Study & Master

Geography

CAPS

Teacher's Guide

Grade 10

Helen Collett • Norma Winearls • Caron Olivier

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CAMBRIDGE UNIVERSITY PRESS

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Cambridge, New York, Melbourne, Madrid, Cape Town,
Singapore, São Paulo, Delhi, Tokyo, Mexico City

Cambridge University Press
The Water Club, Beach Road, Granger Bay, Cape Town 8005, South Africa

www.cup.co.za

First published 2012

ISBN 978-1-107-38163-6

Editor: Barbara Hutton
Typesetter: Brink Publishing & Design
Illustrator: James Whitelaw

Acknowledgements
Photographs: Alex Guth: page 48; OSIS (Ocean Satellite Imaging Systems) Landstat image: page 101; Wikipedia: page 101
Maps: Department: Rural Development & Land Reform. Republic of South Africa. Directorate: National Geo-spatial Information: pages 234, 257 and 258
Cover image: Masked weaver bird, juvenile © Anthony van Tonder/ Independent Contributors/Africa Media Online

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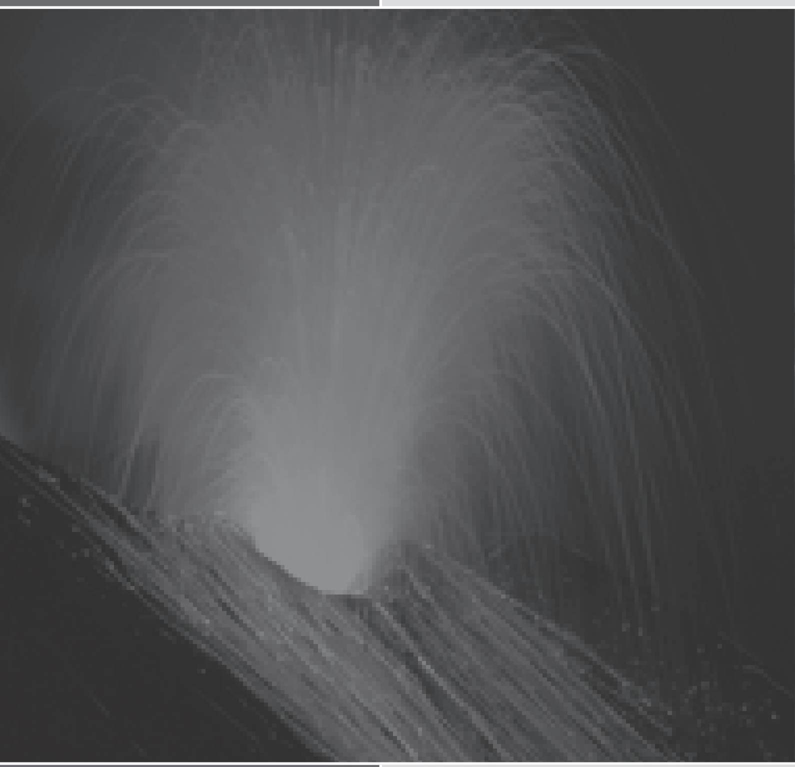
1. INTRODUCTION



1. Curriculum and Assessment Policy Statement (CAPS)

A single Curriculum and Assessment Policy Statement (CAPS) exists for each school subject. The CAPS for each subject details the minimum outcomes and standards of the learning process as well as assessment processes and procedures.

For more information on the CAPS, please see Section 1 of the CAPS document for Geography.

2. Geography as a subject

Aims

Geography is an elective subject that focuses on the study of the human and the physical environments. There are different branches of Geography (for example, Physical Geography and Human Geography) but they all focus on the concept of space in a continuously changing environment.

Geography in Grades 10 to 12 seeks to develop the following knowledge, skills and attitudes in the learners:

- explaining and interpreting both physical and human geographical processes
- describing and explaining the dynamic interrelationship between the physical and human worlds
- developing knowledge about where places are and the nature of a range of different places at different scales
- practising essential transferable skills – literacy, numeracy, oracy, graphicacy
- promoting the use of new technologies, such as Information Communication Technology (ICT) and Geographical Information Systems (GIS)
- developing a commitment towards sustainable development
- creating awareness and sensitivity for inequality in the world
- fostering empathy, tolerance and fairness
- making and justifying informed decisions and judgements about social and environmental issues.

Geography topics

The topics in the Geography CAPS (Grades 10–12) can be explored by focussing on the 'big ideas' of place, spatial processes, spatial distribution patterns and, the interaction between the human and natural environment. These, coupled with the posing of key questions, provide a launching pad for geographical explorations and investigations.

METHOD OF ENQUIRY	KEY QUESTIONS	CONCEPTS
Observation	What is it? What is it like? Who or what is affected?	physical and human processes, awareness, perception, characteristics, similarities and differences
Description	Where does it occur? Why is it there?	location, place, region, space, distribution, pattern, scale, spatial association

METHOD OF ENQUIRY	KEY QUESTIONS	CONCEPTS
Analysis and explanation	What happened or is happening? Why did it happen? How is it changing?	interdependence, causes and processes
Evaluation and prediction	What are the effects? What is likely to happen?	environmental impact, social impact, interdependence, spatial interaction, spatial organisation, human–environment interaction, cause, process, time, behaviour, consequence, justice, quality of life, environmental quality, welfare, costs and benefits

Geographical knowledge, skills and techniques should be taught in an integrated way in each of the following topics in Grade 10:

- The atmosphere (Term 1)
- Geomorphology (Term 2)
- Population (Term 3)
- Water resources (Term 4).

For more information on Geography as a subject, please see Section 2 of the CAPS document.

Time allocation

Geography is allocated four hours of teaching time per week in Grades 10 to 12. Revision, consolidation and assessment (formal and informal) are included in this allocation. It is recommended that in addition to this, six hours of fieldwork be undertaken by the learners. Most of this will need to be completed outside of lesson time.

The topics are weighted differently in terms of time allocation. This weighting should not be seen as a statement about the relative importance of the topics since each is equally important. In Grade 10 the topics are weighted as shown on the table which follows:

Topic	Focus	Time allocation	Term
The atmosphere	Geographical knowledge	27 hours	Term 1
	Geographical skills and techniques	6 hours	
	Assessment and consolidation	3 hours	
Geomorphology	Geographical knowledge	24 hours	Term 2
	Geographical skills and techniques	10 hours	
	Assessment and consolidation	2 hours	
Population	Geographical knowledge	26 hours	Term 3
	Geographical skills and techniques	4 hours	
	Assessment and consolidation	6 hours	
Water resources	Geographical knowledge	15 hours	Term 4
	Geographical skills and techniques	6 hours	
	Assessment and consolidation	3 hours	

3. How *Study & Master Geography Grade 10* works

Course components

Study & Master Geography Grade 10 consists of a:

- Learner's Book
- Teacher's Guide.

Learner's Book

The Learner's Book is divided into eight modules that cover the four Geography topics. There are two modules allocated to each topic. The first module focuses specifically on the geographical knowledge associated with the topic while the second module focuses on the geographical skills and techniques associated with it.

Each module is further divided into units and activities. Each module has three or more units each of which covers an area of the topic.

There is a Review section at the end of each term which learners can use to revise the term's work in preparation for tests and examinations. In addition, examination practice is provided at the end of the Learner's Book. This consists of examination papers which the learners can complete.

Fieldwork is provided for in a practical and enjoyable way. It is included in the activities of Module 2 for the topic, 'The atmosphere'. For the other topics in Grade 10, fieldwork activities are suggested at the end of Modules 3, 5 and 7. Fieldwork activities provide learners with an opportunity to apply and deepen their geographical knowledge, skills and techniques as they use what they have learnt to explore and investigate their environment first-hand. As such, these activities are an integral part of learning and help learners to experience the relevance of what they learn in the classroom and transfer it to outside the classroom.

Formal assessment opportunities are included in the Learner's Book in the form of Assessment Tasks. All other formal assessment activities (tests and examinations) are provided in the Teacher's Guide.

Teacher's Guide

The Teacher's Guide provides information and guidance on:

- Geography as a subject (Section 1)
- planning for the Grade 10 year and lessons (Sections 1 and 4)
- using the modules and units in the Learner's Book to create lessons (Section 2)
- suggested answers for all activities in the Learner's Book (Section 2)
- suggested consolidation and extension activities (Section 2)
- informal assessment suggestions (Section 2)
- a programme of assessment (Section 3)
- tests (Section 3)
- alternative assessment tasks to the ones that appear in the Learner's Book
- model mid-year and end-of-year examination papers (Section 3)
- guidance on the assessment of all Formal Assessment Tasks (Section 3)
- memorandums for all Formal Assessment Tasks (Section 3)
- recording and reporting on formal assessment (Section 3)
- a list of useful websites (Section 4)
- classroom materials that can be made with scrap/waste materials (Section 4)
- additional worksheets and activities on all Geography topics (Section 4).

Section 3 mirrors the Learner's Book and is divided into modules. It indicates how the modules and units in the Learner's Book can be used to create lessons.

Inclusivity

An important part of teaching is to accommodate all learners, including those who experience barriers to learning. *Study & Master Geography* takes into account that learners come from different backgrounds and have different abilities. So it offers learning material that learners can relate to, while extending their learning and experiences. There are a variety of types of activities – activities that appeal to learners of all levels and backgrounds, and that offer opportunities to work individually, in pairs, in groups or as a whole class. This Teacher's Guide also provides consolidation and extension activities for each unit which teachers need when they have to manage a class of diverse learners. Section 4 (Resources) also provides further worksheets for learners and ideas for activities.

4. Grade 10 Year Plan

The table below indicates how *Study & Master Geography Grade 10* covers all requirements of the CAPS for Geography and how it is intended for use in each of the 40 weeks in the school year.

Term	Week/s	Module	Unit no.	Unit title	No. of hours	Geography CAPS content	Resources
1	1	**Module 1** The atmosphere: Geographical knowledge	1	Composition and structure of the atmosphere	5	**Composition and structure of the atmosphere** • Importance of the atmosphere. • The composition and structure of the atmosphere – troposphere, stratosphere, mesosphere, thermosphere. • The ozone layer – in the stratosphere. • Causes and effects of ozone depletion. • Ways to reduce ozone depletion.	Learner's Book pp. 10–19; Teacher's Guide pp. 18–25
1	2–4		2	Heating of the atmosphere	8	**Heating of the atmosphere** • Processes associated with the heating of the atmosphere – insolation, reflection, scattering, absorption, radiation, conduction, convection. • The greenhouse effect – impact on people and the environment. • Factors that affect the temperature of different places around the world – latitude, altitude, ocean currents, distance from oceans. • Global warming – evidence, causes, and consequences with reference to Africa. • The impact of climate and climate change on Africa's environment and people – deserts, droughts, floods, rising sea levels.	Learner's Book pp. 20–39; Teacher's Guide pp. 25–36; atlases; tracing paper/ wax paper

Term	Week/s	Module	Unit no.	Unit title	No. of hours	Geography CAPS content	Resources
1	4–6		3	Moisture in the atmosphere	8	**Moisture in the atmosphere** • Water in the atmosphere in different forms – water vapour, liquid • Processes associated with evaporation, condensation and precipitation. • The concepts of dew point, condensation level, humidity, relative humidity – factors affecting relative humidity. • How and why clouds form. • Cloud names and associated weather conditions. • Different forms of precipitation – hail, snow, rain, dew, frost. • Mechanisms that produce different kinds of rainfall – relief, convectional, frontal.	Learner's Book pp. 40–53; Teacher's Guide pp. 36–43; atlases; thermometers; cloth; cotton/cord/string; water; tin cans; ice
1	6–7		4	Reading and interpreting synoptic weather maps	6	**Reading and interpreting synoptic weather maps** • Weather elements – temperature, dew-point temperature, cloud cover, wind direction, wind speed, atmospheric pressure. (Note: the concept of atmospheric pressure is only introduced here; it is developed more fully in Grade 11) • Weather conditions – e.g. rain, drizzle, thunderstorms, hail, snow as illustrated on station models. • Reading and interpreting a selection of synoptic weather maps.	Learner's Book pp. 54–64; Teacher's Guide pp. 43–49
1	7	Review: Term 1		Activities 1–4	1	**Assessment and consolidation**	Learner's Book pp. 81–82; Teacher's Guide pp. 60–61
1	8	Test		The atmosphere	1	**Assessment and consolidation**	Teacher's Guide pp. 213–216; 217–218

Term	Week/s	Module	Unit no.	Unit title	No. of hours	Geography CAPS content	Resources
1	8	**Module 2** The atmosphere: Geographical skills and techniques	1	Geographical Information Systems (GIS)	1	**Geographical Information Systems** • Reasons for the development of GIS. • How remote sensing works. • Satellite images related to meteorology and climatology.	Learner's Book pp. 65–69; Teacher's Guide pp. 50–53; atlases
1	8–9		2	Fieldwork and practical work	4	**Fieldwork and practical work** • Using maps and other graphical representations – atlases, synoptic weather maps, temperature graphs. • Collecting and recording data using a variety of techniques – using weather instruments, collecting weather information from the media. • Processing, collating and presenting fieldwork findings – line graphs, bar graphs, maps, diagrams, synoptic weather maps.	Learner's Book pp. 70–75; Teacher's Guide pp. 53–58; atlases; daily local newspaper/s
1	9		3	Using atlases	1	**Using atlases** • Map reading – comparing information from different maps. • Atlas index – locating physical and constructed features.	Learner's Book pp. 76–78; Teacher's Guide pp. 58–59; atlases
1	9	Review: Term 1		Activity 5	1	**Assessment and consolidation**	Learner's Book p. 83; Teacher's Guide p. 61
1	10	Assessment Task 1		The atmosphere	1 hr (complete as homework)	**Assessment and consolidation** The atmosphere: Assessment Task 1	Learner's Book pp. 79–80; Teacher's Guide pp. 198–201 or 219
1	10	Revision			3	**Assessment and consolidation**	Teacher's Guide pp. 269–275

Term	Week/s	Module	Unit no.	Unit title	No. of hours	Geography CAPS content	Resources
2	1–2	**Module 3** Geomorphology: Geographical knowledge	1	The structure of the Earth	6	**The structure of the Earth** • The internal structure of the Earth. • Classification of rocks – igneous, sedimentary, metamorphic. • The rock cycle. • Intrusive igneous activity and associated features – batholiths, laccoliths, monoliths, dykes, sills, pipes. • Overview of landforms associated with igneous, sedimentary, metamorphic rocks.	Learner's Book pp. 86–102; Teacher's Guide pp. 62–70; hard-boiled eggs; sharp knives; resource books on rocks; vinegar
2	2–3		2	Plate tectonics	6	**Plate tectonics** • Changes in the position of continents over time. • Evidence for the movement of continents over time. • Plate tectonics – an explanation for the movement of continents. • The mechanics of plate movements. • Processes and landforms associated with different kinds of plate boundaries. • The world's volcanic and earthquake zones.	Learner's Book pp. 103–113; Teacher's Guide pp. 71–76; hard-boiled eggs
2	4		3	Folding and faulting	4	**Folding and faulting** • The process of rock folding – link to plate movement. • Landforms associated with folding. • The process of faulting – link to plate movement. • Different types of faults. • Landforms associated with faulting, e.g. rift valleys and block mountains.	Learner's Book pp. 114–121; Teacher's Guide pp. 77–81

Term	Week/s	Module	Unit no.	Unit title	No. of hours	Geography CAPS content	Resources
2	5		4	Earthquakes	4	**Earthquakes** • How and where earthquakes occur. • The relationship between earthquakes and tectonic forces. • Measuring and predicting earthquakes. • How earthquakes and tsunamis affect people and settlements – differences in vulnerability. • Strategies to reduce the impact of earthquakes. • Case examples of the effects of selected earthquakes.	Learner's Book pp. 122–131; Teacher's Guide pp. 81–86
2	6		5	Volcanoes	4	**Volcanoes** • Types of volcanoes – extrusive, intrusive, active, dormant, extinct. • Structure of volcanoes. • Impact of volcanoes on people and the environment – positive and negative. • Case studies of different volcanic eruptions.	Learner's Book pp. 132–140; Teacher's Guide pp. 87–91; plasticine/play dough/ papier mâché; paint
2	7	Fieldwork 1			Extra-curricular outing (approx. 2½ hrs)	**Six hours of extra-mural fieldwork is recommended in Grade 10.**	Learner's Book pp. 141; Teacher's Guide p. 92; paper; pencils; cameras/ cellphones; resource books on rocks
2	7	Assessment Task 2		Geomorphology	Homework	**Assessment and consolidation** Geomorphology: Assessment Task 2	Learner's Book pp. 142–144; Teacher's Guide pp. 201–202; 220–221
2	7	**Module 4** Geomorphology: Geographical skills and techniques	1	Mapwork skills	2	**Mapwork skills** • Locating exact position – degrees, minutes and seconds. • Scale – word, ratio, fraction and line scale.	Learner's Book pp. 145–149; Teacher's Guide pp. 93–96; atlases; wall maps with different scales (optional)

Term	Week/s	Module	Unit no.	Unit title	No. of hours	Geography CAPS content	Resources
2	7–8		2	Topographic maps	4	**Topographic maps** • South African 1:50 000 map referencing system. • 1: 50 000 maps – conventional signs and symbols. • Navigating position using compass directions (16 points). • Direction – true and magnetic bearing. • Landforms and contours. • Simple cross-sections.	Learner's Book pp. 150–163; Teacher's Guide pp. 96–102; atlases; protractors; rulers; graph or quad paper; topographic maps (optional)
2	8		3	Aerial photographs and orthophoto maps	2	**Aerial photographs and orthophoto maps** • Photographs of landscapes. • Oblique and vertical aerial photos. • Orthophoto maps to be used in conjunction with 1:50 000 maps and aerial photos.	Learner's Book pp. 164–170; Teacher's Guide pp. 102–104; drawing of an aeroplane; match box/small box
2	9		4	Using atlases	9	**Using atlases** • Atlas index – locating physical and constructed features. • Four-digit grid reference (latitude and longitude, degrees and minutes) to identify and locate features on maps. • Concept of map projections: examples of equal area and true direction projections – critical evaluation.	Learner's Book pp. 171–175; Teacher's Guide pp. 105–108; atlases; tennis/ soccer balls (optional); paper (optional); globe (optional)
2	9	Review: Term 2	Activities 1–6		1 hr (complete as homework)	**Assessment and consolidation**	Learner's Book pp. 176–182; Teacher's Guide pp. 108–110
2	9–10	Examinations				**Assessment and consolidation**	Teacher's Guide pp. 227–229 and 233–236

Term	Week/s	Module	Unit no.	Unit title	No. of hours	Geography CAPS content	Resources
3	1	**Module 5** Population: Geographical knowledge	1	Population distribution and density	4	**Population distribution and density** • Meaning of population distribution and population density. • World population density and distribution. • Factors that affect distribution and density of the world's population.	Learner's Book pp. 184–190; Teacher's Guide pp. 111–116; atlases/maps of world and Africa; calculators
3	2		2	Population structure	4	**Population structure** • Population indicators – birth rates, death rates, life expectancy, fertility rate, natural increase. • Factors that influence population indicators. • Population structure – age, gender represented as population pyramids.	Learner's Book pp. 191–200; Teacher's Guide pp. 116–121; atlases
3	3–4		3	Population growth	6	**Population growth** • World population growth over time. • Demographic transition model. • Concept of overpopulation. • Managing population growth.	Learner's Book pp. 201–213; Teacher's Guide pp. 121–127; atlases
3	4–6		4	Population movements	8	**Population movements** • Kinds of population movement – international migration, emigration, immigration, regional migration, rural-urban migration, urbanisation, voluntary and forced migration. • Causes and effects of population movements • Temporary and permanent movements – migrant labour, economic migrants, political migrants and refugees. • Attitudes to migrants.	Learner's Book pp. 214–229; Teacher's Guide pp. 127–135; atlases

Term	Week/s	Module	Unit no.	Unit title	No. of hours	Geography CAPS content	Resources
3	6–7		5	HIV and AIDS	4	**HIV and AIDS** • HIV infection rates in southern Africa. • Social and economic effects of HIV and AIDS using specific examples from the southern African region. • The impact of HIV and AIDS on population structure.	Learner's Book pp. 230–235; Teacher's Guide pp. 135–138; atlases; calculators
3	7	Fieldwork 2			Extra-curricular outing (approx. 1 hr)	Six hours of extra-mural fieldwork is recommended in Grade 10.	Learner's Book pp. 236; Teacher's Guide pp. 138–139; graph or quad paper; pencils
3	7	Review: Term 3		Activities 1–3	2	**Assessment and consolidation**	Learner's Book pp. 248–249; Teacher's Guide pp. 147–149
3	8	Test		Population	1	**Assessment and consolidation**	Teacher's Guide pp. 222–233; 224–225
3	8	**Module 6** Population: Geographical skills and techniques	1	Geographical Information Systems (GIS)	2	**Geographical Information Systems (GIS)** • Satellite images related to topics about population.	Learner's Book pp. 237–240; Teacher's Guide pp. 140–143
3	8–9		2	Using atlases	2	**Atlas skills** • Map reading – comparing information from different maps. • Interpreting graphs, population pyramids, photographs, models.	Learner's Book pp. 241–247; Teacher's Guide pp. 143–147; atlases; calculators (optional); glass of water
3	9	Review: Term 3		Activity 4	1	**Assessment and consolidation**	Learner's Book p. 250; Teacher's Guide p. 149
3	9–10	Revision			6	**Assessment and consolidation**	Teacher's Guide pp. 294–298
4	1	**Module 7** Water resources: Geographical knowledge	1	Water in the world	2	**Water in the world** • Different forms of water in the world – liquid, solid, gas. • Occurrence of salt water and fresh water – oceans, rivers, lakes, ground water, atmosphere). • The hydrological cycle.	Learner's Book pp. 252–258; Teacher's Guide pp. 150–155; 1 [ℓ] cooldrink bottles/measuring cylinders; jars; teaspoons; droppers; water; food colouring (optional); atlases

Term	Week/s	Module	Unit no.	Unit title	No. of hours	Geography CAPS content	Resources
4	1–2		2	The world's oceans	4	**The world's oceans** • Oceans as sources of oxygen, food, energy. • Ocean circulation – warm and cold currents. • Ocean currents and their importance for fishing, trade and tourism. • Relationship between oceans and people – pollution, over-fishing, desalination. • Strategies for managing the world's oceans.	Learner's Book pp. 259–274; Teacher's Guide pp. 155–161; atlases
4	2–3		3	Water management in South Africa	5	**Water management in South Africa** • Rivers, lakes and dams in South Africa. • Factors influencing the availability of water in South Africa. • Challenges of providing free basic water to rural and urban communities in South Africa. • Role of government – initiatives towards securing water –interbasin transfers; building dams. • Role of municipalities – provision, water purification. • Strategies towards sustainable use of water – role of government and individuals.	Learner's Book pp. 275–284; Teacher's Guide pp. 162–167

<table>
<tr><th>Term</th><th>Week/s</th><th>Module</th><th>Unit no.</th><th>Unit title</th><th>No. of hours</th><th>Geography CAPS content</th><th>Resources</th></tr>
<tr><td>4</td><td>3–4</td><td></td><td>4</td><td>Floods</td><td>4</td><td>Floods
• Causes of flooding – physical and human.
• Characteristics of floods: analysis and interpretation of flood hydrographs.
• Managing flooding in urban, rural and informal settlement areas.
• Case study of flooding in South Africa.</td><td>Learner's Book pp. 285–293; Teacher's Guide pp. 167–172</td></tr>
<tr><td>4</td><td>4</td><td colspan="3">Fieldwork 3</td><td>Extra-curricular outing (approx. 2½ hrs)</td><td>Six hours of extra-mural fieldwork is recommended in Grade 10.</td><td>Learner's Book p. 294; Teacher's Guide p. 172; paper; pencils; plastic bottles/jars; cameras/cellphones; resource books and/or access to the Internet</td></tr>
<tr><td>4</td><td>4</td><td>Assessment Task 3</td><td colspan="2">Water resources</td><td>1 (complete as homework)</td><td>Assessment and consolidation
Water resources: Assessment Task 3</td><td>Learner's Book pp. 295–297; Teacher's Guide pp. 207–209; 227–229; 237–247; 254–258</td></tr>
<tr><td>4</td><td>5</td><td rowspan="3">Module 8
Water resources: Geographical skills and techniques</td><td>1</td><td>Topographic maps</td><td>2</td><td>Topographic maps
• Landforms and contours.</td><td>Learner's Book pp. 298–304; Teacher's Guide pp. 173–177; atlases; topographic maps 1:50 000 (optional)</td></tr>
<tr><td>4</td><td>5</td><td>2</td><td>Aerial photographs and orthophoto maps</td><td>2</td><td>Aerial photographs and orthophoto maps
• Photographs of landscapes.
• Oblique and vertical aerial photos.
• Orthophoto maps to be used in conjunction with 1:50 000 maps and aerial photos.</td><td>Learner's Book pp. 305-311; Teacher's Guide pp. 177–179; atlases; rulers; calculators (optional); topographic maps 1:50 000 (optional)</td></tr>
<tr><td>4</td><td>6</td><td>3</td><td>Geographical Information Systems (GIS)</td><td>2</td><td>Geographical Information Systems (GIS)
• GIS concepts: spatial objects, lines, points, nodes, scales.</td><td>Learner's Book pp. 312–314; Teacher's Guide pp. 180–181; rulers; cotton/wool/strong/shoe laces/dental floss</td></tr>
<tr><td>4</td><td>6–7</td><td colspan="2">Review: Term 4</td><td>Activities 1–7</td><td>3</td><td>Assessment and consolidation</td><td>Learner's Book pp. 315–320; Teacher's Guide pp. 182–184</td></tr>
<tr><td>4</td><td>7–8</td><td colspan="3">Exam preparation</td><td>7</td><td>Assessment and consolidation</td><td>Learner's Book pp. 321–340; Teacher's Guide pp. 184–192</td></tr>
<tr><td>4</td><td>9–10</td><td colspan="4">Examinations</td><td>Assessment and consolidation</td><td>Teacher's Guide pp. 237–247; 254–260</td></tr>
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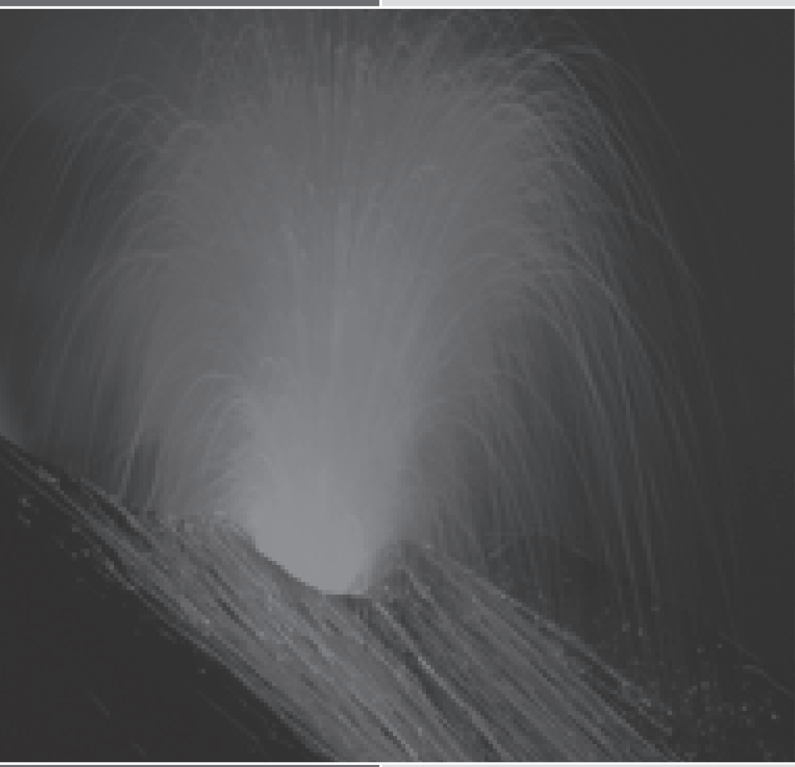
2. LESSON-BY-LESSON

This section contains teaching notes for the modules in the Learner's Book and answers to all the activities. It also provides informal assessment suggestions and suggested consolidation and extension activities.



General

- Many of the activities are bite-sized, quick and easy to do. Because of this you can often work through as many as two or three activities in a lesson.
- The information boxes (those with a magnifying glass), case studies and other information in boxes in the Learner's Book provide additional information, examples or applications for some teaching points in the main body text.
- Use a variety of approaches for reading these boxes – for example, read the box to the class, ask a learner to read the box to the class, or ask learners to read the box on their own (use this approach for short, easy-to-read boxes).
- In most cases, these boxes are there for teaching and learning purposes (they are always linked to activities), but not for revision purposes. Point out to your learners that when they use the book for revision, they need only focus on the main body text.
- In this Teacher's Guide, the instruction, 'Instruct the learners to work on Activity x', includes going through the answers with the class once they have completed the activity, unless the activity is set for, or finished off, as homework. In this case, remember to go through the answers to the activity at the start of the next lesson.

Term 1
Learner's Book
pages 9–64
Duration: 29 hours

MODULE 1

THE ATMOSPHERE: GEOGRAPHICAL KNOWLEDGE

This module on the atmosphere covers important concepts that relate to the weather and environmental issues, such as ozone depletion and global warming. Learners often have a shaky or garbled concept of the greenhouse effect. Watch out for this so that you can correct any misconceptions.

Curriculum and Assessment Policy Statement (CAPS)

Composition and structure of the atmosphere

- Importance of the atmosphere.
- The composition and structure of the atmosphere – troposphere, stratosphere, mesosphere, thermosphere.
- The ozone layer – in the stratosphere.
- Causes and effects of ozone depletion.
- Ways to reduce ozone depletion.

Heating of the atmosphere

- Processes associated with the heating of the atmosphere – insolation, reflection, scattering, absorption, radiation, conduction, convection.
- The greenhouse effect – impact on people and the environment.
- Factors that affect the temperature of different places around the world – latitude, altitude, ocean currents, distance from oceans.
- Global warming – evidence, causes, and consequences with reference to Africa.
- The impact of climate and climate change on Africa's environment and people – deserts, droughts, floods, rising sea levels.

Moisture in the atmosphere

- Water in the atmosphere in different forms – water vapour and liquid.
- Processes associated with evaporation, condensation and precipitation.
- The concepts of dew point, condensation level, humidity, relative humidity – factors affecting relative humidity.
- How and why clouds form.
- Cloud names and associated weather conditions.
- Different forms of precipitation – hail, snow, rain, dew, frost.
- Mechanisms that produce different kinds of rainfall – relief, convectional, frontal.

Reading and interpreting synoptic weather maps

- Weather elements – temperature, dew-point temperature, cloud cover, wind direction, wind speed, atmospheric pressure.
  (Note: the concept of atmospheric pressure is only introduced here; it is developed more fully in Grade 11.)
- Weather conditions – e.g. rain, drizzle, thunderstorms, hail, snow as illustrated on station models.
- Reading and interpreting a selection of synoptic weather maps.

Key geographical skills

- Using verbal, quantitative and symbolic data forms such as text, pictures, graphs tables, diagrams and maps.
- Practising field observation and mapping, interviewing people, interpreting sources and working with statistics.
- Applying communication, thinking, practical and social skills.
- Practising the following specific skills:
  - identifying questions and issues
  - collecting and structuring information
  - processing, interpreting, and evaluating data
  - making decisions and judgements
  - deciding on a point of view
  - suggesting solutions to problems
  - working co-operatively and independently.

Key words/concepts

atmosphere; air; atmospheric pressure; density; thermosphere; mesosphere; stratosphere; troposphere; ozone; ozone layer; chlorofluorocarbons (CFCs); hydrofluorocarbons (HCFs); solar radiation; insolation; reflection; absorption; scattering; radiation; evaporation; latent heat; convection; conduction; albedo; lapse rate; ocean current; moderating effect; greenhouse effect ; greenhouse gas; global warming; climate change; water cycle; condensation; precipitation; humidity; wet-and-dry bulb thermometer; relative humidity; saturated air; dew point; dew; frost; cloud; mist; fog; condensation level; condensation nuclei; stratus cloud; cumulus cloud; cirrus cloud; rain; hail; snow; front; relief rainfall / orthographic rainfall; rain shadow; convectional rainfall; frontal rainfall / cyclonic rainfall; weather forecast; synoptic weather map; station model; warm front; cold front; isobar

Learner's Book pages 10–19
Duration: 5 hours

UNIT 1 Composition and structure of the atmosphere

TERM 1, WEEKS 1–2

Curriculum and Assessment Policy Statement (CAPS) content

Composition and structure of the atmosphere

- Importance of the atmosphere.
- The composition and structure of the atmosphere – troposphere, stratosphere, mesosphere, thermosphere.
- The ozone layer – in the stratosphere.
- Causes and effects of ozone depletion.
- Ways to reduce ozone depletion.

Resources

- Learner's Book pages 10–19
- Websites (optional)
  - Two useful sites for your learners are: www.learnersgeo.com/geography-for-learners/0042-composition-of-the-atmosphere.php and www.geography4kids.com/files/atm_intro.html
  - A useful site for you or for advanced learners is: www.ucar.edu/learn
  - For a cartoon on ozone depletion: http://www.epa.gov/ozone/science/missoz

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what the learners may already know about the topics and any areas of difficulty that you think they might encounter.
- For Activity 1, learners will need compasses to draw circles and rulers. Remind them to bring their compasses and rulers to class for Lesson 1.
- For Lessons 3 and 4, try to collect some cartoons on ozone depletion to display in class. See the website above for one example. You can find many more by going to Google Images and typing in 'cartoon, ozone hole' or 'cartoon, ozone depletion'. Select a few of the best ones.

Teaching the unit

Lesson 1

- Read through, or ask learners to read through, the Module 1 introductory paragraph on page 10. You can use it as the basis of an opening discussion to assess what learners already know. If necessary, write up and display the Key questions on the board for the duration of the module. Point out that the NASA photograph shows the layers of the atmosphere.
- Read through, or ask learners to read through, the Unit 1 introductory paragraph on page 11. Point out to that the Key questions for each unit form the headings in the units.
- Work through the sections, 'Why is the atmosphere essential for life on Earth?' (page 11) and 'What is air made up of?' (page 12). Emphasise that except for argon (a noble gas), trace gases such as carbon dioxide, ozone and methane are present in the air in very small and variable (changing) amounts. The amount of water vapour in the air also varies from 1–5%.

Activity 1

- Instruct learners to work on Activity 1.
- Be available to help them with their scale drawings if necessary.

Activity 2

- Instruct learners to work on Activity 2.
- Remind them of prior Natural Sciences or Life Sciences knowledge. For example, what do they know about the nitrogen cycle and the carbon cycle?
- If necessary, set this activity for homework.

Lesson 2

- If Activity 2 was completed for homework, quickly go through the answers with the class.
- Work through the sections, 'How does the atmosphere change the higher above the Earth you go?' (page 13) and 'What are the layers of the atmosphere?' (page 13).
- To help learners understand the concept of atmospheric pressure, describe how we live at the bottom of a 'sea' of air. Also ask them to think of the individual particles of air or molecules of gas as ping pong balls. The stronger the pull of gravity, the closer together the air particles or ping pong balls are. The weaker the pull of the gravity, the more space there is between the air particles or ping pong balls.
- For interest: The more water vapour there is in the air, the lower the air pressure. This is because, surprisingly, the mass of a water molecule is less than the average mass of the molecules that make up air.
- Use Figure 1.1.3 as you work through the layers of the atmosphere. It also serves as a good summary. The order of the layers in the text matches the order of the layers in Figure 1.1.3, from top to bottom. Point out the margin tip that explains where the names of the layers come from. Learners are more likely to remember the names if they understand the meaning of the names.

Activity 3

- Instruct learners to work on Activity 3. This activity takes them step-by-step through the temperature-altitude graph.

Lesson 3

- Read the features, 'Climbing Mount Everest in thin air' (page 15) and 'The auroras: an atmospheric phenomenon' (page 15). Use the features as a starting point for class discussion, for example:
  - Who knows anyone who has climbed Everest?
  - Who has seen the auroras on a documentary on TV?

Activity 4

- Instruct learners to work on Activity 4 in pairs. This activity provides good consolidation of the concept of atmospheric pressure.

Activity 5

- If necessary, allow learners to complete this activity for homework. It consolidates one of the layers of the atmosphere – the mesosphere.

Lesson 4

- Go through the answers to Activities 4 and 5 with the class.
- Work through the section, 'Why is the ozone layer important?' (pages 16–17). Read through the feature, 'It's not always fun in the Sun' (page 16).

Activity 6

- Instruct learners to work on Activity 6.
- If necessary, allow learners to complete this activity for homework.

Lesson 5

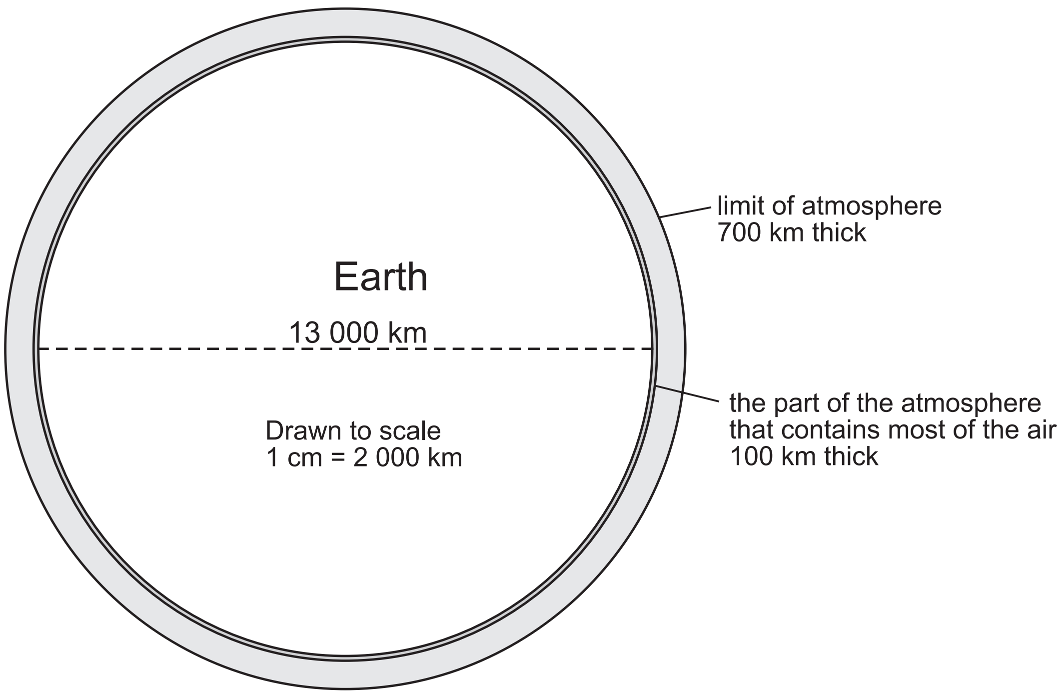
- If Activity 6 was completed for homework, go through the answers with the class.
- Complete and consolidate the section on the ozone layer.
- Read the case study, 'Patching the hole in the ozone' (page 17).

Activity 7

- Instruct learners to work on Activity 7.
- Use this activity to assess learners' comprehension and ability to interpret graphs (see the section, Informal assessment below).
- If necessary, allow learners to complete this activity for homework.

Answers

Activity 1



This is half the size of the scale that your learners will use. In other words, their drawings should be double this size.

Activity 2

Gas in air	Proportion by percentage (%)	Importance
Nitrogen	78%	Bacteria in the soil turn this gas into nitrates that plants can use for growth.
Oxygen	20%	Plants and animals use this gas for respiration. Plants produce this gas as a waste product of photosynthesis.
Carbon dioxide	0,03%	Plants use this gas for photosynthesis.
Water vapour	variable, 1–5%	This gas is the source of rain.

Activity 3

1. colder, decrease
2. colder
3. hotter, increase
4. hotter
5. a) temperatures decrease with height
   b) temperatures increase with height

Activity 4

1. about 16 km
2. 8 850 m above sea level
3. halfway
4. the pull of gravity decreases the higher it gets/ with altitude
5. the concentration of air molecules is lower, i.e. the molecules of air are further apart
6. i) 20%
   ii) 20%
7. 100 000 (i.e. 300 000 ÷ 3)
8. dizziness, shortness of breath, tiredness, inability to think clearly, nausea (any three; nausea is not mentioned in the extract)

Activity 5

1. shimmering lights that are sometimes seen in the night sky in the polar circles
2. thermosphere
3. Charged particles from the Sun (the solar wind) are trapped by the Earth's magnetic field and collide with the air molecules, giving off light.
4. the Earth's magnetic field is strongest at the poles

Activity 6

1. a form of oxygen, made up of three atoms of oxygen
2. stratosphere
3. it absorbs or screens out most of the Sun's harmful UV rays (UV-B)
4. southern parts of South America and Australia, South Africa
5. The thinning of the ozone layer/ size of the ozone hole increased dramatically between September 1979 and October 1989. The satellite images for October 2006 and October 2010 show that the hole is still large, but it hasn't grown any bigger.

Activity 7

1. chlorine-containing chemicals/ chlorofluorocarbons (1) (used in aerosol cans and refrigeration systems) that destroy ozone in the stratosphere (1)
2. 1985 (or 1980s) (1)
3. an international treaty or agreement introduced to protect the ozone layer by stopping CFC production (1); 1987 (1); 1996 (1)
4. a) 1989 (1)
   b) no (1), but it dropped a lot/ significantly (1)
   c) about 8 times (2)
5. a) 1993 (1)
   b) CFCs are long-lasting (1)
   c) ozone levels are starting to go up again/ recover (1)

[14 marks]

Informal assessment

Activity 1

- Check on learners as they draw their circles.
- Draw an approximate version on the board so that learners can check their work.

Activity 2

- Go through the answers with the class, asking learners for the answers.

Activity 3

- Go through the answers with the class, asking individual learners to offer answers. Ask who had trouble following or interpreting the graph. Spend time with these learners in a group, taking them carefully through the graph.

Activity 4

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Activity 5

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Activity 6

- Go through the answers with the class. Ask learners to offer answers.

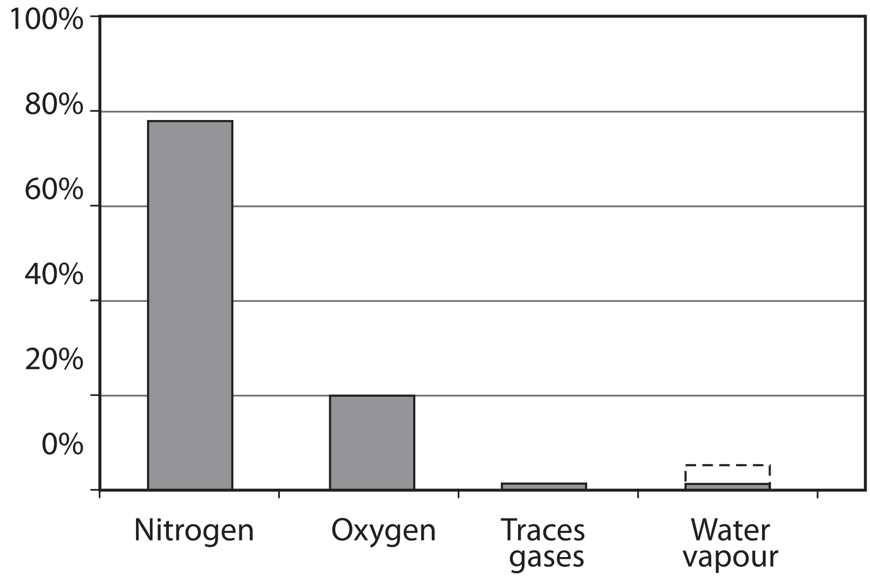
Activity 7

- Take in learners' books and mark their work according to the mark allocation given in the Answers section. Use this to informally assess learners' comprehension skills and ability to interpret graphs. Provide them with feedback on how they are progressing.

Consolidation/extension

Consolidation:

- Learners who struggled with Activity 7 will need help with comprehension and/or interpreting the bar graph. If necessary, set them another bar graph exercise for extra practice. For example, ask them to plot the percentage of nitrogen, oxygen and trace gases on a bar graph, to show the composition of air.



A bar graph showing the composition of air

Extension:

- Learners can get more information on ozone and ozone depletion from the Ozone Hole Tour on the University of Cambridge website: www.atm.ch.cam.ac.uk/tour/index.html

Learner's Book pages 20–39
Duration: 8 hours

UNIT 2 Heating of the atmosphere

TERM 1, WEEKS 2–4

Curriculum and Assessment Policy Statement (CAPS) content

Heating of the atmosphere

- Processes associated with the heating of the atmosphere – insolation, reflection, scattering, absorption, radiation, conduction, convection.
- The greenhouse effect – impact on people and the environment.
- Factors that affect the temperature of different places around the world – latitude, altitude, ocean currents, distance from oceans.
- Global warming – evidence, causes, and consequences with reference to Africa.
- The impact of climate and climate change on Africa's environment and people – deserts, droughts, floods, rising sea levels.

Resources

- Learner's Book pages 20–39
- Atlas
- Activity 2: If you choose to set this up as a demonstration (see Figure 1.2.6), you will need a gas burner or electric hotplate and a pot of water. A pot with metal handles (i.e. non-insulated handles) is good for demonstrating heat conduction.
- Activity 9: Provide learners with tracing paper or wax paper, or ask them to bring their own.
- If you do the extension suggested in Lesson 4 as a demonstration activity, you will need two identical plastic lunchboxes and two weather thermometers or thermometers that range from 0 °C to 100 °C.

- Websites (optional)
  - A useful general site for you or advanced learners: www.ucar.edu/learn
  - www.climatecrisis.net/the_evidence.php – this page gives a brief explanation on global warming and shows photographic evidence. There is also a 12 Tips downloadable page. If learners go to the 'Take action' banner and click on the 'Become carbon neutral' page, they can calculate their household's carbon emissions output, although the questionnaire is designed for Americans.
  - For a description of some of the effects of climate change go to:
    - www.en.wikipedia.org/wiki/Effects_of_global_warming – this gives a comprehensive overview
    - www.climate.nasa.gov/effects – if you scroll down, you will find a list of impacts by region – for example, North America, Latin America, Europe, etc.
    - www. soer.deat.gov.za/174.html – this Department of Environmental Affairs site describes the effects of climate change in South Africa.
    - An inconvenient truth – Al Gore's 2006 documentary film on global warming. Read more about the film on Wikipedia: www.en.wikipedia.org/wiki/An_Inconvenient_Truth

Preparation

- Unit 2 is probably the most difficult unit in this module. Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- See the resources needed for Activity 2 and Activity 9 as well as for the extension activity for Lesson 4 listed above.

Teaching the unit

Lesson 1

- Read through, or ask learners to read through, the Unit 2 introductory paragraph on page 20. Ask learners what they know about the greenhouse effect and global warming. This will give you a chance to address any misconceptions they might have as you work through the unit.
- Work through the sections, 'How is the atmosphere heated?' (page 20) and 'What happens to incoming sunlight?' (page 21). The important messages here are:
  1) The Sun's radiation consists of:
     - short-wave visible light and UV light, and
     - long-wave infrared heat.
  2) The gases in the atmosphere are transparent to the short-waves, which pass through the atmosphere, strike the Earth, warm up the Earth, and are radiated back into the atmosphere as long-wave infrared heat.
- Focus on Figure 1.2.3 (on page 21) for the section on 'What happens to incoming sunlight?' Point out to that the number of incoming and outgoing lines represents the proportion of radiation that's reflected, absorbed and scattered. For example, there are 10 incoming lines and 3 of these are reflected (i.e. 3 out of 10 is 30%).
- Begin the section, 'How does the Earth heat up the atmosphere?' (page 22).

Activity 1

- Instruct learners to work on Activity 1.
- If there is not enough time, learners can do or complete this activity for homework.

Lesson 2

- If Activity 1 was completed for homework, go through the answers with the class.
- Continue the section, 'How does the Earth heat up the atmosphere?' (page 22).
- Activity 2 should help learners recognise how radiation, convection and conduction are methods of heat transfer. The heat transferred by these methods can be felt.
- For latent heat, emphasise that the word 'latent' means hidden and that this form of heat cannot be felt. The latent heat stored in water vapour does not make the air warmer.

Activity 2

- Instruct learners to work on Activity 2.
- The concepts of the heat transfer methods are difficult. The purpose of this activity is to help learners relate these methods of heat transfer to something they know, or have observed.
- You could set this up as a class demonstration with a gas ring or hot plate and a pot of water.

Activity 3

- Allow learners to complete Activity 3 for homework.
- Prepare learners by asking them if they have ever noticed the difference in early morning temperature on a clear day versus an overcast or cloudy day.

Lesson 3

- Go through the answers for Activity 3.
- Begin the section, 'Which factors affect the temperature of different places?' (page 24).
- For 'latitude', focus on Figure 1.2.7 (page 24).
- For 'albedo', ask learners for examples of:
  - surfaces that reflect more heat than they absorb, for example white or shiny silver surfaces
  - surfaces that absorb more heat than they reflect, for example dark-coloured or black surfaces.
- You can relate this to some everyday examples. For example:
  - Lorry tankers that carry milk or petrol are shiny silver to reflect the heat. Shiny silver has high albedo (reflecting power).
  - Black cars have low albedo (reflecting power) and get a lot hotter than white cars, because they absorb a lot of heat.
- Suggest a simple experiment that learners could carry out for themselves – see the Extension section on page 36 of this Teacher's Guide.

Activity 4

- Instruct learners to work on Activity 4.
- Activity 4 looks at the effect of latitude on temperature, but also relates to albedo (see Question 4).

- Continue with the section, 'Which factors affect the temperature of different places?' For 'Altitude' (page 26), ask learners which method of heat transfer is mainly responsible for heating up the layer of air closest to the Earth. The answer is conduction.

Activity 5
- Instruct learners to work on Activity 5.
- Remind learners to refer to the Tip box to help them.

Activity 6
- Allow the learners to complete Activity 6 for homework.
- Prepare learners for this activity by pointing out what seems like a mystery: Kilimanjaro is very close to the equator, but it is capped with snow. Snow at the equator? How is this possible?

Lesson 4

- Go through the answers for Activity 6 with the class.
- Continue the section, 'Which factors affect the temperature of different places?' (pages 27–28).
  - For 'Ocean currents', point out that in the same way that warm air and cold air is mixed by convection, warm water and cold water is mixed by convection.
  - For 'Distance from the oceans', suggest a simple experiment that learners could carry out for themselves, or do it as a demonstration – see the Extension section (page 36 in this guide).

Activity 7
- Instruct learners to work on Activity 7.
- Learners can do this activity in pairs. One learner looks up the latitude of Port Nolloth while the other looks up the latitude of Durban.

Activity 8
- In this activity, learners practice reading temperature graphs.
- Allow learners to complete the activity for homework.

Lesson 5

- Go through the answers for Activity 8.
- Work through the section, 'What is the greenhouse effect and how do we contribute to it?' (page 29).
- Emphasise that the greenhouse effect is a natural effect, but that the huge increase in greenhouse gas emissions now means that the heat balance is being disturbed. Refer to Figure 1.2.13A.
- Point out that other greenhouse gases are: nitrous oxide, ozone, CFCs and HFCs.
- Begin the section, 'What is global warming?'(page 30).
- If necessary, you can spend a bit of discussion time on the dissenter's view of global warming. For example, some scientists acknowledge that global temperatures are rising, but dispute that this is caused by humans. Their view is that like the ice ages of the past, changes in global temperatures are a natural phenomenon and are unavoidable. Point out that although there is controversy around global warming, it is now accepted as the mainstream scientific view.
- Read the case study, 'The Vostok ice core' (page 32).

Activity 9
- Instruct learners to work on Activity 9.
- This activity shows the link between greenhouse gas levels and temperature.
- Ideally, this activity should be done in class, rather than for homework – it's just more fun and sociable – but learners can finish it off for homework if necessary.

Lesson 6

- Continue the section 'What is the greenhouse effect and how do we contribute to it?' (page 29).
  – For 'What are the consequences of global warming', emphasise that there is a feedback-effect in global warming that accelerates the effect, or makes it even worse. For example, as more snow and ice melt at the poles, the less heat the Polar Regions reflect, and the more quickly they heat up.

Activity 10
- Instruct learners to work on Activity 10.
- The answer for Question 2 relates to the moderating effect. If necessary, tell learners that the answer is one of the factors that affect the temperature of different places. Ask them to remember them: latitude, albedo, altitude, ocean currents and distance from the oceans/ the moderating effect of the sea. They must then identify the factor that best explains why certain regions on the map are warming faster.

- Read the case study 'The melting polar ice caps' (page 34).

Activity 11
- Instruct learners to work on Activity 11. If there is not enough time, learners can complete this activity for homework.

Lesson 7

- If Activity 11 was completed for homework, go through the answers with the class.
- Work through the section, 'How will global warming and climate change affect Africa?' (page 35).
  – Point out that global warming disturbs the balance. As it gets warmer, the evaporation of water increases, producing heavier rains in rainy places. On the other hand, arid or semi-arid regions are likely to become hotter and drier.
  – For more information on the effects of climate change, see some of the suggested websites under the Resources section on page 26 in this guide.
- Read the feature, 'The shrinking ice fields of Kilimanjaro' (page 36).

Activity 12
- Let learners complete Activity 12. In this activity, learners practise comprehension, map reading and numeracy.
- If you think learners might have difficulty with this activity, allow them to work in pairs.

Activity 13

- Let learners complete Activity 13. If there is not enough time, learners can complete this activity for homework.

Lesson 8

- If Activity 13 was completed for homework, go through the answers with the class.
- Work through the section, 'What action must we take to stop global warming and climate change?' (page 38).
- List on the board the climate change convention events that have involved the international community.
- Talk about our responsibility as individuals and how we can try to limit climate change. Lead into a discussion of the two topics set in Activity 14.

Activity 14

- See the suggested answers in the Answers section below to help you guide the discussion.
- Also note:
  - A nice analogy for global warming is this: The crew on a huge, slow oil tanker spots a massive iceberg in the distance. Although they are half an hour's travelling distance from the iceberg, the tanker can't change its course in time to avoid crashing into it. Although the accident hasn't happened yet, it will happen. The tanker is on an inevitable collision course. The same scenario might apply to global warming. The disaster hasn't happened yet, but have we already reached a point of no return? Or can we mobilise and take corrective action fast enough?
  - Here's an interesting quote from Oliver Morton's book, *Photosynthesis: Eating the sun:* 'What to call this extraordinary state of affairs, in which we add almost a hundred watts of warming power to the planet for every watt we make deliberate use of? It is most often discussed under the rubric of 'global warming', but this lacks both accuracy and a sense of danger. The change in climate brought about by our enhancement of the greenhouse effect is not going to be a monotonic warming, and its effects will differ markedly in different parts of the world (some bits, though very few, might be conceivably cool). Warming also sounds both gentle and broadly pleasant; what we are doing is unlikely, for most people, to be either. [James] Lovelock, deeply alarmed on the subject, prefers to speak of 'global heating.'
  - If you think this quote is too sophisticated for your learners, you could just suggest to them the part about global warming sounding mild and pleasant. And that rather, we should talk of global heating.
  - And here's a quote by the Russian astronaut Vladimir Shatalov: 'Beyond [the atmosphere] there is only emptiness, coldness and darkness. The blue sky, which gives us breath and protects us from endless black and death, is but an infinitesimally thin film. How dangerous it is to threaten even the smallest part of this gossamer, this conserver of life.'

Activity 15

- Allow the learners to complete this activity as homework.
- Use the activity to assess learners' ability to read and interpret data in a table (see Informal assessment section).

Answers

Activity 1

1. incoming sunlight/ radiation
2.

Insolation	Terrestrial radiation
heats up the Earth's surface	heats up the atmosphere
consists of light (short-wave radiation) and infrared heat (long-wave radiation)	consists of infrared heat (long-wave radiation)
takes place during the day	takes place during the day and at night

Activity 2

1. (1) radiation; (2) conduction; (3) convection; (4) convection
2. (4)

Activity 3

1. a) higher minimum temperatures are linked to cloud cover
   b) radiation

Activity 4

1. between the equator (0°) and 23 °N and S/ 23 °N to 23 °S
2. the polar regions 66.5 °– 90 °N and S
3. a lot is reflected by clouds
4. Map of the Earth' surface; the variable pattern of insolation is due to differences in albedo – some surfaces reflect more insolation than others

Activity 5

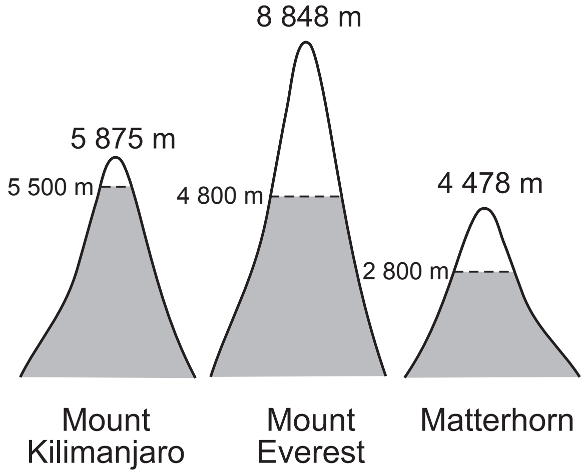
Altitude (m)	Temperature (°C)
1 400	30
2 000	26,1*
3 000	19,6
4 000	13,1
5 000	6,6
6 000	0,1

* Calculated like this:
2 000 m −1 400 m = 600 m
600 m ÷ 100 m = 6
30 °C − (6 × 0,65) °C = 30 °C – 3,9 °C = 26,1 °C

Then − 6.5 °C for every drop in 1 000 m, for example:
26,1 °C – 6,5 °C = 19,6 °C
19,6 °C – 6,5 °C = 13,1 °C, etc.

Activity 6
Learners can draw their outlines of the mountains on a scale of
1 cm = 2 000 km or 1 cm = 1 000 km. This is a scale of 1 cm = 2 000 km.

1.



2. higher

Activity 7
1. Port Nolloth 29°15' S; Durban 29°53' S
2. 6 °C
3. The cold Benguela Current makes Port Nolloth colder than it would otherwise be. The warm Mozambique Current makes Durban warmer than it would otherwise be.

Activity 8
1. Pietermaritzburg
2. Pietermaritzburg
3. a) about 12,5 °C;
   b) about 18 °C;
   Note: accept one or two degrees on either side of these values
4. Pietermaritzburg
5. Durban is a coastal town. The ocean moderates temperatures. Pietermaritzburg is an inland town. There is no moderating effect.

Activity 9
1–3 Learners should see that all three graphs follow the same up and down pattern.
4. a) decreases/ drops/ falls
   b) increases/ rises
5. about 0,7 °C (from – 0,4 °C at 1900 to – 0,3 °C at 2000; it's really about 0,5 °C, but it looks like 0,7 °C on the graph)

Activity 10
1. the northern hemisphere
2. It is because of the moderating effect of the sea. The northern hemisphere has a bigger land mass. Land heats up faster than the sea.

Activity 11
1. The North Pole (the Arctic) is a frozen sea. The South Pole (the Antarctic) is a frozen continent.

2. a) autumn in the Arctic, late summer/early autumn in the Antarctic
   b) at the top left-hand side of the map; South America
   c) at the bottom of the map; Australia

Activity 12

1. Tanzania
2. Kilimanjaro is high enough for temperatures at the top to be low.
3. 4 500 m
4. a) 85%
   b) 50% (the Fürtwangler glacier is centre left on the map)
5. The inhabitants use the snowmelt for irrigation of crops.
6. Job creation – tourists need accommodation, transport and guides.
   Income – tourists buy food, supplies and curios.
7. Example: No, the glaciers are shrinking so fast and are so sensitive to global warming that it is unlikely they can be saved.

Activity 13

1. Example: If global temperatures have increased by 0,5 °C in 100 years, then the maximum time would be 200 years, i.e. 2 200. But this is if the rate of global warming is constant/ not accelerating. It could easily increase by 2 °C this century.
2. 90%
3. Coffee farmers will no longer be able to cultivate the easy-to-grow robusta coffee as a cash crop. It means a loss of income because:
   - it will be hard to replace this crop with another type of coffee that grows as easily
   - coffee is a crop that fetches good prices.

Activity 14

Here are some example arguments on the two topics.
Is it too late to stop global warming?

No, because:

- Green technologies/ ways of generating electricity and powering cars are being developed.
- Humans are good at controlling their environment, thanks to scientific knowledge and technology.
- The ozone layer is recovering thanks to action taken. We could do the same with global warming.

Yes, because:

- The world is not yet committed to renewable forms of energy. Only a small percentage of the world's fuel and electrical energy/ power is generated by renewable technologies.
- Most people in developed countries are unwilling to sacrifice their high standard of living which includes unlimited transport and high energy use.
- Many people don't care. They hope that the problem won't affect them in their lifetime. They don't care about future generations.

Who should be held responsible for global warming?

- Governments and politicians – they are responsible for environmental policies.

- Our capitalist society. Capitalism is an economic system based on development and production. Capitalism is money-driven, not environment-driven.
- The oil companies and coal-powered electricity companies who have a vested interest in continuing with fossil fuels.
- Developed or industrialised countries. The output of carbon emissions per person in a developed country is far more than the output per person in a developing country.
- Everyone on the planet. We all use the Earth's resources.
  - We contribute to carbon emissions directly by driving our cars or burning fuel for fires.
  - We contribute to carbon emissions indirectly by using electricity generated by burning coal or by eating meat or rice. The large-scale cattle farming and cultivation of rice in rice paddies produces significant amounts of methane – a potent greenhouse gas.

Activity 15

1. China (1) and the United States (1)
2. It has a very high population (1). (India is the second-most populated country in the world. Its population is about one sixth of the world's total population.)
3. Land-use changes, i.e. deforestation in Brazil is high (1). Deforestation contributes to carbon dioxide emissions (1).
4.

Country		Percentage of the global total	Per capita emissions (tonnes per person)
1.	United States	16%	24,1
2.	Canada	2%	23,2
3.	Russia	5%	14,9
4.	Indonesia	6%	12,9
5.	European Union	11%	10,6
6.	Japan	3%	10,6
7.	Brazil	4%	10,0
8.	Mexico	2%	6,4
9.	China	17%	5,8
10.	India	5%	2,1

Give 1 mark each for Russia at number 3, Indonesia at number 4, Brazil at number 7 and China at number 9. (4)

5. United States (1) and Canada (1)
6. India (1)

[12 marks]

Informal assessment

Activity 1

- Write up the completed table on the board.

Activity 2

- Ask learners to swap books with a partner and check each other's work as you quickly go through the answers with the class.

Activity 3

- Quickly go through the answers with the class.

Activity 4

- Go through the answers with the class. Ask learners to offer answers.

Activity 5

- Write up the completed table on the board. For those learners who struggled with the calculation, also write up the workings out on the board.

Activity 6

- Draw the answer on the board according to scale. Or ask three learners to each quickly draw one of the three mountains on the board according to scale.

Activity 7

- Go through the answers with the class. Ask learners to offer answers.

Activity 8

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Activity 9

- Go through the answers with the class. Ask learners to offer answers.

Activity 10

- Go through the answers with the class. Ask learners to offer answers. If you chose not to prepare the learners for Question 2 as suggested in the section, Teaching the unit, congratulate those who got the correct answer because it is quite tricky to work it out.

Activity 11

- Go through the answers with the class.

Activity 12

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Activity 13

- Go through the answers with the class. Ask learners to offer answers.

Activity 14

- Use this discussion activity to informally assess learners' ability to express a point of view or argue a point. Try to encourage those learners who are shy about offering their opinions. You can take a Yes/No class vote on the question of whether it's too late to stop global warming as a way of making learners feel that their opinion counts.

Activity 15

- Write up the table for Question 4 on the board. Ask learners to offer answers to the other questions.
- Alternatively, mark this activity yourself according to the mark allocation given in the Answers section.
- Use this activity to informally assess learners' ability to read and interpret data in a table.

Consolidation/extension

Consolidation:

- Learners who struggled with Activity 5 probably need help with their numeracy skills. After you have talked them through the calculations for the answers, then let them complete Worksheet 1 (page 269) in the Resources section of this Teacher's Guide.
- They can also complete Worksheet 2 (pages 270–271) in the Resources section of this Teacher's Guide. This activity focuses on the heating of the atmosphere and its effect on temperature in different places. It would also serve as a good revision activity for all learners.

Extension:

- For the concept of albedo (Lesson 3), suggest that learners try one or more of the following:
  - On a hot day, in a parking lot, find a white car parked next to a black car. To feel the temperature, put your hand on the roof of the white car, then on the black car. Which feels hotter and why? Answer: The black car. It has lower albedo than the white car and absorbs more of the Sun's radiation.
  - On a hot, sunny day, put identical jars of water, closed with lids, in the Sun. The one is covered with a tight-fitting sleeve of black paper, the other with a sleeve of white paper. After half an hour to an hour, feel the temperature of the water in the two jars with your finger or measure it with a thermometer. Which is hotter and why?
- To demonstrate the 'Distance from the oceans' effect (Lesson 4) let learners complete the experiment in Worksheet 3 (page 272) in the Resources section of this Teacher's Guide. You could also do this experiment as a demonstration, or suggest learners try a variation of this experiment at home, or even just talk about this experiment.
- Let learners complete Worksheet 4 (pages 273–274) in the Resources section of this Teacher's Guide. It focuses on the depletion of the ozone in the atmosphere.
- Ask learners to make a 'Stop global warming' poster. For some examples, try this website: www.consultoresprado.eu/ui-global-warming-drawings

Learner's Book
pages 40–53
Duration: 8 hours

UNIT 3 Moisture in the atmosphere

TERM 1, WEEKS 4–6

Curriculum and Assessment Policy Statement (CAPS) content

Moisture in the atmosphere

- Water in the atmosphere in different forms – water vapour, liquid.
- Processes associated with evaporation, condensation and precipitation.
- The concepts of dew point, condensation level, humidity, relative humidity – factors affecting relative humidity.
- How and why clouds form.
- Cloud names and associated weather conditions.
- Different forms of precipitation – hail, snow, rain, dew, frost.
- Mechanisms that produce different kinds of rainfall – relief, convectional, frontal.

Resources

- Learner's Book pages 40–53
- Atlases
- If you do the extension suggested in Lesson 1, you will need glass jars with lids, water, table salt and teaspoons. Ask learners to bring jars to class.
- Activity 3 (per group): two thermometers, cloth, cotton/ cord/ string, water.
- Activity 5 (per group): one thermometer, one tin can, ice and water.
- Websites (optional)
  - The Frequently Asked Questions section at the bottom of the South African Weather Services (SAWS) homepage includes interesting and useful information for you and your learners: www.weathersa.co.za
  - A useful site for you or your learners which covers types of precipitation: http://en.wikibooks.org/wiki/Adventist_Youth_Honors_Answer_Book/Nature/Weather
  - A useful site for you or advanced learners: http://www.ucar.edu/learn/
  - For rainfall data for 16 main cities or towns in South Africa, from 1960 to 2001 – daily, monthly and 24 hour maximum: www.1stweather.com/regional/data/data_daily_rain.shtml

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what the learners may already know about the topics and any areas of difficulty that you think they might encounter.
- Activities 3 and 5 are practical activities, which you will need to prepare for. Also, you need to do Activity 3 on two different weather days: 1) a dry, windy day; and 2) a rainy, hot or humid day. See the resources for these two activities listed above.
- Be prepared for thermometer breakages if learners are going to use thermometers. Read 'How to safely clean up a broken thermometer' on www.vtvets.org/pdf/broken_thermometer.pdf

Teaching the unit

Lesson 1

- Read through, or ask learners to read through, the Unit 3 introductory paragraph on page 40. Ask them for everyday signs of water vapour in the air. Examples are:
  - salt clumps or gets stuck in the salt cellar
  - old coffee granules turn sticky
  - biscuits that aren't stored in airtight containers become soggy
  - droplets of water condense on the outside of a glass filled with cold water or a cold drink
  - freezers ice up and often need defrosting
  - dew collects on the grass, on surfaces and windows of cars
  - fog, mist and clouds form.
- Work through the section, 'What are the three different forms of water?' (page 40) and 'What are the three important processes in the water cycle?' (page 41).
- If you choose to do the extension activity (see the Extension section), set up a glass jar on a sunny window sill as a demonstration, or ask learners to set up their own jars.

Activity 1
- Let learners complete Activity 1. This activity should be quick and easy for most of them.

Lesson 2

- Work through the section, 'What is humidity?' (pages 41–42).
- Remind learners of the examples they gave that show water vapour in the air.
- Point out that evaporation always takes place, even at very low temperatures. But when evaporation takes place faster than condensation (the reverse process), then humidity is high.
- Carefully go through the principle of the wet-and-dry-bulb thermometer: Evaporation takes place at the wet bulb and causes cooling, relative to the dry bulb.
- Carefully go through the concept of relative humidity: It is the amount of water vapour in the air relative to how much water vapour the air could contain. For this reason it is expressed as a percentage.

Activity 2
- Let learners complete Activity 2. This activity consolidates the principle of the wet-and-dry- bulb thermometer and the concept of relative humidity.

Lesson 3

Activity 3
- Let learners complete Activity 3, which is a practical activity.
- Learners should do this activity in groups of 3–6. The smaller the group the better, but you will be restricted by the number of thermometers you have.
- Safety warning: Point out to learners that thermometers contain red-dyed alcohol or mercury. Warn them that mercury is poisonous and that glass thermometers break easily, so they should use them carefully and take care not to drop them. If a learner breaks a thermometer, they must let you know immediately, rather than try to clean it up themselves.
- Keep a watchful eye throughout the activity and be available to help or answer questions.
- Take your own measurements or record the thermometer readings from one or two groups so that you have a sense of the correct measurements for that particular day.
- Depending on what sort of day it is, you will then have to identify another day, as soon as possible for learners to complete the activity/ take another set of measurements.

Activity 4
- Read the feature, 'Humidity makes it extra hot' (page 44).
- Once learners have set up their thermometers for Activity 3, they can work on the feature and Activity 4.

Lesson 4

- Work through the section, 'What are dew, frost and dew point?' (pages 44–45).

- Carefully explain the concept of dew point – it is a difficult concept. Emphasise that dew point is a temperature and is related to relative humidity – how much water vapour there is in the air.

Activity 5

- Let learners complete Activity 5, which is a practical activity, in pairs or groups of 3–4.
- Safety warning: Remind learners to work carefully with their thermometers to avoid breaking them.
- Take your own measurements or record the thermometer readings from one or two groups so that you have a sense of the correct measurements for that particular day.
- Keep a watchful eye and be available to help or answer questions.

Lesson 5

- Work through the section, 'How do clouds form?' (page 46).
- Begin the lesson by asking learners what a cloud is and if they know the names of some cloud types.
- For the concept of condensation level (the height at which the base of a cloud forms), refer closely to Figure 1.3.10.

Activity 6

- Let learners complete Activity 6, which will help them grasp the concept of condensation level.
- Learners can work in pairs or on their own for this activity.
- Be available to help learners who struggle to use the graph, or ask those learners who quickly get the hang of it to show others.

- Begin working through the section 'Types of clouds and weather' (page 48).

Lesson 6

- Continue the section, 'Types of clouds and weather' (page 48).
- Ask learners to pay attention to the clouds in the sky for the next few days or weeks and to try to identify them. Point out that there are often many types of cloud that they can see in the sky at one time.
- If appropriate cloud-wise, take the class outside briefly to study the clouds.

Activity 7

- Let learners complete Activity 7 individually. This is a simple revision activity based on types of clouds.

Activity 8

- Let learners complete Activity 8 individually. This activity gives them some practice at identifying some basic cloud types.

Lesson 7

- Work through the section, 'What is precipitation?' (page 50). This is a simpler section than the other material in Unit 3.
- Ask learners: Who has seen snow? Who has seen hail? Point out that hail is common to the eastern half of the country which has summer rainfall and thunderstorms.

- Begin the section, 'What is the difference between relief, convectional and frontal rainfall?' (pages 51–53).
  - Begin by asking learners what makes air rise. They will probably be most familiar with the convection method. Focus on the three different ways that air can rise, as shown in Figure 1.3.17.
  - Read, 'Mechanisms of rainfall' with learners.

  For 'Relief rainfall':
  - Point out that because mountains act as obstacles that force air to rise and cool, they create their own weather. Mountains are often capped with clouds. (Ask learners if they have noticed how on relatively cloudless day, clouds 'collect' or form over mountains.)
  - Ask learners to turn to a map of South Africa in their atlases. Ask them to find George and Oudtshoorn, and the Outeniqua Mountains between them. Point out that George receives a much larger amount of rain than Oudtshoorn because it is close to the coast and not in the rain shadow of the Outeniqua Mountains. For example, if George receives a high rainfall of 200 mm, the rainfall in Oudtshoorn might be only 40—65 mm.

  For 'Convectional rainfall', point out that this type of rainfall:
  - takes place in South Africa's interior
  - is often associated with thunderstorms and hail
  - can cause turbulence for aeroplanes.

Lesson 8

- Continue the section 'What is the difference between relief, convectional and frontal rainfall?' (pages 51–53).
  - Remind learners that they are looking at mechanisms of rainfall. Recap the two types you have looked at so far – relief and convectional.
  - For 'Frontal rainfall', point out that this type of rainfall takes place in the Western Cape. Because of the frontal rainfall, this region, unlike the rest of the country, is a winter rainfall region.

Activity 8

- Let the learners complete Activity 8 which is a simple revision exercise on the three mechanisms of rainfall.

Answers

Activity 1

1. a) evaporation
   b) precipitation
   c) evaporation
   d) condensation
2. a) cooling
   b) heating
   c) heating
   d) cooling

Activity 2

1. Dry bulb: 30 °C. Wet bulb: 23 °C
2. 7 °C
3. 55%
4. 0 °C

Activity 3

4. Here is an example of results. The main thing is that the temperature difference between the dry bulb and wet bulb is larger on a windy day than on a rainy day. Ideally, you should have taken your own set of measurements on the two days on which learners did the experiment. Substitute the values in the table below.

	Temperature of dry bulb	Temperature of wet bulb	Temperature difference
Dry/windy day	31 °C	25 °C	6 °C
Rainy/humid day	26 °C	24 °C	2 °C

5. more, lower

Activity 4

1. 31 °C
2. 46 °C
3. Example: On a humid day, you sweat less and so you don't feel the cooling effect of evaporation.

Activity 5

4. Here is an example of results. Once again, the main thing is that the difference between the air temperature and the dew point temperature is larger on a windy day than on a rainy day.

   Ideally, you should have taken your own set of measurements on the day on which learners did the experiment. Substitute the values in the table below.

	Air temperature	Dew point temperature
Dry/windy day	28 °C	5 °C
Rainy/humid day	27 °C	15 °C

5. a) lower
   b) higher

Activity 6

1. f) For cloud 2, learners should get a condensation level of 1 km, as shown in Figure 1.3.10.
2. a) Condensation level
   b) higher
   c) lower
   d) 6 °C, 20 °C
   e) 18° C, 8 °C

Activity 7

1. stratus, cumulus, cirrus
2. cirrus, cirrocumulus, cirrostratus, cumulonimbus (sometimes)
3. nimbostratus, cumulonimbus
4. stratus/ stratocumulus/ nimbostratus
5. cumulonimbus

Activity 8

A cirrus
B cirrocumulus
C cumulus
D cumulonimbus

Activity 9

Region	3	2	1
Type of rainfall	relief	convectional	frontal
How the air rises	air is forced to rise over a mountain	warm air rises on a hot day by convection	warm air rises over cold air
Type of cloud	thick, low cloud (cap or lenticular cloud*)	cumulonimbus	nimbostratus
Form of rain	drizzle	heavy, short	light, long

* Your learners aren't expected to know the terms for this type of cloud. It is included here for their interest.

Informal assessment

Activity 1

- Quickly go through the answers with the class.

Activity 2

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.
- For learners who got more than one answer incorrect, set another similar activity for homework (see the Consolidation section).

Activity 3

- Write up an example of the results on the board, preferably with measurements that match the experiment on the two days, rather than the ones given in the Answer section above.
- Take in learners' books (or at least one from each group) and scan through their work to informally assess how well they have managed to do the experiment and record their results.

Activity 4

- Go through the answers with the class. Ask learners to offer answers.

Activity 5

- Write up an example of the results on the board, preferably with measurements that match the experiment on the two days, rather than the ones given in the Answer section above.
- Take in learners' books (or at least one from each group) and scan through their work to informally assess how well they have managed to do the experiment and record their results.

Activity 6

- Go through the answers with the class.

Activity 7

- Go through the answers with the class. Ask learners to offer answers.

Activity 8

- Go through the answers with the class. Ask learners to offer answers.

Activity 9

- Write up the completed table on the board.

Consolidation/extension

Consolidation:

- For learners who struggled with Activity 2 or want more practice, let them complete Worksheet 5 (page 275) in the Resources section of this Teacher's Guide.

Extension:

- You can extend Lesson 1 by making a very simple model of the water cycle that shows how the Earth's water cycle takes place in a closed system. The instructions for how to make this model may be found in Worksheet 6 (page 276) in the Resources section of this Teacher's Guide.

Learner's Book
pages 54–64
Duration: 6 hours

UNIT 4 Reading and interpreting synoptic weather maps

TERM 1, WEEKS 6–7

Curriculum and Assessment Policy Statement (CAPS) content

Reading and interpreting synoptic weather maps

- Weather elements – temperature, dew-point temperature, cloud cover, wind direction, wind speed, atmospheric pressure.
- Weather conditions – e.g. rain, drizzle, thunderstorms, hail, snow as illustrated on station models.
- Reading and interpreting a selection of synoptic weather maps.

Resources

- Learner's Book pages 54–64
- If you do the extension activity suggested for Lesson 1 (continued in Lessons 5 and 6), you will need to supply or ask learners to bring materials for making their own simple weather instruments. For example:
  - For wind vanes: heavy paper, drinking straws, glue, dowels, nails and a hammer (see Worksheet 7 on page 277 of this Teacher's Guide)
  - For rain gauges: plastic 2 litre cooldrink bottles, scissors, Plaster of Paris, marker pens and rulers
  - For anaeroid barometers: tins or glass jars, broken balloons, strong rubber bands, glue, sticky tape, white card, drinking straws.
- Websites (optional)
  - The South African Weather Service's (SAWS) website for weather forecasts: www.weathersa.co.za
  - A useful site for you or your learners which includes details on how weather instruments work and pointers on how to make a simple wind vane or rain gauge: http://en.wikibooks.org/wiki/Adventist_Youth_Honors_Answer_Book/Nature/Weather

- For a PDF document on weather instruments and how to record the weather: http://www.rmets.org/pdf/simweameasurements.pdf
- For information on barometers and instructions on how to make a simple anaeroid barometer: http://www.home-weather-stations-guide.com/make-a-barometer.html
- This site posts a daily synoptic weather chart for South Africa: www.koolasun.co.za/weather/sa-weather-chart.html

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what the learners may already know about the topics and any areas of difficulty that you think they might encounter.
- See the resources needed for Lesson 1 extension activity listed above.

Teaching the unit

Lesson 1

- Begin the lesson by focusing on the term 'meteorology', which is the science of the atmosphere. Point to the Tip box that gives the origins of the word – meteros means 'high in the sky'. Ask learners if they are familiar with the term 'MET office'. MET is short for meteorological.
  - Remind learners that the atmosphere is the source of our weather.
  - Encourage learners to pay attention to the weather forecasts in the media – TV, radio, or newspapers.
  - Point out that South Africa's weather forecasts come from the South African Weather Services (SAWS), which falls under the Department of Environmental Affairs. Encourage learners to look at the SAWS website if they are not already familiar with it.
- Introduce the section, 'What are the weather elements? (page 54)' by generating a list on the board from the learners' suggestions.
- Read through this section in the Learner's Book.
- If you choose to do the extension activity (see the Extension section), learners can begin making simple weather instruments such as a wind vane, a rain gauge or an anaeroid barometer. They can complete these in Lessons 5 and 6.

Lesson 2

- Work through the section, 'What is a weather forecast? (page 54), and 'The South African Weather Service' (pages 55–56).

Activity 1

- Let learners complete Activity 1. Remind them that weather forecasts (such as the one in Figure 1.4.2 that they are using) are available on the South African Weather Service's (SAWS) website.
- This activity gives learners practice using an online five-day weather forecast.

Activity 2

- Read the feature, 'What does it mean when there's a 30% chance of rain?' (page 55) then, as a class, discuss the answers to the questions in Activity 2.
- This is a discussion-based activity that needs to be done in class.

Lesson 3

- Work through the section, 'What is a synoptic weather map?' (pages 56–58). Point out that synoptic weather maps or aspects of them are useful to people who do wind and water sports, for example, surfers, windsurfers, sailors and paragliders.
- Point out the synoptic weather map example in Figure 1.4.7.
- Carefully talk learners through the station model in Figure 1.4.4.

Activity 3

- Let learners complete Activity 3 in pairs. It gives them practice in reading the information on station models.

Activity 4

- Remind learners of the concept of dew point before they work through this activity, i.e. that it is a temperature and that it indicates the amount of water vapour in the air.
- If there is not enough time, learners can do or complete this activity for homework.

Lesson 4

- If Activity 4 was completed for homework, go through the answers with the class.
- Work through the section, 'Frontal weather systems' (page 59).
- Refer to Figure 1.4.8 which shows the difference between a warm front and a cold front. Emphasise that the 'warm' or 'cold' refers to the air that is approaching *behind* the front.
- Work through the section, 'Pressure patterns' (page 60).
- Refer to Figure 1.4.9 that shows isobars. Remind learners that the units for the values are hectopascals, not millibars.
- Work through the section, 'Wind patterns' (page 60).
- Refer to Figures 1.4.10 and 1.4.11 that show how the wind spirals around high and low pressure systems.
- Tell learners that when they look at ocean currents (Module 3), they will see how they also follow a circular pattern. This is because of the turning of the Earth.
- As an interesting aside, point out that, it is commonly believed that the Coriolis effect affects the direction that water spirals down a plug-hole, i.e. clockwise down the plug-hole in the northern hemisphere and anti-clockwise down the plug-hole in the southern hemisphere. But the Coriolis effect is not strong enough to affect the flow of bathwater. They can find out more about this misconception on:
  – en.wikipedia.org/wiki/Coriolis_effect under the heading 'Draining in bathtubs and toilets'
  – www.guardian.co.uk/notesandqueries/ query/0,5753,-20326,00.html
- Refer to the synoptic weather map in Figure 1.4.12 that shows wind patterns.

Activity 5

- If there is not enough time, learners can complete this activity for homework.

Lesson 5

- If Activity 5 was completed for homework, go through the answers with the class.

Activity 6

- Learners can do this activity in pairs and then go through the activity with the whole class.
- If learners are doing the extension activity (see the Extension section on page 49 of this Teacher's Guide), they can spend the rest of the lesson making their simple weather instrument.

Lesson 6

- Go through the feature, 'Weather satellites: A view of the weather from space' (page 63).

Activity 7

- This is a simple, but important exercise that helps learners relate the cold front system seen in a satellite image to its depiction on a synoptic weather map.
- If learners are doing the extension activity (see the Extension section on page 49 of this Teacher's Guide), they can spend the rest of the lesson making their simple weather instrument.

Answers

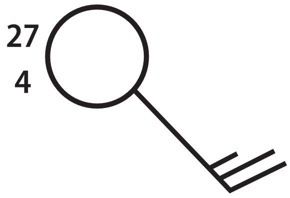
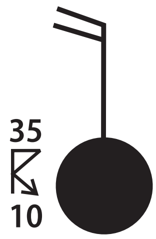
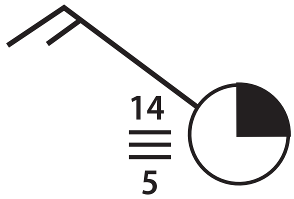
Activity 1

1 a) minimum: 23°C; maximum: 27°C
  b) 20 kmph; north-east
  c) 1012 hPa
  d) 90%
  e) humidity is high, so temperatures feel hotter than they really are
2. five-day
3. a) 30%
  b) 5 mm
  c) 20 kmph north-east
  d) 20 kmph south-west

Activity 2

Learner's own answers. For example, learners might say in (2) that they thought that a 30% chance of rain meant drizzle or that it rains for 30% of the day. Others may have already had a more accurate impression.

Activity 3

			
Air temperature	27 °C	35 °C	14 °C
Dew point	4 °C	10 °C	5 °C
Precipitation	none	thunderstorms	fog
Cloud cover	clear	overcast	2 eighths
Wind direction	south-east	north	north-west
Wind speed	25 knots	20 knots	15 knots

Allocate 1 mark per answer (18)

Activity 4

1. 2010-08-03, 14:00 SAST
2. Gough Island is at the bottom left, Marion Island at the bottom right
3. dew points are low
4. dew points are high/er
5. dew point = – 6 °C; clear/no cloud cover
6. dew point = 5 °C; six-eighths/heavy cloud cover
7. more

Activity 5

1. cold front
2. cloudy, rainy weather
3. 1028 hPa; above
4. 988 hPa and 980 hPa; below
5. far apart
6. close together
7. low pressure

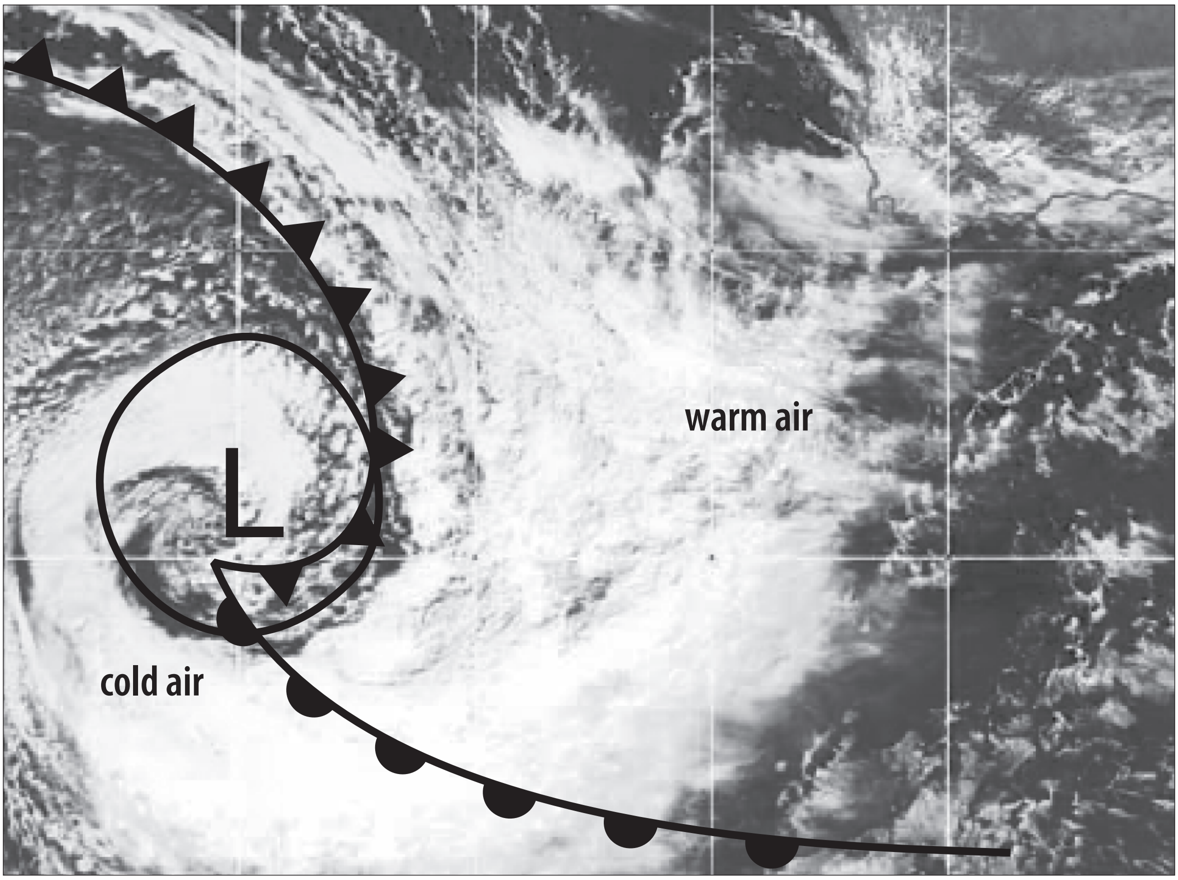
Activity 6

1. a) B, C, A
   b) movement of warm air
   c) movement of cold air
   d) The warm front is shown in maps B and C – see the red bumps. Note that:
      - the cold air is ahead of the warm front, i.e. on the side of the red bumps
      - the warm air is behind the warm front, i.e. on the opposite side of the red bumps.

   e) cold, warm
2. a) A
   b) C
   c) B

Activity 7

1. Examples:
   A polar-orbiting satellite goes around the poles, perpendicular to the direction that the Earth turns in. This means it covers the whole of the Earth after several orbits.
   A geostationary satellite follows the speed and direction that the Earth turns in. This means that it covers a fixed area above the Earth.
2.



Informal assessment

Activity 1

- Go through the answers with the class. Ask learners to offer answers.

Activity 2

- Informally assess learner's old and new understanding of the percentage chance of rain. Ask learners if the explanation in the feature was helpful.

Activity 3

- Write up the table of answers on the board or, mark this activity according to the mark allocation given in the Answers section.
- Use the activity to informally assess how well learners can read the station models.

Activity 4

- Go through the answers with the class. Ask learners to offer answers.

Activity 5

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Activity 6

- Go through the answers with the class. Ask learners to offer answers.

Activity 7

- Check learners' overlays as they do this activity.

Consolidation/extension

Consolidation:

- For learners who struggled with Activity 2, or need more practice, ask them to interpret the station models for one or more of the following towns on the synoptic weather map in Figure 1.4.7 on page 58 of the Learner's Book: Cape Town, Port Elizabeth, Durban, Bloemfontein and Pretoria.

  They should draw up and complete the table below. If they have trouble only with reading wind direction, for example, then they need only focus on wind direction.

	Cape Town	Port Elizabeth	Durban	Bloemfontein	Pretoria
Air temperature	14 °C	18 °C	23 °C	21 °C	23 °C
Dew point	5 °C	9 °C	17 °C	–4 °C	–15 °C
Cloud cover	6 eighths	1 eighth	2 eighths	clear	Clear
Wind direction	west south-west	west south-west	north north-west	west south-west	due west
Wind speed	10 knots	25 knots	10 knots	10 knots	15 knots

Extension:

- Let learners make their own simple weather instruments. Refer to the relevant websites suggested in the Resources section above or let them follow the instructions to make a simple wind vane in Worksheet 7 (page 277) in the Resources section of this Teacher's Guide.

Term 1
Learner's Book
pages 65–78
Duration: 6 hours

MODULE 2

THE ATMOSPHERE: GEOGRAPHICAL SKILLS AND TECHNIQUES

In this module we deal with Geographical Information Systems (GIS), fieldwork and practical work, and using atlases.

Geographical Information Systems are the outcome of our increasing access to computers and our ability to use them to process a wide range of information. Satellite photos are beamed down to the Earth, and then the data is stored, sorted and analysed. Computer technology helps us to quickly retrieve and work with stored information. Maps can be created and information on them manipulated electronically, by adding layers of information for specific tasks. One result of GIS is our use of Garmin or TOM-TOM maps that can instantly direct us to where we need to go when we key in name places.

Fieldwork and practical work involves working with instruments to collect information. It means we use first-hand information, such as observation of weather, or collection of rainfall figures from a rain gauge, or secondary sources such as the media. The data can then be processed in a variety of ways such as in graphs, diagrams or synoptic weather maps.

When we want to find out where a place is situated in the world, we use an atlas. An atlas gives us scale and a sense of distance, and gives us information about relief and oceans. Most atlases also give information about climate, vegetation, agriculture and fishing, infrastructure, comparison of wealth, urban sizes, population details, travel, and tourism facts.

Curriculum and Assessment Policy Statement (CAPS)

Geographical Information Systems
- Reasons for the development of GIS.
- How remote sensing works.
- Satellite images related to meteorology and climatology.

Fieldwork and practical work
- Using maps and other graphical representations – atlases, synoptic weather maps, temperature graphs.
- Collecting and recording data using a variety of techniques – using weather instruments, collecting weather information from the media.
- Processing, collating and presenting fieldwork findings – line graphs, bar graphs, maps diagrams, synoptic weather maps.

Using atlases
- Map reading – comparing information from different maps.
- Atlas index – locating physical and constructed features.

Key geographical skills
- Using verbal, quantitative and symbolic data forms such as text, pictures, graphs, tables, diagrams and maps.

- Practising field observation and mapping, interviewing people, interpreting sources, working with statistics.
- Applying communication, thinking, practical and social skills.
- Practising the following specific skills:
  – identifying questions and issues
  – collecting and structuring information
  – processing, interpreting, and evaluating data
  – making decisions and judgements
  – deciding on a point of view
  – suggesting solutions to problems
  – working co-operatively and independently.

Key words/concepts

Geographical Information Systems (GIS); satellite; spatial information/ data; remote sensing; electromagnetic radiation (EMR); spectral characteristic; spectral reflectance/ reflection; spectral reflectance curve; Raster model; Vector model; pixel; point; co-ordinate; geostationary orbit; climate graph; synoptic weather map; climate; latitude; longitude

Learner's Book pages 65–69
Duration: 1 hour

UNIT 1 Geographical Information Systems (GIS)

TERM 1, WEEK 8

Curriculum and Assessment Policy Statement (CAPS) content

Geographical Information Systems

- Reasons for the development of GIS.
- How remote sensing works.
- Satellite images related to meteorology and climatology.

Resources

- Learner's Book pages 65–69
- Atlases
- A cell phone or other electronic device which has a navigation or mapping instrument on it (optional)
- Website (optional)
  - www.gis.com

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what the learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

Lesson 1

- A good way to start this topic is to ask learners how many of them own a cell phone. Some of them may have Blackberry's and iPhones. Some learners may have their own Notebooks and iPads. Learners may have their own computer, or access to a computer, and to the Internet. The parents of some of the learners may have a Garmin or Tom-Tom in their

cars for directions and maps. The school may own a Garmin which it uses for a bus route.
- Explain to learners that the wide use of the above items shows how GIS has been made accessible to most of us in some form or another.
- Read through, or ask learners to read through the Module 2 introductory paragraph on page 65.
- Read through, or ask the learners to read through the Unit 1 introductory paragraph on page 66. Read through the Key questions and explain which Key questions the lesson will deal with.
- It will help to summarise answers to these Key questions on the board as your go through the information on pages 66–69 with the learners. Focus on the factual content, for example: 'Why were Geographical Information Systems (GIS) developed?' can be summarised by the factual points: to store, to retrieve, to analyse information.
- You can develop this further, by asking questions such as: Why or how do we store information? What has made GIS better and more efficient than what was used in the past?
- Read through, or ask learners to read through the section, 'Why were Geographical Information Systems (GIS) developed?' (page 66).
- Ask if learners have seen a satellite. Explain that anyone can see a satellite by watching the sky at night. Satellites pass overhead and move like a star on a pathway or course as far as the eye can see.
- When you explain how remote sensing works (pages 67–68) you can talk about X-rays at a hospital, which work on a similar principle.
- The word 'Raster' refers to the line-by-line scanning of information by a computer. A 'Raster scan' is the rectangle shown on a computer monitor or TV screen.
- The word, 'pixel' was first used in the 1960s in America. It comes from two words: 'picture' and 'elements'. It refers to the smallest unit of a photo or picture.
- Go through the section, 'Which satellites are used in meteorology and climatology?' (page 69).

Activity 1
- Ask learners to do Activity 1 for homework or in class if there is time.
- This is work which can be done individually to summarise the main points of the lesson and consolidate learning.

Answers
Activity 1
1. Suggested answers to a point-form summary on GIS:
   a) GIS was developed to respond to the need for:
      - immediate, up-to-the-minute information
      - rapid use of information for disaster management, war and civil disturbance, and severe weather warnings
      - data that can be added to maps, amended, altered, upgraded or manipulated. For example, the use of layers of information on maps allows town planners to plot traffic on street maps. Town planners can add a layer of information about traffic lights. With observation of peak-time traffic, traffic lights can be staggered to help ease the flow of traffic.

   b) Remote sensing works using electromagnetic radiation or EMR:
      - There is no physical contact between the sensor and the object.
      - Each object has a unique signature or 'spectral characteristic'

- A spectral characteristic is reflected to the sensor.
- The 'spectral reflectance curve' is processed into information for us to analyse.

c) Satellites used in meteorology and climatology are:
- TIROS satellites
- Geostationary Operational Environmental Satellites (GOES)
- Meteostat satellites
- MetOP satellites.

Informal assessment

Activity 1

- Ask learners to read out their answers. Summarise the points on the board as they do this.
- Ask learners if anyone had anything different that you can add to the summary.

Consolidation/extension

Consolidation:

- Allow learners more time to read through this module. Help them to focus on finding the main points.

Extension:

- If you have Internet availability, allow learners to investigate the development of GIS further. Direct them to use a search engine such as GOOGLE. They can type in any of the following words, and read up on background information: GIS; EMR; remote sensing; TIROS; geostationary satellites; Raster; Vector. This will help prepare them for additional work with GIS.

Learner's Book pages 70–75
Duration: 4 hours

UNIT 2 Fieldwork and practical work

TERM 1, WEEKS 8–9

Curriculum and Assessment Policy Statement (CAPS) content

- Using maps and other graphical representations – atlases, synoptic weather maps, temperature graphs.
- Collecting and recording data using a variety of techniques – using weather instruments, collecting weather information from the media.
- Processing, collating and presenting fieldwork findings – line graphs, bar graphs, synoptic weather maps.

Resources

- Learner's Book pages 70–75
- Atlases
- The local newspaper on a daily basis while doing this section. You can ask the librarian/ or another teacher/ or a parent/ or task a child with cutting out only the weather section and dating each piece for use in plotting weather data (optional).
- Websites (optional)
  - www.weathersa.co.za
  - www.southafricanweather.co.za
  - www.koolasun.co.za
  - www.weatherphotos.co.za

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- Be prepared for the lessons by having available an example of: (a) a synoptic weather map; (b) a climate graph; (c) weather instruments, such as a rain gauge, thermometer or barometer. You can have photos of the weather instruments if they are not available.

Teaching the unit

Lesson 1

- Read through the Unit 2 introduction (page 70) with the class.
- On the board, write the key question: 'What is a climate graph and how is it used?'
- On the board, show learners what a climate graph is, emphasising that each graph must have a heading and place reference; and labels for the degrees Celsius temperature, for the rainfall in mm, for the months of the year.
- You can do this by following these steps: Construct a climate graph on the board for an imaginary place. Make a heading, 'Diagram to show a climate graph of (give an imaginary name)'. On the vertical axis on the left, show temperature in degrees Celsius. On the vertical axis on the right show precipitation (rainfall) in mm. On the horizontal axis show time. Make a bar graph to show rainfall. Make a line graph that shows the temperature (remember the seasons of the year: you must have high temperatures for summer and low for winter).
- Point out the following: along the horizontal axis are the months of the year. In the southern hemisphere, the months of Jan, Feb, Mar and then Oct, Nov, Dec form the summer season; winter occupies the months of April, May, June, July, Aug, Sept.
- Teach the learners to check in which season the maximum rain falls. They can do this by looking when the line graph shows high temperatures for summer and low temperatures for winter. (Remind them that in the southern hemisphere, the summer season is in December/ January and the winter season is in June/ July. It is the opposite in the northern hemisphere.)
- Teach the learners to check in which hemisphere this imaginary place is. They can do this by checking when the temperatures are high in summer (summer in the northern hemisphere is during our winter: from April through to September).
- Read through the information on page 70 with learners, 'What is a climate graph and how is it used?'

Activity 1

- The learners will need an atlas for the activity.
- You can begin the activity in class focusing on the first place (Moscow) to ensure that learners know how to use an atlas, and where to look for information for the answers.
- Then let learners complete the activity at home.

Lesson 2

- Remind the class about synoptic weather maps. You can refer to one by placing a copy on the board. Remind them of the symbols used on a synoptic weather map and what they mean.

- Read the information on page 71 with the learners, 'What is a synoptic weather map and how is it used?'

Activity 2

- Go through Activity 2 in class. Use the learner's answers for comment and teaching.
- Check their understanding of normal pressure at sea level (1 013 mb); anything above is High and anything below is Low.
- Look at the isobar intervals on the synoptic map (Figure 2.2.2).
- Point out the South Atlantic High pressure cell; the Indian Ocean High Pressure cell; the Low pressure over SA.
- Point out that this is a feature of summer synoptic maps. The temperature over the land causes air to rise, creating low pressure. The sea is cooler by contrast, and higher pressure is found over the sea in summer.

Lesson 3

- Introduce the practical aspect of this lesson, which is to do with collecting information from primary sources (e.g. the amount of rain) or secondary sources (using TV, radio or newspaper information). Read the information on page 71, 'How do you collect and record weather data?' Go through the activities with the learners.

Activities 3 and 4

- Activity 3 and 4 are similar and will take a week. Once you have explained this to learners, set up the investigation task for homework.
- Encourage learners to use computer resources, or the library, or to bring information they have collected to class. Or take the learners out to show them what to do to record features of the weather.
- They can begin Activity 3 and 4 in the classroom and fill in the table for each day of the week, completing it at home or in class.

Lesson 4

- Read the information, 'How meteorologists process, put together and present fieldwork' (page 73) with learners. This section explains the terms synoptic weather map, climate and weather, and discusses the four factors affecting climate.
- Use Figures 2.2.3A and B to show synoptic weather maps typical for summer and winter.
- Point out the similarities – both have isobars; and the differences – the cold fronts across the south-west Cape in winter, and the High pressure over the interior in winter; while in summer the Low pressure is over the interior because of the heat of the land and rising air, and the sea is relatively cooler than the land and so has High pressure cells over it in summer.

Activity 5

- Do Activity 5 as a class exercise if you have the time; or begin in the class and learners can complete it for homework.
- Discuss Figures 2.2.3 and 2.2.4. Talk about the different way in which information is shown in each of them, and what the information is.

Answers

Activity 1

2. Moscow: latitude 55 °N; Port Nolloth: latitude 29 °S; Singapore: latitude 1°N
3. Moscow: inland; Port Nolloth: Benguela Current, cold; Singapore: Equatorial Current, warm
4. Moscow: 0–200 m; Port Nolloth: 0–200 m; Singapore: 0–200 m
5. Moscow: inland approximately 900 km; Port Nolloth: on the coast; Singapore: on the coast
6. Moscow: Rainfall is throughout the year; maximum rainfall in August and September; maximum rainfall is approximately 75 mm in August; yearly rainfall is a total annual rainfall of approximately 650 mm. Temperature ranges from 10 °C to 25 °C (a range of 35 °C); maximum temperatures in June, July and August.
   Port Nolloth: Rainfall is less than 1 mm each month, with slightly more in May to August; the yearly rainfall is a total annual rainfall of approximately 6 mm. Temperature ranges from 7,5 °C to 20 °C (a range of 12,5 °C); maximum temperatures in January, February, November and December.
   Singapore: Rainfall is between 175 mm to 250 mm each month, with November, December and January recording the largest amounts; the yearly rainfall is a total annual rainfall of approximately 2 420 mm. Temperatures range from 27,5 °C to 32,5 °C; maximum temperatures are in May, June and July.
7. Port Nolloth has a dry climate because it is next to a cold current (air sinks over a cold current; cold air does not have the capacity to carry water vapour).

Activity 2

1. no
2. 1 016 mb
3. low
4. Indian Ocean High Pressure Cell

Activity 3

The answers may vary a little depending on whether learners do this from home, and the accuracy with which they use instruments if they have any. If this is done using instruments from school, there should be no variation. If it is done from data from the newspaper or radio, there should be no variation.

Activity 4

This is a practical exercise making use of secondary sources. Everyone's answers should be the same because they are using the same sources for the area in which they live, or one town that you choose for the activity.

Activity 5

1. Currents are warm or cold. Air rises over a warm current, and is warmer. Warm air can hold more moisture. Warm temperatures accelerate evaporation. Rainfall occurs more frequently along coasts where there is a warm ocean current. This affects the climate and vegetation. Cold currents have cold, dense air above them. This cannot hold moisture and there is little evaporation because of the cold temperature. The climate is drier along the coast where there is a cold current.
2. altitude or height above sea level

3. Distance from the sea leads to a climate of extremes: higher summer temperatures and colder winter temperatures than if you were near the coast. This is similar to the temperature found in Russia on the 'steppes', a flat region characterised by climatic extremes and distance from the sea.

Informal assessment

Activity 1

- Remind learners about the factors which affect climate: LOAD (latitude, ocean currents, altitude and distance from the sea).
- Go through the answers in class; check who understands how to use an atlas and has managed to do the activity; find out what difficulties learners have.

Activity 2

- Assess learners' responses to the questions to ensure that they understand they key features of a synoptic weather map.

Activity 3

- You can complete the activity at the same time as the learners. This will help you to assess their answers.
- Let learners mark each other's work. Make a copy of your answers for each learner or you can put the answers on the board.
- Ask learners if anyone has anything different as an answer, and comment on why that may have happened. (For example, if a rain gauge is used, it needs to be in an open area away from a wall or a tree that will shelter it from the rain, or the figures will be different from those recorded in an open area.)

Activity 4

- Ask a learner to draw the table on the board and get learners to check that all the labels are correct.
- Ask another learner to complete the rows.
- Correct any inaccuracies with a memorandum that you will have prepared for that time period and that area or town, so that all answers cover the same time period and geographical area.
- Go over the work with learners who did not understand the activity.

Activity 5

- Ask learners for their answers and discuss these in class.

Consolidation/extension

Consolidation:

- Practise interpretation of other climate graphs if necessary, after Lesson 1.
- Spend more time with the learners who found Activity 5 difficult. Discuss each of the factors (LOAD) and their effect on climate.

Extension:

- Focus on climate graphs of: (a) high altitude areas; (b) areas far from the sea; (c) areas along the equator; (d) areas along the West coasts where there are cold currents; (e) areas along the East coasts where there are warm currents. Let learners compare similarities and dissimilarities.
- You can extend Activity 4 by creating a lengthier assignment, for example, for the second term they must create a wall chart to show the weather in

the area. They can summarise their findings and present this to the class at the end of the term.
- Refer learners who need an extension of Activity 5 to the websites: www.koolasun.co.za and to www.weatherphotos.co.za to get more practice with a variety of images.

Learner's Book pages 76–78
Duration: 1 hour

UNIT 3 Using atlases

TERM 1, WEEK 9

Curriculum and Assessment Policy Statement (CAPS) content

- Map reading – comparing information from different maps.
- Atlas index – locating physical and constructed features.

Resources

- Learner's Book pages 76–78
- Atlases

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what the learners may already know about the topics and any areas of difficulty that you think they might encounter.
- You will need to make sure that there is at least one atlas for every two learners to share.

Teaching the unit

Lesson 1

- You can ask a learner to read through the introductory paragraph and the text under 'How do you use maps to compare information?' (page 76).
- Ask the class to explain the relevance of Figure 2.3.1. Remind the class of the link between cold water – cold dense air – no evaporation – no moisture; and warm water – warm air – plenty of evaporation – plenty of moisture.
- Ask the class to comment on the relevance of Figure 2.3.2. Remind the class of currents, moisture and vegetation. Remind the class about the four factors (LOAD) that affect climate.

Activity 1

- Let learners complete Activity 1 for homework. It will help them to consolidate the climate work.
- Read the information on page 78, 'How do you read an atlas index?'
- Ask the class to turn to the index in their atlases. Let them look up the example of 'Taung'. Show them the boxed example in the Learner's Book (page 78).

Activity 2

- Allow learners to complete the activity in the class. They will need the atlases to complete it.

Answers

Activity 1

1. West side of continent
2. Cold current
3. A cold current has little evaporation above it; there is little precipitation; the land is dry; the vegetation is desert-like.
4. Tropical and equatorial rain forests mostly
5. A warm current has rising air and evaporation; warm air can hold more moisture; there is more precipitation; the land has moisture; the vegetation is lush.
6. It is very cold in the extreme North and South; little evaporation; little moisture; an ice desert
7. The link is: cold current – little moisture – dry desert-like vegetation; warm current – moisture – abundant vegetation
8. A suggested answer could be: Vegetation regions overlap with climate regions because vegetation is dependent on rainfall. Rainfall is dependent on moisture in the atmosphere. Moisture in the atmosphere is dependent on warm rising air from a warm ocean current.

Activity 2

1. a) On the Asian continent
   b) China
   c) Asia
   d) Egypt, Africa
   e) In the West of Sudan, Africa
2. a) 34°S 18º20´E
   b) 33°S 27º55´E
   c) 29°45S 31ºE
   d) 26°30´S 30ºE
   e) 25°40´S 28º15´E

Informal assessment

Activity 1

- As this activity is a summary of what has been taught, you may choose to take the books in to check if the learners have understood this.
- Alternatively, you can get learners to swap books and check their answers against suggested answers you have put on the board.

Activity 2

- Call out the answers for learners and ask them to mark their own. Ask them to indicate by a show of hands who found each of the places.

Consolidation/extension

Consolidation:

- Give the names of a number of places that learners can locate using the index of their atlases. This can be like a treasure hunt for learners to make it more fun.

Extension:

- Ask the class to give an important fact about each of these places, or you could pin the names onto a map of the world, with one fact about each place.

Learner's Book pages 79–80

Assessment Task 1 The atmosphere

TERM 1

For information on how to assess the learners' completed tasks, please see pages 198–201 of this Teacher's Guide.

Learner's Book pages 81–84

REVIEW TERM 1

These activities provide an opportunity for learners to consolidate concepts and skills learnt in Term 1. Learners can complete them in class or as homework. It is suggested that they complete the activities individually as a means of self-assessment.

You can write the answers on the board for the learners and/or call them out where more appropriate. However, if possible, it is suggested that you photocopy the answers and give them to the learners so that they have them for revision purposes.

Activity 1

1. Temperature decreases with altitude.
2. 1) The lower atmosphere is heated from the ground up. Only the layer of air closest to the ground is warmed by the Earth by conduction.
   2) The higher up you go the thinner the air gets. Air molecules hold heat.
3. 6,5 °C
4. lapse rate
5. troposphere
6. The air is thinner or less dense at 6 000 m. Gravity decreases with altitude therefore the pull on air particles is strongest close to the Earth.

Activity 2

1. insolation
2. See Figure 1.2.7 on page 24 of the Learner's Book
3. convection – it circulates the heat
4. Non-solar geysers are heated with electricity. Most of South Africa's electricity is generated at coal-burning power stations, which produce carbon emissions. Carbon emissions trap in the infrared heat that the Earth radiates – enhancing the greenhouse effect. Therefore solar geysers, which don't use electricity, don't contribute to the greenhouse effect.

Activity 3

1. saturated/ filled with water
2. saturation
3. decreases
4. less than
5. 100%
6. dew or fog
7. more
8. higher

Activity 4

1. Geographical Information Systems
2. storage, retrieval and analysis of data
3. image-taking from a distance
4. an X-ray or a satellite photograph
5. Vector and Raster
6. A possible answer could include: Vector – uses points, nodes and represents rectangles; is considered more accurate but not for continuous data representation; Raster – uses pixels; is best suited to maps for whole or continuous spatial data such as forests, cultivated land or soil types; difficult to show line networks.

Activity 5

1. a) the weight of the air that presses down on the Earth
   b) barometer
   c) hectopascals
   d) isobars
2. a) 18 °C
   b) 0 °C
   c) none/clear
   d) 20 knots
   e) westerly
3. Winter. The map shows a cold front sweeping across the country. The maximum temperatures are low.

Term 2
Learner's Book
pages 86–140
Duration: 24 hours

MODULE 3

GEOMORPHOLOGY: GEOGRAPHICAL KNOWLEDGE

This module focuses on geology – the study of rocks – and the theory of plate tectonics. Plate tectonics explains all sorts of fascinating changes in the Earth's crust, for example, the change in the position and shape of the continents over millions of years and the spreading of the sea floor. It also explains large-scale features such as mid-ocean ridges and rift valleys; and phenomena such as earthquakes and volcanoes.

Curriculum and Assessment Policy Statement (CAPS)

The structure of the Earth
- The internal structure of the Earth.
- Classification of rocks – igneous, sedimentary, metamorphic.
- The rock cycle.
- Intrusive igneous activity and associated features – batholiths, laccoliths, monoliths, dykes, sills, pipes.
- Landforms associated with igneous, sedimentary, metamorphic rocks.

Plate tectonics
- Changes in the position of continents over time.
- Evidence for the movement of continents over time.
- Plate tectonics – an explanation for the movement of continents.
- The mechanics of plate movements.
- Processes and landforms associated with different kinds of plate boundaries.
- The world's volcanic and earthquake zones.

Folding and faulting
- The process of rock folding – link to plate movement.
- Landforms associated with folding.
- The process of faulting – link to plate movement.
- Different types of faults.
- Landforms associated with faulting, e.g. rift valleys and block mountains.

Earthquakes
- How and where earthquakes occur.
- The relationship between earthquakes and tectonic forces.
- Measuring and predicting earthquakes.
- How earthquakes and tsunamis affect people and settlements – differences in vulnerability.
- Strategies to reduce the impact of earthquakes.
- Case examples of the effects of selected earthquakes.

Volcanoes
- Types of volcanoes – extrusive, intrusive, active, dormant, extinct.
- Structure of volcanoes.
- Impact of volcanoes on people and the environment – positive and negative.
- Case studies of different volcanic eruptions.

Key geographical skills
- Using verbal, quantitative and symbolic data forms such as text, pictures, graphs tables, diagrams and maps.
- Practising field observation and mapping, interviewing people, interpreting sources, working with statistics.
- Applying communication, thinking, practical and social skills.
- Practising the following specific skills:
  - identifying questions and issues
  - collecting and structuring information
  - processing, interpreting and evaluating data
  - making decisions and judgements
  - deciding on a point of view
  - suggesting solutions to problems
  - working co-operatively and independently.

Key words/concepts
mantle; crust; silicate; continental crust; oceanic crust; igneous rock; magma; sedimentary rock; fossil; metamorphic rock; rock cycle; igneous intrusion; batholith; laccolith; lopolith; dyke; sill; volcanic pipe; weathering; erosion; tor; hogsback; cuesta; mesa; Pangea; Gondwanaland; continental drift; lithosphere; tectonic plate; divergent boundary; convergent boundary; transform fault boundary; mid-ocean ridge; sea-floor spreading; subduction; island arc; ocean trench; fold mountain; fault line; folding; anticline; syncline; faulting; normal fault; reverse fault / thrust fault; strike-slip fault; graben; horst; rift valley; block mountain; transform fault; earthquake; seismic wave; focus; epicenter; seismograph; seismogram; seismometer; Richter scale; moment scale; tsunami; volcano; lava; igneous extrusion; hot spot; shield volcano; stratovolcano / composite volcano; cinder cone; active volcano; dormant volcano; extinct volcano; vent, pipe; crater; caldera; lava lake; lava plateau; volcanic plug; geyser; hot spring

Learner's Book
pages 86–102
Duration: 6 hours

UNIT 1 The structure of the Earth

TERM 2, WEEKS 1–2

Curriculum and Assessment Policy Statement (CAPS) content
The structure of the Earth
- The internal structure of the Earth.
- Classification of rocks – igneous, sedimentary, metamorphic.
- The rock cycle.
- Intrusive igneous activity and associated features – batholiths, laccoliths, monoliths, dykes, sills, pipes.
- Landforms associated with igneous, sedimentary, metamorphic rocks.

Resources

- Learner's Book pages 86–102
- Activity 1: Hardboiled eggs, several sharp knives (and some salt and pepper – learners can eat the eggs afterwards).
- Activity 7: Resource books on rocks and some vinegar for testing for calcite rocks, such as limestone.
- Websites (optional)
  - For a very good overview of all the content covered in this module: http://rst.gsfc.nasa.gov/Sect2/Sect2_1a.html
  - A useful site for your learners that covers most of the content in this module; it includes an explanation on the Earth's magnetic field: www.geography4kids.com/files/earth_intro.html
  - This site is directed at UK learners and has good information on the rock cycle and types of rocks: www.geolsoc.org.uk/gsl/site/GSL/lang/en/rockcycle
  - The University of Cape Town's (UCT) Geology Department website has a photogallery section: web.uct.ac.za/depts/geolsci/photo_galleries.htm
  - The University of KwaZulu-Natal (UKZN) has a good website. If you are in the KZN area, they have schools education programmes linked to their Science and Technology Education Centre: www.geology.ukzn.ac.za/StudyingGeology.html
  - This page on the SANBI site gives information on the geology of Kirstenbosch and Table Mountain: www.sanbi.org/index.php?option=com_content&view=article&id=832&Itemid=511
  - Books (optional): Your public library, especially the children's section, is likely to have books on rocks. Look out for *E.Explore: Rock and Mineral*, by John Farndon, Dorling Kindersley (2005) – it's a very helpful book with beautiful pictures.
- Rock samples (optional): If you are looking for a rock kit and are in KZN, the Science and Technology Education Centre at UKZN usually gives rock kits to teachers for free after they attended their rock box workshop. They have a limited stock of kits only. To arrange a workshop, contact the Science and Technology Education Centre by emailing stec@ukzn.ac.za for details. They also offer posters in English and isiZulu for free.

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what the learners may already know about the topics and any areas of difficulty that you think they might encounter.
- For Activity 1, ask each learner to bring a hardboiled egg to class unless you plan to supply the hardboiled eggs yourself.

Teaching the unit

Lesson 1

- Read through, or ask learners to read through, the Module 3 introductory paragraph on page 86. You can use it as the basis of an opening discussion to assess what learners already know.
  - Ask questions such as: What is the Earth made up of? How many main layers are there? Why does the Earth have a magnetic field/magnetic poles?
  - If necessary, write up and display the Key questions on the board for the duration of the module.

- Read through, or ask learners to read through, the Unit 1 introductory paragraph on page 87.
- Point out to learners that the focus in this module is the study of the Earth's crust.
- Work through the section 'What is the Earth like inside?' (page 87).
- As one of those useless, but fun facts, you could point out that the pressure is so high at the centre of the Earth that if anyone were to reach it, they would be squashed to the size of a marble.
- Point out that minerals make up the Earth's crust. Rocks are made up of grains of minerals.
- Point out that there are three main types of minerals:
  1) Metals, such as gold, which occur in pure form; and iron which occurs in combination with other minerals (as iron ore)
  2) Non-metals that occur in pure form, such as sulfur; and graphite and diamond (which are both forms of carbon)
  3) Composite minerals that are mixtures of minerals – often metals combined with non-metals. Examples are silicates (mixtures of silicon and oxygen) and gypsum (a mixture of calcium, which is a metal, sulfur and oxygen). Most of the Earth's minerals are composites.
- Emphasise that continental crust consists mainly of granite; and that oceanic crust consists mainly of basalt. Also that oceanic crust, although thinner, is denser than continental crust.

Activity 1

- Learners can do this activity in pairs or small groups, but it is more fun if they can each work with an egg themselves.
- Ask learners to wash their hands beforehand and/or work hygienically so that they can eat their eggs afterwards.

Activity 2

- This is a simple revision or summary activity on the layers of the Earth.

Lesson 2

- Begin the section, 'What are the three main types of rocks and how do they form?' (page 89)
- For 'Igneous rock' (page 89), emphasise that it can be divided into:
  - intrusive – which solidifies below the ground, cools slowly and therefore forms large crystals, e.g. granite
  - extrusive – which solidifies above the ground, cools fast and therefore forms fine crystals, e.g. basalt. This is volcanic rock.

Activity 3

- This activity questions learners fairly thoroughly on igneous rocks. It should help them form a good understanding of the different types of igneous rocks and the relationship between them.

- Work through the section, 'Sedimentary rock' (page 90).
- Ask learners to begin looking for rock samples for a class rock collection (see Activity 7).

Activity 4

- Let learners complete this activity as homework. It is a simple revision activity on types of sedimentary rock.

Lesson 3

- Go through the answers for Activity 4 with the class.
- Work through 'Metamorphic rock' (page 92). Note that gneiss is pronounced 'nice'.
- Emphasise that the parent rock of metamorphic rock can be any type of rock.
- Focus on Figure 3.1.11 which shows contact metamorphism – how a body of rock close to a magma intrusion can become metamorphic rock when it comes into contact with the heat.

Activity 5

- This is a simple revision activity on types of metamorphic rock.

Activity 6

- This activity helps learners summarise the different types of rock. If there is not enough time for the learners to complete it in class, then let them do so for homework.

- Remind learners to look out for rock samples for the class rock collection for the next lesson (Activity 7). Ask learners to read the guidelines for Activity 7.

Lesson 4

- Work through the section, 'How are rocks recycled?' (page 94).
- Talk learners through Figure 3.1.14, which shows the rock cycle.
- Set learners to work on Activity 7 for the rest of the lesson. In this activity they try to classify some of their rock samples.

Activity 7

- Let learners use the rest of the lesson for this activity which requires them to classify some of their rock samples.
- Learners should work in small groups for this activity. They can continue working on this activity in Lesson 5.
- Be available to guide learners with their identifications by making suggestions and offering clues where possible. Unless you have a strong geology background, it is unlikely that you yourself will be able to identify all the rock samples!

Activity 8

- This activity helps learners summarise the rock cycle. Let the learners complete it as homework.

Lesson 5

- Go through the answers for Activity 8 with the class.
- Work through the section, 'What is intrusive igneous activity?' (page 95).
- Ask learners for examples of intrusive rock – for example granite, gabbro and dolerite.
- Refer closely to Figure 3.1.16 which shows the different shapes of the intrusions.

Activity 9

- Point out to that in the pictures which they must use to identify the type of intrusion, the darker rock is the igneous intrusion.

- Let learners continue working on Activity 7 (the rock collection) for the rest of the lesson.

Lesson 6

- Work through the section, 'From which type of rock are particular landforms made?' (page 98). Refer closely to the examples in the photographs and diagram (Figures 3.1.17 to 3.1.25).
- Read the case study, 'Paarl Rock' (page 99).

Activity 10

- This activity develops learners' comprehension skills and understanding of terms.

- Read the case study, 'The Golden Gates' (page 101). Ask:
  - Has anyone in the class been there?
  - Is the basalt cap layer intrusive or extrusive igneous rock?

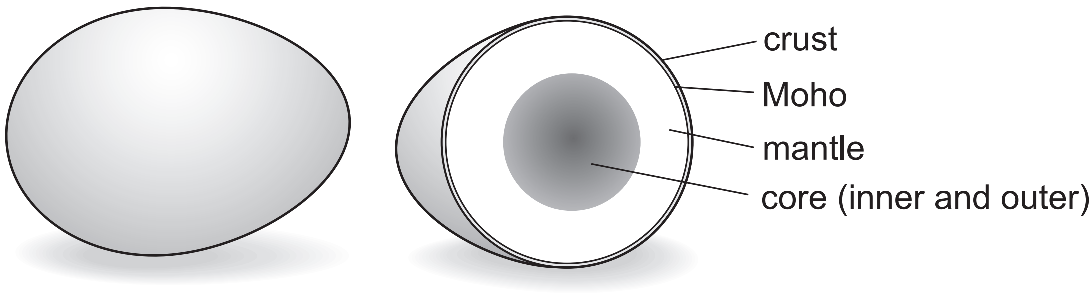
Activity 11

- This activity tests comprehension skills and summarises most of the key concepts in this unit. Allow learners to complete it as homework if they do not have time to do so in class.

Answers

Activity 1

3. a) core – inner and outer
   b) mantle
   c) crust
   d) Moho



Activity 2

1.

Layer	Composition
Inner core	nickel and iron (solid)
Outer core	nickel and iron (liquid)
Mantle	molten rock
Crust	rock

2. a) crust
   b) inner core
   c) mantle
   d) granite
   e) the continental crust is heavier and less dense than the oceanic crust

Activity 3

1. • The grey parts are quartz
   • The pink parts are feldspar
   • The black parts are mica
2. basalt
3. pumice
4. crystals are bigger than gabbro (it is medium-grained)
5. crystals of rhyolite and basalt are smaller

Activity 4

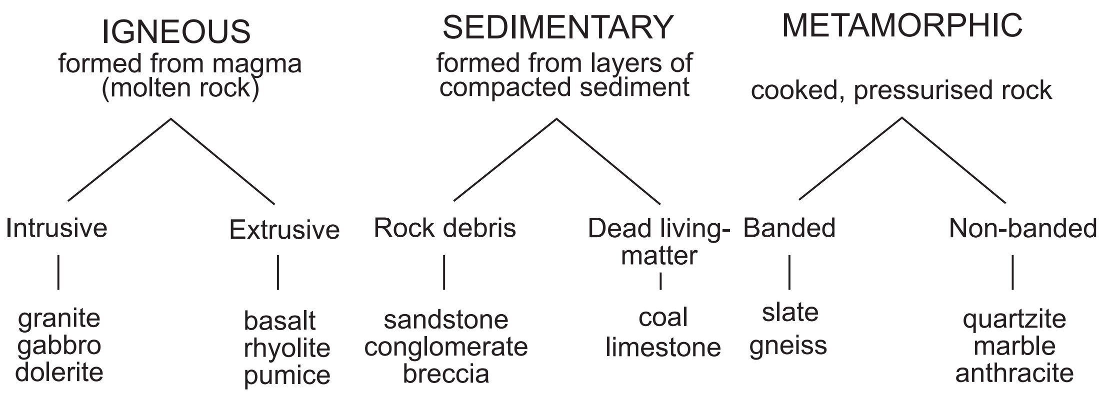
1. pebbles (and sand) – conglomerate; clay – shale; sand – sandstone
2. quartz
3. calcite
4. dolomite
5. coal
6. because the dead remains of plants and animals often end up in the layers of sediment; OR sedimentary rock, unlike igneous rock is never molten. Hot molten rock would destroy the remains.

Activity 5

1. gneiss (is banded)
2. The pale layers are quartz and feldspar. The grey layers are mica.
3. shale
4. No. It has been 'cooked' and changed its mineral structure.
5. anthracite

Activity 6

1.



Note: The above diagram includes all three examples that were covered in the Learner's Book. For the activity, learners can give any two of the three examples.

2. They are very hard-wearing. Slate and marble are both metamorphic. Granite has cooled slowly and it is very crystalline.

Activity 7
The learners' answers will depend on the rocks they collected.

Activity 8
These are the labels for numbers 1–5 on the rock cycle diagram:
1. weathering
2. heat and pressure
3. melting
4. crystallisation
5. uplift

Activity 9
1. A – sill; B - batholith; C – dyke
2. the igneous rock (intrusions) is a dark-coloured rock

Activity 10
1. a geological feature, such as a mountain, that is made up of a single mass of very hard rock – usually igneous or metamorphic
2. a) Paarl Rock
   b) Uluru/Ayres Rock (it is sedimentary)
3. Paarl Rock and Uluru have formed in very different ways. Paarl Rock is part of a massive underground granite intrusion, whereas Uluru is sedimentary. Although they can both be classified as 'monoliths', they have very different origins.

Activity 11
1. Free State (1)
2. i) c (1)
   ii) b (1)
3. all three rock types – igneous, sedimentary and metamorphic OR five different types of rock in total (1)
4. sandstone (1)
5. basalt (1)
6. sandstone (1)
7. It formed from those sandstone layers that were in close contact with the hot lava flow, which turned these layers into metamorphic rock. (1)

[8]

Informal assessment

Activity 1
- Go through the answers with the class. Ask learners to offer answers.

Activity 2
- Write up the completed table on the board. Go through the answers to Question 2 orally.

Activity 3
- For Question 1, refer learners to the picture of granite in Figure 3.1.6 and point out the different minerals.
- Go through the rest of the answers. Ask learners to offer answers.

Activity 4
- Go through the answers with the class. Ask learners to offer answers.

Activity 5

- Go through the answers with the class. Ask learners to offer answers.
- For Question 2, refer learners to the picture of gneiss in Figure 3.1.10 and point out the different minerals.

Activity 6

- Write up the completed summary diagram on the board. Ask learners to offer their answers to this and to Question 2.

Activity 7

- Observe and guide learners as they work on identifying their rock samples.
- You can use this activity to informally assess:
  - how well learners understand the different rock types
  - their ability to work co-operatively.

Activity 8

- Write up the answers on the board.

Activity 9

- Go through the answers with the class. Ask learners to offer answers. Discuss the pictures with the class.

Activity 10

- Go through the answers with the class. Ask learners to offer answers.

Activity 11

- You can mark this activity according to the mark allocation given in the Answers section. Use this activity to informally assess learners' comprehension and provide feedback to them on whether they have grasped the concepts covered in this unit.
- Alternatively, ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Consolidation/extension

Consolidation:

- For learners who struggled with Activity 10, or need extra practice, ask them to read the case study, 'The Golden Gates' (page 101) again and then let them complete Worksheet 8 (page 278) in the Resources section of this Teacher's Guide.

Extension:

- Encourage learners to look at some of the websites suggested in the resources section.
- Encourage learners to find and look at books on rocks – from the public library, school library or home.
- Let learners complete Worksheet 9 (pages 279–281) in the Resources section of this Teacher's Guide. It focuses on the different types of rocks and their formation.

UNIT 2 Plate tectonics

Curriculum and Assessment Policy Statement (CAPS) content

Plate tectonics

- Changes in the position of continents over time.
- Evidence for the movement of continents over time.
- Plate tectonics – an explanation for the movement of continents.
- The mechanics of plate movements.
- Processes and landforms associated with different kinds of plate boundaries.
- The world's volcanic and earthquake zones.

Resources

- Learner's Book pages 103–113
- Activity 3: Hardboiled eggs (and some salt and pepper – learners can eat the eggs afterwards).
- Websites (optional)
  – The following website gives an excellent overview on plate tectonics and the rest of the content covered in this module for you and advanced learners: http://platetectonics.com/book/index.asp
  – For a simulation or animation of how continents have moved over the last 800 million years: www.enchantedlearning.com/subjects/astronomy/planets/earth/Continents.html
  – For: 'The Great Continental Drift Mystery', an article on the evidence for continental drift – for you and advanced learners: www.yale.edu/ynhti/curriculum/units/1991/6/91.06.05.x.html

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- Unless you plan to supply the hardboiled eggs yourself, for Activity 3, ask each learner to bring a hardboiled egg to class.

Teaching the unit

Lesson 1

- Read through the Unit 2 introductory paragraph on page 103.
- Gauge what learners already know about tectonic plates.
- Emphasise that the theory of plate tectonics is relatively new. It became mainstream scientific theory only in the 1960s.
- Work through the section 'What is continental drift?' (page 103).
- Focus on Figure 3.2.1 and draw attention to Pangea and Gondwanaland. Talk about the origin of the names. Pangea means 'all lands' (refer learners to the Tip in their books) and Gondwanaland is named after a part of India (see Activity 1) – India was a part of Gondwanaland.
- You could also point out that:
  – the Earth is 4,5 billion years old
  – 1 billion years ago, the continents all formed another supercontinent called Rhodinia
  – 200 million years from now, the continents will all come together again.

Activity 1

- This activity gets learners to focus on the maps in Figure 3.2.1 that show the change in the position of the continents over time.
- Let the learners complete this activity in class.

Lesson 2

- Work through the section 'What is the evidence for continental drift?' (page 104). It focuses on the father of plate tectonics, Alfred Wegener, and his strong supporter, South Africa's own Alexander du Toit. Ask: Who has heard of either of these scientists before?
- Read the two features, 'Mesosaurus – fossil evidence for continental drift' (page 105) and 'A South African's contribution to continental drift' (page 105).
- Spend a bit of time talking about fossils.
- Point out that the climate of the Karoo has changed over time: it was very cold, then a swamp, and now it is semi-desert.
- Why was it once covered with glaciers? Ask learners to look at the map of Pangea in Figure 3.2.1 and see how the region of the Karoo once lay in the polar circle. 320 to 270 million years ago, Gondwanaland, which was still part of Pangea at this stage, was over the South Pole.
- How did it become a swamp? As the glaciers began to melt at the end of the ice age, sea levels rose and flooded the land. It was covered with inland seas, swamps and deltas.
- Refer to the 'basalt caps' in 'A South African's contribution to continental drift'. Point out that dramatic volcanic activity took place about 183 million years ago and was on an enormous scale – there were huge outpourings of lava. The eruptions lasted about one million years. These are the same basalt outpourings that capped the Drakensberg (remind learners about the feature on 'The Golden Gates').

Activity 2

- Point out that the two short articles are important as they contain content information on the evidence for continental drift.

Lesson 3

- Work through the section, 'What are tectonic plates?' (page 106).
- Draw attention to the map of tectonic plates in Figure 3.2.9. Point out that this is a very important map which they'll refer to many times during the course of the module.

Activity 3

- If necessary, do this activity with the class as a demonstration, or talk them through the steps of the activity and discuss the answers to the questions as they do it.
- Learners can do this activity in pairs or small groups, but it is more fun if they can each work with an egg themselves.
- Ask learners to wash their hands beforehand and/or work hygienically so that they can eat their eggs afterwards.

Activity 4

- This activity gets learners to engage with the map of tectonic plates in Figure 3.2.9.

- If there is not enough time, learners can complete this activity for homework.

Lesson 4

- If Activity 4 was completed for homework, go through the answers with the class.
- Work through the section, 'Why do the plates move?' (page 107).
  - Refer learners again to the map of tectonic plates in Figure 3.2.9 and point out the key to the plate boundaries – divergent, convergent and transform fault.

Activity 5

- This quick activity may only be necessary for those learners who need help with understanding the different types of plate boundaries. Or you can do this activity as a demonstration by holding up pieces of paper against the board.

- Work through the section, 'What happens when the plates move?' (page 108).
- Draw attention to Figure 3.2.13 which summarises the features of divergent and convergent plate boundaries. Point out that this is another important diagram in this module.

Activity 6

- This activity gets learners to engage with the diagram in Figure 3.2.13. The diagram is important because it gives an overview of what happens at divergent and convergent plate boundaries.

Lesson 5

Activity 7

- Read the case study, 'Iceland and the Mid-Atlantic Ridge' (page 110).
- Let learners work in pairs to answer questions on an example of a mid-ocean ridge, which forms at divergent ocean-to-ocean plate boundaries.

Activity 8

- Read the case study, 'The Mariana Trench in the Pacific' (page 111).
- Let learners complete this activity individually. In it, they answer questions on an example of a deep sea trench, which forms at divergent ocean-to-continent plate boundaries.
- If there is not enough time, learners can do or complete this activity for homework.

Lesson 6

- If Activity 8 was completed for homework, go through the answers with the class.
- Work through the section, 'Where are the world's volcanic and earthquake zones?' (page 112).

Activity 9

- Read the case study, 'The Pacific Ring of Fire' (page 113).
- The main purpose of this activity is for learners to link the pattern of the Pacific Ring of Fire to the pattern of convergent and fault boundaries in the Pacific.

Answers

Activity 1

1. Continental drift is the slow movement of the continents relative to each other over time.
2. Pangea
3. South America, Africa, Antarctica, Australia (also Sri Lanka)
4. North America, Europe and Asia
5. Tethys Sea
6. 5 km
7. a) 225 million years (refer to Figure 3.2.1 – the Permian period);
   b) 11,5 cm per million years (2 580 km ÷ 225 million years)

Activity 2

1. Sri Lanka
2. Mesosaurus
3. Glossopteris
4. a) tillite
   b) coal
   c) dune deposits

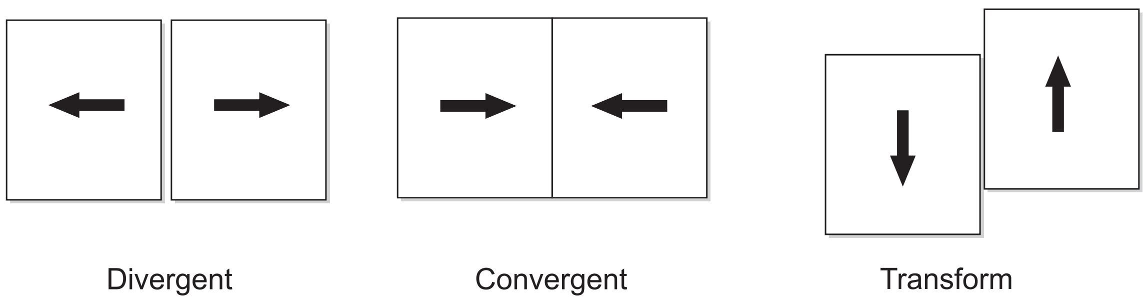
Activity 3

1. a) The shell and thin membrane represent the tectonic plates.
   b) The egg white represents the mantle.

Activity 4

1. 6
2. North American Plate, South American Plate, Eurasian Plate, African Plate, Indo-Australian Plate, Antarctic Plate
3. continental crust and oceanic crust
4. Pacific Plate
5. North American Plate, South American Plate, Eurasian Plate, African Plate
6. Arabian Plate
7. San Andreas Fault; Los Angeles lies on the Pacific Plate, not the North American Plate

Activity 5



Activity 6

1. divergent – ocean (2)
   divergent – continent (2)
   convergent – ocean-to-continent (2)
   convergent – ocean-to-ocean (2)

2. a) in the ocean (1)
   b) heavier (1)
   c) made (1)
   d) melted down (1)
   e) newer (1)

[13]

Activity 7

1. North American Plate and Eurasian Plate
2. The pattern of the Ridge matches the pattern of the divergent boundary line.
3. As two ocean plates move apart, magma rises from the Earth's mantle to form new crust. The magma eruptions form a chain of underwater mountains – a mid-ocean ridge.
4. a) sea-floor spreading
   b) yes
   c) The tectonic plates that carry the continents that are on either side of the Atlantic Ocean are moving away from each other.

Activity 8

1. a convergent ocean-to-continent boundary
2. Philippine Plate (ocean) and Eurasian Plate (continent)
3. Philippine Plate
4. the Philippines and Japan

Activity 9

2. Pattern of the plate boundaries: The line of volcanic activity matches the convergent boundaries and transform fault boundaries.
3. Pacific Plate and North American Plate; Cocos Plate, Nacza Plate and South American Plate
4. by the Nacza Plate converging with or pushing against the South American Plate
5. (2) Pattern of the plate boundaries: The line of volcanic activity matches the convergent boundaries and transform fault boundaries.
   (3) Indo-Australian Plate and Pacific Plate; Philippine Plate and Pacific Plate; Okhotsk Plate and Pacific Plate
6. Pacific, Okhotsk, Philippine, Indo-Australian, North American, Cocos, Nacza, South American
7. a) 11
   b) i) ocean-to-continent
      ii) subduction zone

Informal assessment

Activity 1

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Activity 2

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Activity 3

- Informally assess learners' understanding of the concept of tectonic plates as you talk the class through this activity. You can gauge understanding by any questions learners ask.

Activity 4

- Go through the answers with the class. Ask learners to offer answers.

Activity 5

- If learners do this activity themselves, check to see that they have got the concept of divergent, convergent and transform fault boundaries. Then demonstrate, holding the pieces of paper up against the board so that learners can see if they did it correctly.

Activity 6

- You can mark this activity according to the mark allocation given in the Answers section. Use this activity to informally assess and give learners' feedback on their understanding of tectonic plate boundaries and general processes.
- Alternatively, you could ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Activity 7

- Go through the answers with the class. Ask learners to offer answers.

Activity 8

- Go through the answers with the class. Ask learners to offer answers.

Activity 9

- Go through the answers with the class. Ask learners to offer answers.

Consolidation/extension

Consolidation:

- For learners who struggled with Activity 6, ask them complete the table in Worksheet 10 (page 282) in the Resources section of this Teacher's Guide.
- Learners who require more practice with the concepts in Unit 2 could complete Worksheet 11 (page 283) in the Resources section of this Teacher's Guide.

Extension:

- Get learners fired up to find out more about the geology (rocks and mountains) of their area. Two helpful books are:
  - *Geological Journeys*, by Nick Norman and Gavin Whitfield (Struik) is a general book for the whole of South Africa, but quite advanced.
  - *The Rocks and Mountains of Cape Town*, by John S Compton (Double Storey) is suitable for learners in Cape Town.
- Let the learners complete Worksheet 12 (pages 284–285) in the Resources section of this Teacher's Guide. The worksheet gives learners a sense of geological time and an overview of South Africa's geology. It also gives learners practice in applying their knowledge on the different types of rocks (Unit 1).

Curriculum and Assessment Policy Statement (CAPS) content

Folding and faulting

- The process of rock folding – link to plate movement.
- Landforms associated with folding.
- The process of faulting – link to plate movement.
- Different types of faults.
- Landforms associated with faulting, e.g. rift valleys and block mountains.

Resources

- Learner's Book pages 114–121
- Websites (optional)
  - This website includes a very good section on folding and faulting: http://rst.gsfc.nasa.gov/Sect2/Sect2_1a.html
  - This site also has good information on folding and faulting, as well as simple animations of the three different types of fault: www.physicalgeography.net/fundamentals/10l.html
  - For a simple summary on folding and faults for learners: www.geography4kids.com/files/earth_intro.html
  - For a slideshow that has some lovely photos of rock folds from slide 26 onwards: www.wiziq.com/tutorial/9182-Fold-Structure
  - For more excellent photos of rock folds and faults: http://ualberta.ca/~jwaldron/gallerypages/folds.html and http://ualberta.ca/~jwaldron/gallerypages/faults.html
  - This PDF has useful and interesting information on mountains, including volcanic mountains (which are covered in Unit 4): http://facstaff.unca.edu/ahuang/2011_Spring/atms379/chapter_2b_mountain_environment.pdf
  - For some good photos of folds and faults: www.geology.wisc.edu/~chuck/Classes/Mtn_and_Plates/rock_deformation.html
  - For information on the San Andreas Fault: http://platetectonics.com/book/page_15.asp

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- If you choose to do the Lesson 1 extension activity, and have access to computers, book computer time for this lesson. Check that the slideshow is still available online.

Teaching the unit

Lesson 1

- Read through, or ask learners to read through, the Unit 3 introductory paragraph on page 114. Emphasise that:
  - A fold is a bend/buckle in the rock or crust
  - A fault is a break/crack in the rock or crust.
- Work through the section 'What is the process of rock folding?' (pages 114–115).
- Demonstrate folding, or ask learners to demonstrate folding, by pushing together two ends of a piece of paper.
- Draw attention to the different types of folding patterns shown in Figure 3.3.1. Point out that:
  - Synclines are troughs and anticlines are domes.
  - Symmetrical folds have sides or limbs with similar dips.
  - Asymmetrical folds have one side or limb much steeper than the other.
  - Isoclinal folds are very tight folds – the limbs are almost parallel to one another.
  - In overturned folds, the fold axis is at an angle, it is not vertical, as it is in a symmetrical fold. The fold axis is an imaginary line through the centre of a fold.
  - Heavily overturned folds are recumbent folds; the folds lie on their sides.
  - Chevron folds are pointed folds; most other fold types are rounded.

Activity 1

- This is a revision-type activity on the different fold types.
- If you are doing the extension activity (see the Extension section, page 81 in this guide), set learners at computers to look at the photos of rock folds. If you have a computer projection system with Internet connection, you can present photos to the class as a slide show.

Lesson 2

- Work through the section 'Which landforms are associated with fold mountains?' (page 115).
- Focus on the map of the world's fold mountains in Figure 3.3.5. Learners should be familiar with some of these mountain ranges. Before they look at the map, you could ask them to close their books and have a class quiz. For example: Can you name the fold mountains in North Africa?

Activity 2

- In this activity, learners classify fold mountains of the world as old or new.

Activity 3

- Read the case studies, 'How the Cape Fold Mountains formed' and 'How the Himalayan Mountains formed' (page 117).
- Let learners work in pairs to complete the questions.

Lesson 3

- Begin the section, 'How do faults form?' (page 118).
- Remind learners that a fault is a break/crack in rock or the Earth's crust.
- Work through 'Types of fault' (page 118) and refer learners to Figure 3.3.9 which illustrates these.
- Emphasise that a reverse fault (also called a thrust fault) is the opposite of a normal fault.

- If necessary, demonstrate what happens as these faults form, using two blackboard dusters.

Activity 4

- This activity is a consolidation activity on the three different types of fault.

- Work through 'What type of landforms and features does faulting produce?' (page 119), focusing on 'Block mountains and rift valleys'.

Activities 5 and 6

- Read the case studies, 'Pilanesberg' and 'The Great African Rift Valley' (page 120).
- If there is not enough time, learners can complete these activities for homework.

Lesson 4

- If learners completed Activity 5 for homework, go through the answers with the class.
- Recap on the section, 'Block mountains and rift valleys' (page 119).
- Work through 'Transform faults' (page 121).

Activity 7

- Read the case study, 'The San Andreas Fault' (page 121).
- Allow the learners to work through the questions in pairs.

Answers

Activity 1

1. 1E; 2H; 3A; 4G; 5I; 6B; 7F; 8C; 9D (9)
2. a) Figure 3.3.2 symmetrical/isoclinal (1)
   b) Figure 3.3.3 chevron (1)

[11]

Activity 2

1. a) Cape Fold, Great Dividing Range, Appalachians
   b) Rockies, Andes, Alps, Atlas, Urals, Himalayas, Pyrenees

Activity 3

2. What is now the top of India (which borders on China and Nepal) was once a coastal region.
3. continent to continent
4. The Indo-Australian Plate is still pushing into the bottom of the Eurosian Plate.
5. 450 million years old
6. the collision of continents as Pangea was formed
7. the rifting of Gondwanaland

Activity 4

1. a) strike-slip fault (1)
   b) reverse/ thrust fault (1)
   c) strike-slip fault (1)
   d) strike-slip fault (1)
   e) normal fault, reverse/ thrust fault (2)

2. A normal or reverse/thrust (one can't tell which of the two it is from the limited view in the photo);
   B strike-slip (2) [8]

Activity 5

1. normal faulting
2. Somalian Plate
3. rift valleys and block mountains
4. Ruwenzori – Uganda; Mitumba – Burundi and the Democratic Republic of Congo

Activity 6

1. California, USA
2. strike slip/transform fault
3. Pacific Plate (left) and North American Plate (right)
4. The Pacific Plate is moving north and turning anti-clockwise.

Informal assessment

Activity 1

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.
- If you choose, you can ask learners to mark their partner's answers according to the mark allocation given in the Answers section.
  Ask those learners who got less than 9/11 to do the consolidation activity (see page 81).

Activity 2

- Go through the answers with the class. Ask learners to offer answers.

Activity 3

- Go through the answers with the class. Ask learners to offer answers.

Activity 4

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.
- If you choose, you can ask learners to mark their partner's answers according to the mark allocation given in the answers section.
  Ask those learners who got less than 6/8 to do the consolidation activity (see page 81).

Activity 5

- Go through the answers with the class. Ask learners to offer answers.

Activity 6

- Go through the answers with the class. Ask learners to offer answers.

Activity 7

- Go through the answers with the class. Ask learners to offer answers.

Consolidation/extension

Consolidation:

- Let learners who struggled with Activity 1 and/or Activity 4, complete Worksheet 13 (pages 286–287) in the Resources section of this Teacher's Guide. This activity is also useful practice for all learners. Learners can do it in a revision lesson or for homework.

Extension:

- You can extend Lesson 1 by allowing learners to spend some time looking at rock fold photos on www.wiziq.com/tutorial/9182-Fold-Structure, from slide 26 onwards, or http://ualberta.ca/~jwaldron/gallerypages/folds.html
- Extend Lesson 3 by giving the following website address for photos of faults: http://ualberta.ca/~jwaldron/gallerypages/faults.html. Or, if you have a computer projection system with Internet connection, you can present photos to the class as a slide show.
- Extend Lesson 4 by printing out one or more copies of the following PDF and allowing learners to browse through the pages for enrichment: http://facstaff.unca.edu/ahuang/2011_Spring/atms379/chapter_2b_mountain_environment.pdf.

Learner's Book
pages 122–131
Duration: 4 hours

UNIT 4 Earthquakes

TERM 2, WEEK 5

Curriculum and Assessment Policy Statement (CAPS) content

Earthquakes

- How and where earthquakes occur.
- The relationship between earthquakes and tectonic forces.
- Measuring and predicting earthquakes.
- How earthquakes and tsunamis affect people and settlements – differences in vulnerability.
- Strategies to reduce the impact of earthquakes.
- Case examples of the effects of selected earthquakes.

Resources

- Learner's Book pages 122–131
- Websites (optional)
  - This website has a good page on earthquakes: http://platetectonics.com/book/index.asp
  - An excellent overview for learners on measuring and predicting earthquakes: http://en.wikibooks.org/wiki/High_School_Earth_Science/Measuring_and_Predicting_Earthquakes
  - A 2-page PDF, 'Locating, measuring and predicting earthquakes – how do we do it?' http://scearthquakes.cofc.edu/educators/factsheets/SCEEPFactSheets_5.pdf
  - A comprehensive PDF factsheet on earthquakes and a list of earthquake events: http://www.geolsoc.org.uk/webdav/site/GSL/shared/pdfs/education%20and%20careers/Earthquakes-fact-sheet. A PDF with a section that focuses on earthquakes in the UK.
  - For more information for you or learners on seismic waves: http://www.proofofconcepts.com/webtextbook/earth_internal_processes/

earthquakes/calcepicnt.htm (Note: the Virtual Earthquake Lab link doesn't seem to work)
  – The US Geological Survey website has up-to-date information on seismic events:
    http://earthquake.usgs.gov
  – An animation on earthquakes with an overview of the Earth's structure: www.youtube.com/watch?v=30SFfPvcss0
  – A short documentary feature that shows the effects of earthquake tremors: www.youtube.com/watch?v=CtBXTvtFaCU&NR=1&feature=fvwp
  – Animations of how a tsunami forms: www.youtube.com/watch?v=4Xebwzb3dDE&feature=related or http://science.howstuffworks.com/nature/natural-disasters/tsunami3.htm
  – A simulation of the wave pattern effect of the Indian Ocean tsunami: www.youtube.com/watch?v=IC4xWwZ60BE&feature=related
  – Footage of flood effect of 2011 tsunami in Japan: www.youtube.com/watch?v=TGYJpGkFoW8&NR=1&feature=fvwp

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- Over the year, collect newspaper cuttings about earthquakes events or source newspaper articles on the Internet on past earthquakes (for future lessons).

Teaching the unit

Lesson 1

- Read through, or ask learners to read through, the Unit 4 introductory paragraph on page 122. As a class, brainstorm recent or past earthquake events.
- Work through the section, 'What causes an earthquake?' (page 122).
- Focus on the key terms: seismic wave, focus and epicentre.
- Work through the section, 'How are earthquakes linked to plate tectonics?' (page 122).
- Ask learners to look at the maps of the world's volcanoes (page 113) and the Pacific Ring of Fire (page 113) again.

Activity 1

- Read the case study 'South Africa measures four earthquakes' (page 123).
- If there is not enough time, learners can do or complete this activity for homework.

Lesson 2

- If learners completed Activity 2 for homework, go through the answers with the class.
- Work through the section, 'How are earthquakes measured?' (page 124).
- Emphasise the difference between a seisomograph and a seismogram. It's easy to mistake a seisomograph for being a plot of an earthquake.
- You can point out that P-waves are primary and S-waves are secondary waves. S-waves are the destructive waves.

- Work through 'The measurement scale' (page 125). Emphasise that the Richter scale is no longer used and explain why. Unlike the moment scale, it measures only the size of the jolt and not the length or duration of the jolt. Refer learners to Figure 3.4.6 to get a sense of the scale.
- Work through the section, 'How are earthquakes predicted?' (page 125).

Activity 2
- Read the case study: 'Predicting earthquakes – hit and miss' (page 126).
- This activity summarises some aspects of measuring and predicting earthquakes.

Lesson 3

- Work through the section, 'How do earthquakes and tsunamis impact on people and the environment?' (page 127).
- Briefly talk about tsunami incidents learners may know of – for example, the 2004 Indian Ocean tsunami and the 2011 Pacific Ocean tsunami in Japan.
- Read the feature: 'A geography lesson saves lives' (page 127) and talk about the warning signs of a tsunami.

Activity 3
- Read the case studies: 'The Indian Ocean Tsunami of 2004' (page 128) and '2010 earthquake in Haiti' (page 129).
- This works well as a class or group discussion activity.

Lesson 4

- Work through the section 'How can the impact of earthquakes be reduced?' (page 130).
  - Point out, for example, that people in countries like Japan are generally well-prepared for earthquakes. Learners are drilled to take refuge under their desks if an earthquake strikes in class.

Activity 4
- Learners can do this activity on their own or in pairs. The activity gives them practice in working with data.
- If necessary, talk learners through the information Table 3.4.1 beforehand.

Activity 5
- Read the feature, 'The Milnerton Fault, Cape Town' (page 131). Discuss how prepared Cape Town is for an earthquake and lead a brief class discussion. Refer learners to the section headed 'How can the impact of earthquakes be reduced?' on page 130 as a reference.

Answers

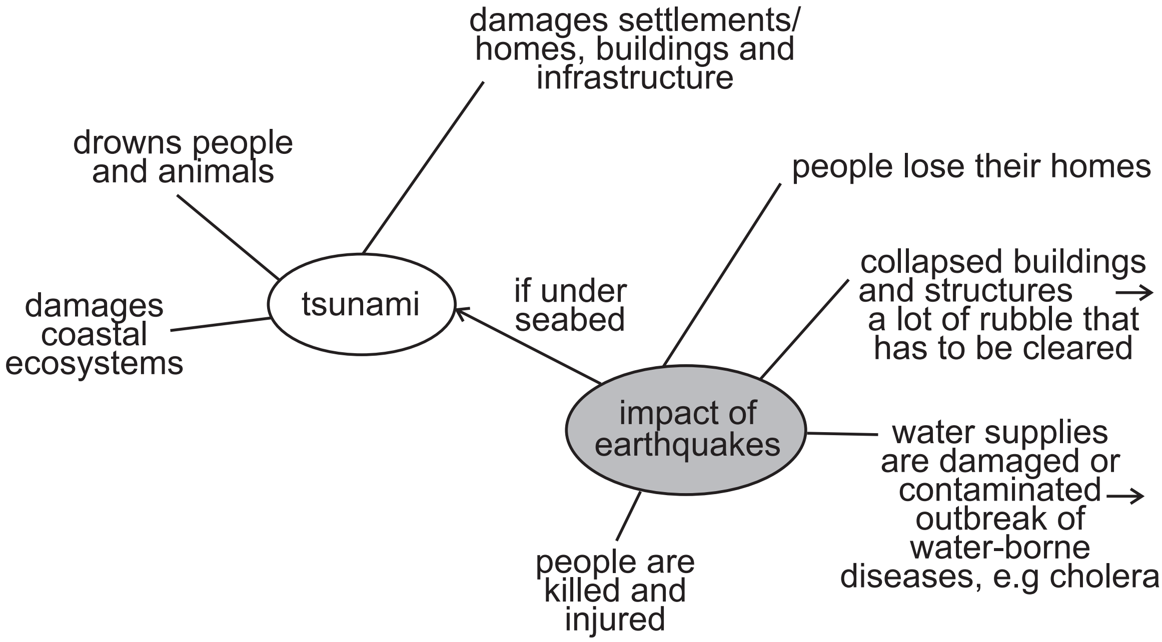
Activity 1
1. focus – the focus is the point underground at which the earthquake takes place (whereas the epicentre is the point at the surface)
2. Human activity such as mining, deep drilling and dam building can cause earthquakes. Mining and deep drilling creates gaps and spaces in the rock. This weakens the rock and means that it can give way under pressure. The weight of the water in a dam can relax the tension in a fault, making it possible to move further apart.
3. South Africa does not lie on any tectonic plate boundaries.
4. natural (due to an ancient fault line)

Activity 2

1. a scientist who studies earthquakes
2. the shocks or tremors that often come before the main shock or earthquake
3. the old scale for measuring the size of an earthquake; it goes from 0 to 10
4. It is costly and disruptive. It requires personnel to organise and carry out the evacuation, transport, temporary shelter to house people, and so on.

Activity 3

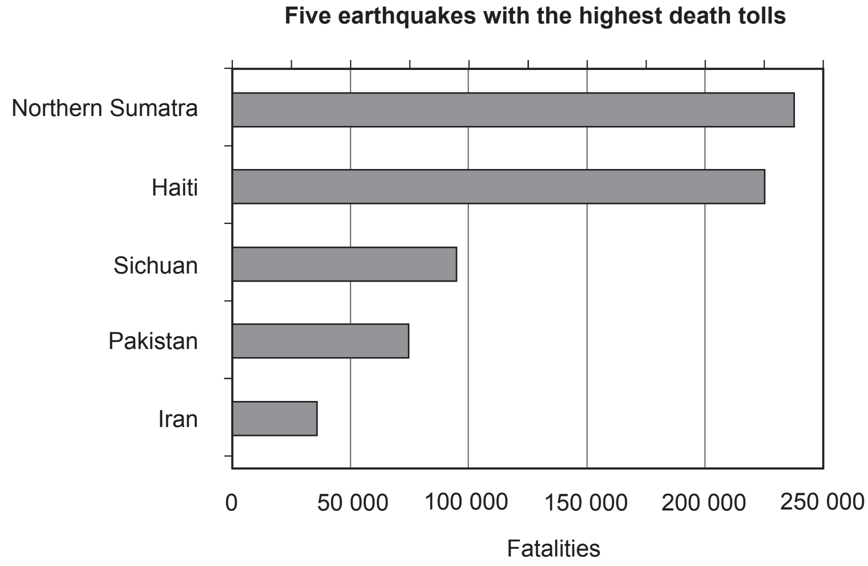
2. Haiti is a developing country. Many of its inhabitants are poor.
4. Here is an example mind-map.



Activity 4

1. The 2010 Haiti earthquake (1); the 2008 Sichuan earthquake, China (1); the 2004 earthquake off the West Coast of Northern Sumatra (1)
2. The 2004 earthquake off the West Coast of Northern Sumatra (1)
3. The 2006 Kuril Islands earthquake and the 2003 Hokkaido earthquake, Japan; both magnitude 8.3 (3)
4. The 2008 Sichuan earthquake, China (1); the 2004 earthquake off the West Coast of Northern Sumatra (1)
5. Average magnitude = 8.39 (3); total fatalities = 317 660 (3)
   The average is calculated like this: (8.8 + 8.1 + 7.9 + 8.5 + 8.3 + 8.6 + 9.1 + 8.3 + 7.9 + 8.4) ÷ 10
   The total is calculated like this: 507 + 192 + 87 587 + 25 + 0 + 1 313 + 227,898 + 0 + 0 + 138
6. Average magnitude = 7.38 (3); total fatalities = 677 819 (3)
   The average is calculated like this: (7.0 + 7.5 + 7.9 + 8.0 + 6.3 + 7.6 + 9.1 + 6.6 + 6.1 + 7.7) ÷ 10
   The total is calculated like this: 222 570 + 1 117 + 87 587 + 514 + 5 749 + 80 361 + 227 898 + 31 000 + 1 000 + 20 023
7. It depends where the earthquake takes place:
   - If it is in an isolated place, it may not kill people. (2)
   - Developing countries are more vulnerable/ usually more badly affected. For example, informal structures collapse more easily and recovery operations require money and infrastructure. (2)

8.



This graph has fatalities on x-axis and countries on y-axis. Learners may also plot fatalities on y-axis and countries on x-axis.

Assign 10 marks for the bar graph as follows:

- heading (1)
- labeling of x-axis with something like 'Fatalities' or 'Numbers dead' (1)
- numbers along x-axis (1)
- correct use of scale (1)
- labeling of y-axis with names of countries (1)
- each bar correctly plotted per country, plotting can be approximate (5)

[25]

Activity 5

One could argue that Cape Town is partly prepared for an earthquake because:

- the risk of an earthquake taking place has been assessed
- there are building regulations in place that specify that new buildings must be built with high-strength concrete that can withstand earthquakes.

One could argue that Cape Town is not prepared for an earthquake because:

- most of the city's buildings are not built or engineered to withstand earthquakes
- the informal settlements on the Cape Flats are very vulnerable to earthquakes
- residents do not have experience of an earthquake and have not been drilled in preparation.

Informal assessment

Activity 1

- Go through the answers with the class. Ask learners to offer answers.

Activity 2

- Go through the answers with the class. Ask learners to offer answers.

Activity 3

- Draw an example of the mind-map on the board which learners can use to assess whether their own mind-maps were comprehensive.

- Alternatively, you can construct a mind-map on the board as learners offer answers.

Activity 4

- You can mark this activity, or just the bar graph (Question 8), according to the mark allocation given in the Answers section. Use this activity to informally assess learners' graph drawing skills and their ability to work with data. Give them feedback on these areas.
- Alternatively, go through the answers with the class. Ask learners to offer answers. Draw the bar graph on the board so that learners can compare their own graphs with this.

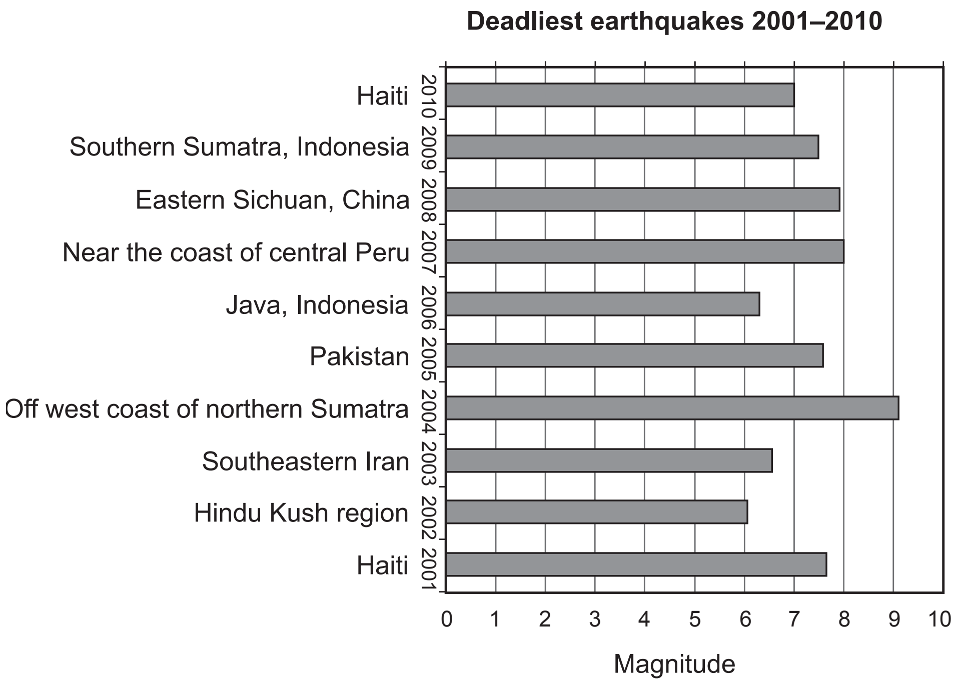
Activity 5

- Monitor learners' contributions to the class discussion and look for evidence of the application of geographical knowledge about earthquakes.

Consolidation/extension

Consolidation:

- For learners who struggled with Activity 4, ask them to plot a bar graph of the magnitude of the 10 deadliest earthquakes, beginning with 2001 and ending with 2010.
- Their graph should look similar to this (which has been plotted with magnitude on x-axis and countries on y-axis, but it's just as good to plot this the other way around):



Extension:

- You can extend Lesson 3 by giving learners the website addresses for some of the animations and videos listed under the Resources section, or if you have a computer projection system with Internet connection, you can show some of these to the class. You could also suggest they look at these for homework.
- Recommend some of the websites to learners that are listed under the Resources section above.

UNIT 5 Volcanoes

Curriculum and Assessment Policy Statement (CAPS) content

Volcanoes

- Types of volcanoes – extrusive, intrusive, active, dormant, extinct.
- Structure of volcanoes.
- Impact of volcanoes on people and the environment – positive and negative.
- Case studies of different volcanic eruptions.

Resources

- Learner's Book pages 132–140
- Activity 3: You will need materials such as plasticine (which is expensive), or play dough (see recipe on page 267), or papier mâché (see recipe on page 267) and paints, unless learners do this activity at home.
- Websites (optional)
  - For a map of the Decade Volcanoes, as well as a feature article, 'Living with volcanoes': http://ngm.nationalgeographic.com/2008/01/volcano-culture/decade-volcano-map-interactive
  - For general information and features on the Decade Volcanoes: http://www.sciencedaily.com/articles/d/decade_volcanoes.htm
  - This page on the US Geological Survey website gives general information on the Hawaiian hot spot volcanoes; there are other pages that feature some of the important Hawaiian volcanoes and give details of hazards: http://hvo.wr.usgs.gov/volcanoes
  - On the Greek volcanic island Santorini, see the introduction and the section 'Volcanic eruptions': http://en.wikipedia.org/wiki/Santorini#Volcanic_eruptions
  - On the Indonesian volcanic island of Krakatoa: http://en.wikipedia.org/wiki/Krakatoa
- Books (optional):
  - *Krakatoa: The Day the World Exploded*, by Simon Winchester. This is a good read for you or learners who are advanced readers of English.
  - *Planet Earth: Volcano* (Time-Life Books). This is an old book (1982/1989), but it has some excellent information and exciting features on volcanic eruptions. You might be able to get a copy at the public library or at a second-hand bookshop.

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- Over the course of the year, collect newspaper cuttings about volcanic eruptions (for future lessons).
- For Activity 3 (optional), you might need to prepare play dough and papier mâché (see the recipes in the Resources section).

Teaching the unit

Lesson 1

- Read through, or ask learners to read through, the Unit 5 introductory paragraph on page 132.
- You can begin with a brainstorming session, asking learners to name well-known volcanic mountains or volcanic islands.
- Point out that islands are divided into:
  - continental islands – islands that sit on the continental shelf (these are always close to a continent), and
  - oceanic islands – islands that are not on the continental shelf, but often in the middle of the ocean (unless they are at an ocean-to-continent convergent boundary). Most of these oceanic islands are volcanic.
- Work through the section, 'What makes a volcano?' (page 132). Ask learners to offer answers to this question to assess what they already know.
- Work through the section, 'Where do volcanoes form?' (page 133).
- Make sure learners turn back to the map of the world's volcanoes in Figure 3.2.18 on page 113.
- Focus on the list of volcanic features or activity at subduction zones and rift zones. Figure 3.5.2 is a repeat of Figure 3.2.13. Remind learners that this is an important overview diagram.
- Emphasise that the three types of volcanic islands are: volcanic island arcs, ocean rift volcanic islands and volcanic hot spot islands.
- Point out, for interest's sake, that an atoll is formed from a coral reef that has grown on an eroded, sunken volcanic island (in other words, a submarine volcanic island). The Maldives is a famous series of atolls.

Activity 1

- Read the case study, 'The origin of the Hawaiian Islands' (page 134).
- For other hot spot island examples (2a), learners are given the South Atlantic Ocean as a clue for Tristan da Cunha. As a clue for the Maldives, ask them to look in an atlas just north of the equator in the Indian Ocean.

Lesson 2

- Work through the section, 'What types of volcanoes are there?' (page 135).
- Focus learners' attention on Figure 3.5.7 which shows examples of each of the three types of volcano.
- Work through these terms – active, dormant and extinct. Learners should be able to work out their meanings. Point out that dormant means 'at rest or sleeping'.
- Read the feature, 'The Prince Edward Islands are shield volcanoes' (page 135).

Activity 2

- This activity focuses on a shield volcano example and reinforces some terms.
- Let learners complete the activity in pairs.

- Work through the section, 'What is the structure of the stratovolcano?' (page 136).
- Let learners begin planning their models for Activity 3, or you can ask them to do this as a homework project.

Lesson 3

Activity 3

- This activity will reinforce the structure of a composite volcano/ stratovolcano.
- If learners use ready-made play dough, it will be quick for them to make simple models.
- You could also save this activity for a later stage – for if and when there is lesson time to fill or as a revision activity.

- Go through the section, 'Which features or landforms do volcanoes produce?' (page 136).

Activity 4

- This is a quick activity in which learners identify volcanic features and landforms.

- Begin the section, 'How do volcanoes impact on people and the environment?' (page 137).

Lesson 4

- Read the three case studies, 'Mount St Helens blows its top' (page 138), 'Eyjafjallajökull erupts and disrupts air travel and air freight' (page 138) and 'The Decade Volcanoes and Mount Nyiragongo' (page 139).

Activity 5

- Set Activity 5 for homework. (Make a note to go through the answers with the class in the next lesson, or take in learners' books to mark this activity.)
- This is a small revision type activity based on two of the features.

Activity 6

- This activity is based on the three features.
- It is a class discussion activity that needs your participation. You need to facilitate the discussion and construct or help with the construction of the mind-map on the board. Refer learners to the list of some of the negative effects of volcanoes on page 137 as a reference/ starting point. Ask learners to try to identify some of these effects in the features.

Answers

Activity 1

1. a place of high volcanic activity, not usually at a plate boundary
2. They formed as the Pacific Plate has slowly moved over the hot spot.
3. Nihue
4. Big Island/ Hawaii
5. The Tristan da Cunha group (in the South Atlantic Ocean) and the Maldives (in the Indian Ocean) are some of the probable hot spot islands. (You can point out that the Maldives are not confirmed as a hotspot).
6. No (Learners need to refer to atlases for this.)

Activity 2

1. In the southern Indian Ocean, slightly east of Port Elizabeth, between South Africa and the Antarctic.

2. a) A shield volcano is a large, flat, broad volcano formed from runny lava and effusive eruptions. A cinder cone is a small volcano that spews mostly rock fragments and ash. (Note that Marion Island is a large shield volcano populated with many cinder cones.)
   b) An active volcano is a volcano that has erupted recently (normally within living memory). An extinct volcano is a volcano that no longer erupts.

Activity 3

For this activity, learners make a model of a stratovolcano/ composite volcano. The models, whether simple or fancy, should show:

- a tallish cone with steep sides
- successive layers – in two colours or textures – that represent the layers of lava and ash.

Learners might also embellish their volcanoes with representations of fire and debris to show that they are explosive.

Activity 4

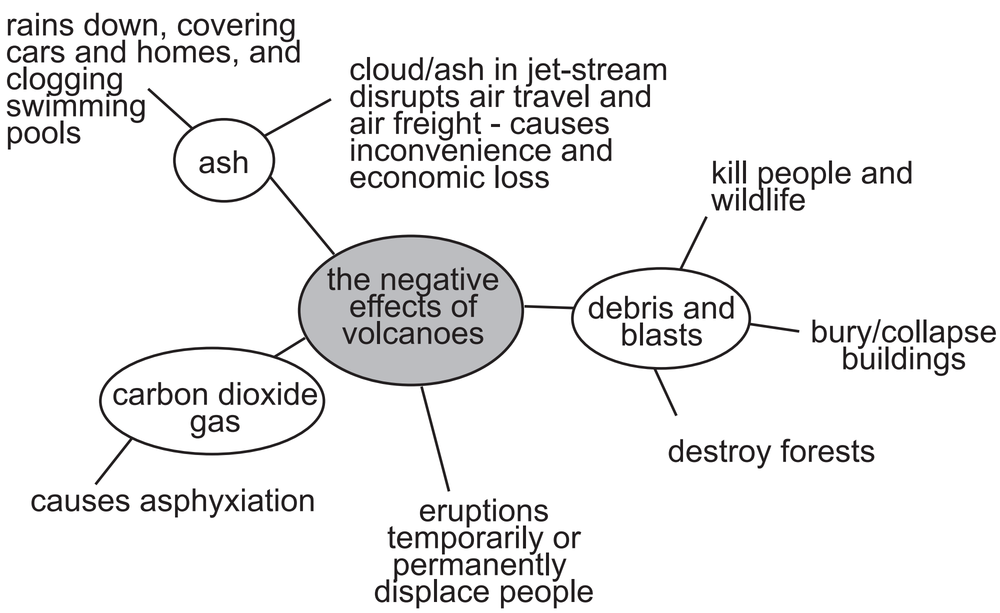
A geyser
B volcanic plug
C caldera
D lava lake

Activity 5

1. a tall, steep volcano (1) formed from successive layers of lava and ash (2)
2. a deep crater-like hollow (1) formed by the collapse or explosion of the top of a volcano (1)
3. a fast-flowing air current (1) in the lower atmosphere (1), usually at the tropopause – the boundary between the troposphere and the stratosphere
4. a scientist/ geologist who studies volcanoes (1)
5. a crater filled with lava (1)
6. the Great African Rift Valley (1)
7. Virunga Mountains (2) [12]

Activity 6

2. An example of a mind-map that shows the negative effects of volcanoes.



Informal assessment

Activity 1

- Go through the answers with the class. Ask learners to offer answers.

Activity 2

- Go through the answers with the class. Ask learners to offer answers.

Activity 3

- Display the models in class so that learners can compare their model with others.
- Comment on some of the best models.
- Use this activity to informally assess learners' model building skills, i.e. their ability to depict or represent something.

Activity 4

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Activity 5

- You can mark this activity according to the mark allocation given in the Answers section. Use this activity to informally assess learners' comprehension skills and to give them feedback on whether they have grasped some of the terms covered in this unit.
- Alternatively, go through the answers with the class. Ask learners to offer answers.

Activity 6

- Informally assess learners' comprehension skills and their ability to identify key or relevant points and to group or structure these points.

Consolidation/extension

Consolidation:

- Let learners complete Worksheet 14 (page 288) in the Resources section of this Teacher's Guide. This is a worthwhile consolidation, revision or summary activity for all learners. It also draws on content from Unit 2 in this module.

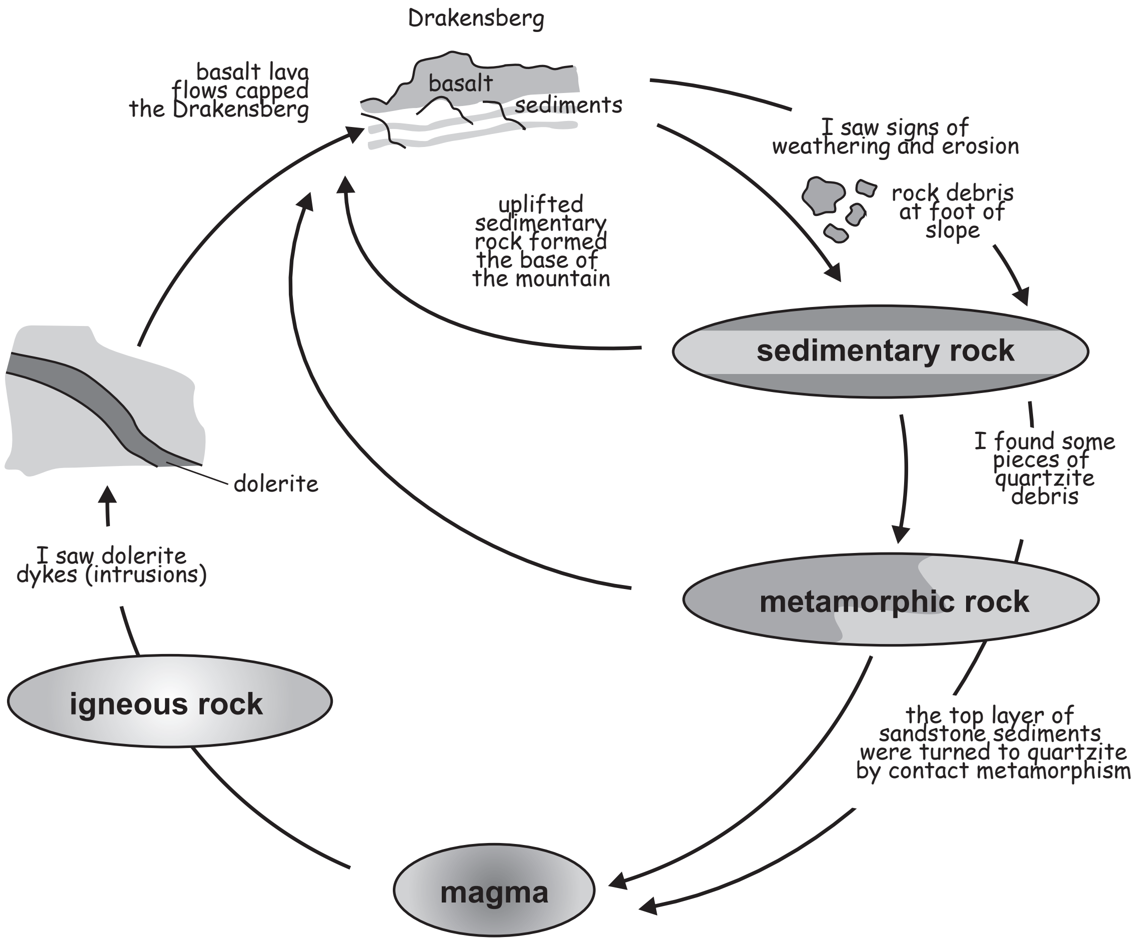
Extension:

- Recommend some of the websites to learners that are listed under the Resources section (page 87 of this Teacher's Guide).
- Suggest that learners also take a look at:
  - the following Wikipedia entry on the Volcanic Seven Summit – the highest volcanic peaks on each of the seven continents: http://en.wikipedia.org/wiki/Volcanic_Seven_Summits
  - this Wikipedia entry on the geography of the Maldives: http://en.wikipedia.org/wiki/Geography_of_the_Maldives
- Suggest that learners look for additional animations or videos of volcanic eruptions on the Internet.
- Recommend the book, *Krakatoa: The Day the World Exploded* to learners who are strong readers. They can look for it at the public library.

Learner's Book page 141	FIELDWORK 1	TERM 2

This fieldwork task is linked to the content of Module 3, Unit 1 and will provide the learners with practical experience of the rock cycle. It would be best to plan the fieldtrip for after the learners have completed Unit 1.

Here is an example of how a learner could present their fieldwork findings on the rock cycle, after a visit to the Drakensberg:



Note: This is a cohesive example that focuses on the Drakensberg. It is just as valid for learners to include evidence of the rock cycle from observations taken in a number of different places.

Learner's Book pages 142–144	Assessment Task 2	Geomorphology TERM 2

For information on how to assess the learners' completed tasks, please see pages 201–203 of this Teacher's Guide.

Term 2
Learner's Book
pages 145–175
Duration: 10 hours

MODULE 4

GEOMORPHOLOGY: GEOGRAPHICAL SKILLS AND TECHNIQUES

Learners need mapwork skills to locate places on maps. They need to understand the various map scales, and which scale shows more area but less detail, or more detail but a smaller area. Geography deals with space, and spatial relationships. With a basic understanding of mapwork skills, learners can 'read' a topographical map. In this module, learners study the 1:50 000 topographical maps. They learn about direction and bearing, how to recognise landforms from contours, and how to draw a simple cross-section of a map.

Maps are brought to life with the use of aerial photographs and orthophotos. Learners will learn to use these photos in combination with the topographic maps. They will also practise using the atlas index again, and learn about the four-digit grid reference to locate features. Map projections are explained, and the reason for the variety of projections is shown, as well as which projection is appropriate to which application.

Curriculum and Assessment Policy Statement (CAPS)

Mapwork skills
- Locating exact position – degrees, minutes and seconds.
- Scale – word, ratio, fraction and line scale.

Topographic maps
- South African 1:50 000 referencing system.
- 1:50 000 maps – conventional signs and symbols.
- Navigating position using compass directions (16 points).
- Direction – true and magnetic bearing.
- Landforms and contours.
- Simple cross-sections.

Aerial photographs and orthophoto maps
- Photographs of landscapes.
- Oblique and vertical aerial photos.
- Orthophoto maps to be used in conjunction with 1:50 000 maps and aerial photos.

Using atlases
- Atlas index – locating physical and constructed features.
- Four-digit grid reference (latitude and longitude, degrees and minutes) to identify and locate features on maps.
- Concept of map projections: examples of equal area and true direction projections – critical evaluation.

Key geographical skills
- Using verbal, quantitative and symbolic data forms such as text, pictures, graphs, tables, diagrams and maps.
- Applying communication, thinking, practical and social skills.

- Practising the following specific skills:
  - identifying questions and issues
  - collecting and structuring information
  - processing, interpreting and evaluating data
  - making decisions and judgements
  - deciding on a point of view
  - suggesting solutions to problems
  - working co-operatively and independently.

Key words/concepts

orthophoto map; topographic map; reference grid; true bearing; true north; magnetic north; magnetic declination; cross-section; aerial; map projection; cylindrical projection; conical projection; azimuthal projection; conformal map; equal area map

Learner's Book
pages 145–149
Duration: 2 hours

UNIT 1 Mapwork skills

TERM 2, WEEK 7

Curriculum and Assessment Policy Statement (CAPS) content

Mapwork skills

- Locating exact position – degrees, minutes and seconds.
- Scale – word, ratio, fraction and line scale.

Resources

- Learner's Book pages 145–149
- Atlases
- Wall maps with different scales (optional)

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- Locate wall maps or maps in the learners' atlases with different scales.

Teaching the unit

Lesson 1

- Read through the introduction to the module on page 145 of the Learner's Book with learners.
- Work through the information, 'How do we locate an exact position on a map? (page 146) with learners.
- You will need to teach this lesson by explaining the concept of co-ordinates, degrees and minutes. Use the steps below to help you.
- Write the co-ordinates for Johannesburg in the introductory paragraph, on the board. Write the co-ordinates to show 'degrees' (°) and to show 'minutes' (´), so that it looks like this: Johannesburg 26°10´S 28°2´E.
- Ask learners what is meant by 'co-ordinates'. Ask them which of the numbers refer to latitude and which to longitude.
- Draw three parallel lines across the board. Draw three lines crossing these at right angles to make a grid. Use the squares on the grid to refer to 1 degree of latitude/longitude.

- Mark the top horizontal line 25 °S, the middle line 26 °S, and the bottom line 27 °S. These are the lines of latitude. Now label the lines running downwards: the first line is 27 °E, followed by 28 °E and 29 °E.
- Each degree of latitude and longitude is divided into 60 minutes. You can quarter each square into four squares with a broken line to signify the difference between the new lines and the existing latitude and longitude lines.
- Each broken line represents 30´. Ask learners how to show where 15´ or 45´ are in each block. Ask them how they would find 10´ or 02´.
- Ask in which of the blocks on the board they would shade in the location of Johannesburg, and why.

Activity 1

- Let learners complete this activity in pairs.
- If you want to make the activity more challenging, give them a time limit on finding each place.
- Go through the answers with the class.

Lesson 2

- If you have maps with different scales, put these up on the board. If not, refer to different maps in the learners' atlases.
- Read through the information in the sections, 'What does scale mean on a map?' (page 147) and 'How is scale represented on a map?' (page 149).
- Teach learners that a large scale is a map on which objects are relatively large, while a small scale means that objects on the maps are relatively small. You can remind them about fractions: $\frac{1}{2}$ is a larger fraction than $\frac{1}{10}$; so too is $\frac{1}{10\,000}$ a larger fraction than $\frac{1}{50\,000}$.
- On the board, explain the four ways in which scale can be represented: in written words; as a ratio; as a fraction; and with a line scale.
- Refer to the scale on the wall maps you have displayed and/ or to different maps in the learners' atlases. Let the learners interpret each of the scales.

Activities 2 and 3

- These are short activities in which learners apply the information in the unit.
- If there is time, allow learners to complete them in class. Otherwise, set them as homework.

Answers

Activity 1

1. Polokwane
2. New York
3. Mumbai
4. Mexico city
5. Rio de Janeiro

Activity 2

1. Africa map has a scale of 1: 40 000 000; Johannesburg map has a scale of 1:250 000.
2. More detail is shown on the 1:250 000 map.
3. The larger the scale, the less detail can be shown; the smaller the scale, the greater the detail that can be shown.

Activity 3

1. c) $\frac{1}{20\ 000}$; b) 1 cm on the map is equal to ½ km in reality; a) $\frac{1}{650\ 000}$
2. a) 1 cm on the map is equal to 650 000 cm on the ground
   b) 1:20 000; 1 cm on the map is equal to 20 000 in reality
   c) 1:50 000; $\frac{1}{50\ 000}$

Informal assessment

Activity 1

- Ask learners for their answers. You can help them by showing how to 'approximate'. This means, find the nearest latitude and longitude lines (normally rounded off in an atlas), and then judge where the exact line is that is wanted.
- Remind them to check in which hemisphere it is in (N, S, E, W).

Activity 2

- Go through the answers with the whole class. By going over the answers, you will help those who are not quite sure of this concept.

Activity 3

- Ask learners to write answers on the board.
- Some learners may also use a line scale. Remember that 1 cm of the line scale will be equal to either (a) 650 000 cm, or (b) 20 000 cm, or (c) 50 000 cm.

Consolidation/extension

Consolidation:

- If learners require further practice with using co-ordinates to locate places on a map (Activity 1), divide them into pairs and ask each pair to find five places on different maps in their atlases and to write down the co-ordinates of these places on a sheet of paper. (They should write down their answers too!) Let each pair give their sheet of paper to another pair of learners who have to find the places listed. This activity can also be used for revision.
- Find towns in South Africa. Write them on the board. Get learners to find the four-grid reference for these, using their atlases.

Extension

- Complete the first consolidation activity, but set time limits for writing down the co-ordinates of places as well as for locating them.

Learner's Book pages 150–163
Duration: 4 hours

UNIT 2 Topographic maps

TERM 2, WEEKS 7–8

Curriculum and Assessment Policy Statement (CAPS) content

Topographic maps

- South African 1:50 000 referencing system.
- 1:50 000 maps – conventional signs and symbols.
- Navigating position using compass directions (16 points).
- Direction – true and magnetic bearing.
- Landforms and contours.
- Simple cross-sections.

Resources

- Learner's Book pages 150–163
- Atlases for consolidation and extension especially in Lesson 4
- A display of signs and symbols used on 1:50 000 maps
- A large protractor and ruler for use on the board for demonstration purposes
- Learners will need their own protractors or Maths sets for the work on direction and bearing.
- Learners may find either graph paper or quad books (the ones with squares often used by Maths teachers) useful for the cross-section activity.
- Topographic maps 1:50 000 from Chief Director of Surveys and Mapping, Mowbray (optional)
- Websites to use (optional)
  - Google 'Maps'. You can use these in colour and in 3D to show how the landforms would look in reality.
  - Websites to use to order maps, or to check what is available, include: www.ngi.gov.co.za, and www.chiefdirectorate:surveys

Preparation

- Read through the unit and familarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- It is a good idea to have a 1:50 000 topographic map of the area in which you live, to put up on the board and refer to. This will be interesting to learners who will recognise features. See the list of Resources above for where to get a map of your area.
- It is a good idea to have a display prepared of the signs and symbols of a 1:50 000 map. You can do this on a large sheet of paper, on an overhead projector, or as a PowerPoint Presentation.

Teaching the unit

Lesson 1

- Display the map of your area or refer to a map in the learners' atlases.
- Read through the introductory paragraph on page 150 with learners.
- On the board, draw a square. Sub-divide it into four squares. (Refer learners to Figures 4.2.1 A and B.) Put the letters, 'A' and 'B' inside the top two squares; below them put the letters 'C' and 'D'. Inside each of the four squares, make another four squares and label them in the same way. You will now have 16 squares.
- Ask a learner to give the latitude of the map you displayed/ selected. Place the latitude on the first line across for your square; the longitude is for the first line down. Ask someone else for the longitude of your map. Alternatively ask for the latitude from Figure 4.2.2. and the longitude.
- Ask a learner to give the two letter reference on your map. (Alternatively use the grid reference from Fig 4.2.2.) The first of the two letters refers to one of the first four squares; the second of the letters is for one of the squares of the second, smaller four squares within the first. Shade this in. This is where the map is. This four-digit grid reference is how the country is sub-divided into smaller areas that are each covered by 1:50 000 maps.

Activity 1

- The purpose of this activity is to familiarise learners with the four-digit grid reference system.
- Let learners complete this activity in class so that you can assist those who have difficulty with these skills and concepts.
- If necessary, allow more able and confident learners to work independently while you work step-by-step through the activity with the other learners.
- Refer to the signs and symbols on pages 152–154 of the Learner's Book and/or to the display you created. Remind learners to refer to these signs and symbols for all 1:50 000 topographical maps.

Activity 2

- Set this activity as homework. It consolidates the material covered thus far in Unit 2.

Lesson 2

- Go through learners' answers to Activity 2.
- On the board, write the heading: Compass direction. Mark the cardinal points: N, S, E, W. Move in a clockwise direction from N; ask the learners for the points between N and E; then between E and S; and complete this. Now go from N clockwise towards NE. Ask learners for the compass direction mid-way between N and NE. Continue this until you have all 16 compass directions.
- Point out that your compass is a circle – it has 360°.
- Read through the section, 'How do we navigate position using compass directions (16 points)?' with learners (page 155).
- Explain Figure 4.2.6 (page 158) on the board. Try a few more examples until you feel that learners have understood the concept.
- Explain that the compass directions only take up 16 points of the 360°. Ask what a possible problem could be for someone needing to more accurately locate a place.
- 'Bearing' is a way of finding direction using all 360°. The angle of declination is usually on the west side of north. A magnetic compass always points to the magnetic north, which is not true north. Show the formula on how to calculate for the declination angle.
- Read through the section, 'How do we measure true and magnetic bearing' (page 158).
- Work through the examples in the text on how to find true bearing and magnetic bearing.
- Make up some more examples of bearing for (a) true bearing, and (b) magnetic bearing. Magnetic declination is generally between 1° and 29° West.

Lesson 3

- Go over how to find true and magnetic bearing with learners.

Activity 3

- Let learners work in pairs to complete this activity.
- Go through the answers with the class. Ask learners to volunteer their answers and provide explanations about how they arrived at them.
- Read through the section, 'How do we interpret landforms and contours?' (pages 159–163). Refer to Figure 4.2.8 (page 160), making sure that learners understand the difference between how these landforms are depicted with contours.

Lesson 4

- Remind learners about how the shape and distance of contour lines depict different landforms. Briefly refer to Figure 4.2.8 again.
- Refer to Figure 4.2.7 to show learners contour lines on a map. Find examples of contour lines on the map on page 161. Ask learners to find the spot heights of these lines. Point out what the 'contour interval' is (this is the difference in height shown in metres between two contour lines). Point out that where the land is steep on the Robberg Peninsula, the contour lines are close together.
- Go through the information on simple cross-sections ensuring that learners understand how a contour map is one view of the land, while a cross-section provides another view. Draw their attention to the spot heights on the contour map, the markings on the piece of paper and the cross-section in Figure 4.2.8.

Activity 4

- Let learners complete steps 1–3 of this activity in pairs and step 4 individually. They can complete it for homework if there is insufficient time in class.

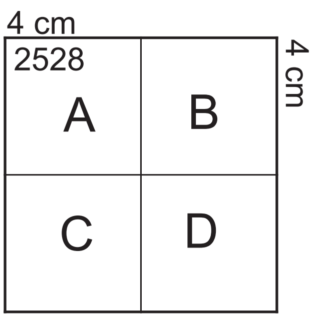
Activity 5

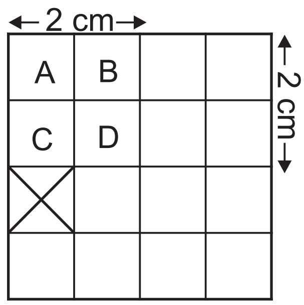
- Do this activity as a class discussion.

Answers

Activity 1

1. latitude: 26˚; longitude: 28˚; A is the big square; second A is inside the previous big 'D' square
2.

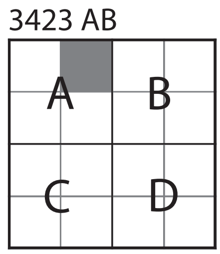




3. 3027DD Rhodes is 30 ˚South; 27 ˚East in South Africa

Activity 2

1. 34 ° and 35 °South
2. 3 °and 24 °East
3.



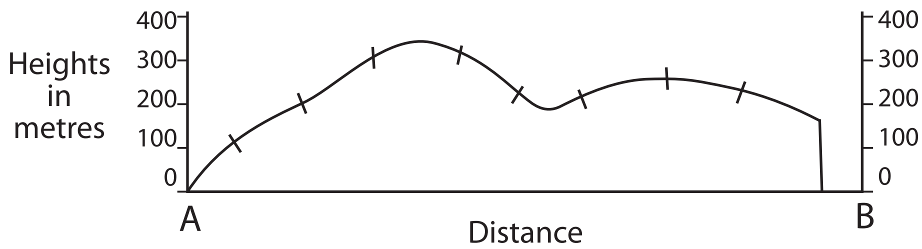
4. 3423AD
5. Approximately 34°25′; 23°45′
6. a) Lighthouse or Marine Beacon
   b) sand banks
   c) trees of a forest or plantation
   d) buildings or settlements
   e) main roads

Activity 3

1. South-south east
2. 150°
3. $150° + 23 = 173°$ (true bearing plus magnetic declination)

Activity 4

1. NW/SE
2. The road runs parallel to the mountain ranges, and along a river valley which makes a natural gap.
3. a) 2
   b) 1
   c) 2
   d) 6
   e) 5
   f) 3
   g) 7
4. a) – g)

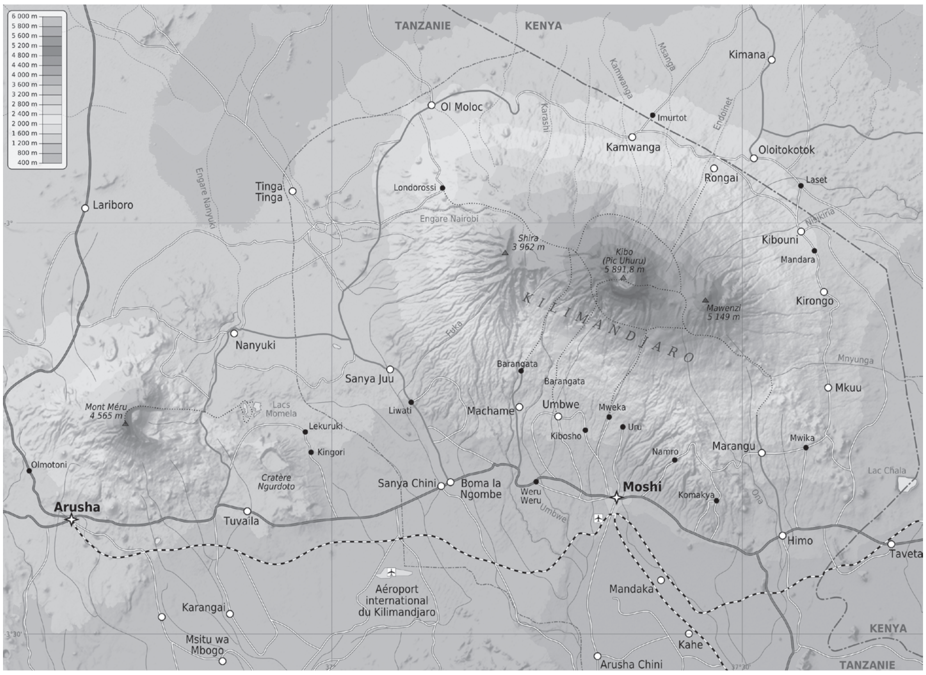


A cross-section

Activity 5

1. and 2.

Figure 4.2.10 Fold mountains, the Great Rift Valley, block mountains



Figuur 4.2.11 Mt Kilimanjaro, a volcano

3. Rift valley is where the line of lakes are found.
4. A volcano is Mt Kilimanjaro.

Informal Assessment

Activity 1

- Go through the activity with the whole class and let learners mark their own work.

Activity 2

- Go through the activity with the whole class explaining how each answer was arrived at. This provides another opportunity for learners to consolidate their understanding.
- Let learners mark their own work.

Activity 3

- Work through this activity with the class.

- If you note that learners have difficulty completing the activity, use the map in Figure 4.2.5 and find other examples for them to answer the same questions on.

Activity 4
- Take in the learners' books to check their cross-section.
- Alternatively, create a memorandum for this cross-section and allow learners to swap books to check.

Activity 5
- Assess learners' ability to identify the features as they participate in the activity.

Consolidation/extension

Consolidation:
- Let learners find other examples of conventional typographic map symbols on the map in Figure 4.2.5.
- Use Worksheet 15 (pages 289–290) in the Resources section of this Teacher's Guide for learners who struggled with the concepts and skills in Unit 2. This worksheet focuses on scale, co-ordinates, direction, magnetic bearing and conventional symbols. It could also be used as a revision activity for the whole class.
- Provide extra examples of cross-sections. Divide learners into mixed-ability groups and give each group a different cross-section to practise with. Use learners who understand this section to be team leaders in the groups to keep everyone on the right track. Allow learners to check their answers by making a memorandum for each of the examples.
- Divide learners into groups. Let them use their atlases and follow the instructions below:
  1. Find a physical map of Africa.
  2. Find the Great Rift Valley. Show the extent of this.
  3. Find the Atlas Mountains and the south-west Cape mountains. These are fold mountains.
  4. Find the dormant volcanoes in Africa (e.g. Mt Cameroon, Mt Ruwenzori, Mt Kenya).

Extension:
- Let learners complete Worksheet 16 (pages 291–293) in the Resources section of this Teacher's Guide. It focuses on contours.
- Let learners use their atlases to locate a physical map of North America and then to find out which of the following features are volcanoes, rift valleys, block mountains or fold mountains: (a) the Rockies; (b) Mt Ranier; (c) Death Valley; (d) Gulf of California; (e) Appalachians.

Learner's Book pages 164–170
Duration: 2 hours

UNIT 3 Aerial photographs and orthophoto maps

TERM 2, WEEK 8

Curriculum and Assessment Policy Statement (CAPS) content
- Photographs of landscapes.
- Oblique and vertical aerial photos.
- Orthophoto maps to be used in conjunction with 1:50 000 maps and aerial photos.

Resources

- Learner's Book pages 164–170
- A drawing of an aeroplane, cut it out; and a matchbox (or any other small box)

Preparation

- Read through the unit and familarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

» Lesson 1

- With the class, read through the introductory paragraph and the information on page 164 on how aerial photographs are taken. It gives some history of the development of aerial photography which you can discuss with learners.
- Use the rough sketch of an aeroplane and attach the matchbox to the underside of it, as if it is the lens of the camera pointed directly down, at 90° to the horizontal. If you tilt the angle of the camera, you can vary what the lens will see. A tilted lens gives an oblique (or angled) photo.
- Read the information on oblique aerial photographs (page 165) with learners.
- Refer them to Figure 4.3.3 A and B. Point out the advantages and limitations of oblique aerial photographs and find examples of these in the photographs in Figure 4.3.3.
- Read the information on vertical aerial photographs (page 166) with learners.
- Refer them to Figure 4.3.4 and discuss the photo in relation to the information that comes before it.
- Refer to Figures 4.3.3 A and B and 4.3.4. Point out how you can tell what time of the day the photo was taken. Ask what they think the best time would be for aerial photos and why. (Answer: Between 10 am and 2 pm because there are the least shadows). Ask them which would be the worst times and why. (Answer: Early morning or late afternoon because of long shadows.) Point out how a vertical aerial photo has the least shadows. Emphasise that shadows are a map interpreter's nightmare because nothing can be seen in the shadow.

» Lesson 2

- Read the information in the section, 'How are orthophoto maps used together with 1:50 000 maps and aerial photos?' (page 167)
- Introduce Figures 4.3.5; 4.3.6 and 4.3.7 as being different mechanisms of capturing visual information of the same location. Ask learners to examine them and to find the similarities and differences.
- Point out the storage dams or reservoirs and mostly seasonal rivers. Point out the river valley which is cultivated. There is a symbol for a monument 'the Livingstone Mission 1843–1846' on the topographic map.

Activity 1

- Let learners complete the activity in pairs.
- Allow some time for discussion of the learners' answers to the questions.

Answers

Activity 1

1. a) They show the same area of land; the mountains and 'gap' or river valley pass can be seen in both; the road can be seen in both; both have contour lines; the settlement can be seen on the eastern side of the gap.
   b) The orthophoto is black and white but the topographic is in colour; the contours on the orthophoto are at 5 m intervals but the topographic map is 20 m intervals; the orthophoto shows more detail of a smaller area but the topographic shows more area in less detail; the orthophoto has a larger scale (1:10 000) but the topographic has a relatively smaller scale (1:50 000).
2. a) orthophoto map scale is 1:10 000; topographic map scale is 1:50 000
   b) orthophoto contour interval is 5 m; topographic is 20 m
3. a) topographic map; b) aerial photo and orthophoto map; c) topographic map; d) orthophoto and aerial photo; e) all three; f) topographic map
4. a) topographic map for large area and symbols
   b) orthophoto for more detail but less area; and aerial photo for understanding surrounding buildings better surrounding buildings better
   c) topographic map for larger area
   d) orthophoto for more detail; aerial photo for understanding surroundings better
   e) need all three maps: topographic for larger area and understanding perspective; orthophoto and aerial photo for understanding impact on immediate surroundings
   f) topographic for large area to choose a suitable site for a farm

Informal assessment

Activity 1

- This is a nice activity to mark with the class because it provides an opportunity for explanation and discussion.
- Point out how the choice of one map over the other has to do with scale, and clarity of information. Something which is community linked, such as a hospital, will need a scale which focuses on a small area, but in great detail. Buying a farm will need an understanding of a much greater area, and less detail is needed.

Consolidation/extension

Extension:

- Find additional features to look for in Figures 4.3.5, 4.3.6 and 4.3.7. If there is data on one that isn't on the other, it may be due to the maps being made at different times. You can discuss with the class which came first in their opinion – the cultivated fields visible on the topographic map, or the vacant flood plain of the orthophoto.
- Direct learners to the origins of orthophotos and aerial photography. They can use the library or computers to access information about the pigeon corps, Robert Goddard and satellites. They can find out how aerial photos were first used for military planning.

Curriculum and Assessment Policy Statement (CAPS) content

Using atlases

- Atlas index – locating physical and constructed features.
- Four-digit grid reference (latitude and longitude, degrees and minutes) to identify and locate features on maps.
- Concept of map projections: examples of equal area and true direction projections – critical evaluation.

Resources

- Learner's Book pages 171–175
- Atlases
- Tennis balls, soccer balls or netballs (optional)
- Paper (optional)
- A globe of the Earth or a ball – to show the difficulty of making maps (optional)

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- For Lesson 2, a good idea is to ask the class to bring in tennis balls, or footballs or netballs.

Teaching the unit

Lesson 1

- Read the introductory paragraph on page 171 with learners.
- Remind them about this tip for remembering whether the longitude or latitude information comes first in a four-digit grid reference: 'a' in latitude comes before 'o' in longitude, therefore the latitude information always comes first.

Activity 1

- Let learners work in pairs or groups to complete the activity.
- If the learners' atlases do not have all of these physical features in the index, use an actual map of Africa in the atlas or a wall map of Africa to find the features. If it has degrees of latitude and longitude, adapt the activity by letting learners create the four-digit code for the features.
- Go through the section, 'How to practise using the four-digit grid reference?' (page 171). After learners have looked at Figure 4.4.1, ask them to interpret the four-digit grid reference. (Answer: latitude is 28 °S and longitude is 30 °E.)

Activity 2

- Let learners complete the activity individually.

- Ask learners to bring a tennis ball, soccer ball or netball to show the concept of a map projection. If possible, have a globe available. This is a good teaching resource.
- Ask learners to place a sheet of paper against the curved surface of their balls. When they do this they will see that only part of the paper has contact with the sphere. This shows the difficulty mapmakers had.
- Read through the introductory information in the section, 'What are map projections?' (page 172) with the learners. Refer to Figures 4.4.2A–C and 4.4.3.
- Use a ball and paper to show how a cylindrical projection would occur. Use the balls for examining how paper can be placed along the 'equator' of the ball. Show what happens to the North and South Poles – the paper doesn't touch the sphere; latitude has to be stretched to accommodate the 'poles'.
- Make a cone hat with the paper (like a lamp-shade). Put this over the 'North Pole' (one end of the ball). Now show that when the focus is on one area of the sphere; other areas get distorted.
- Read through the information on conformal maps in the section, 'True direction projection' (page 174). Figure 4.4.4 shows a Mercator projection which is an example of a conformal map. This is used for accuracy in shape and scale. The North and South Poles are exaggerated in size. Mapmakers loved to use this map projection to show the Empires of Britain, Portugal, Spain, the Netherlands, and France as it made them appear far larger than their colonies!
- Read through the information on 'Equal area maps' (page 174). Figure 4.4.5 shows a Peters projection, which is an example of an equal area map. While the actual comparative area of countries is shown, the shape of the continents is distorted.

Activity 3

- This activity deals with economic geography: the rich North versus the poor South. Encourage learners to think about differences in wealth, in use of resources, in population numbers, in medical and educational infrastructure in the North and the South.
- Use this activity for class discussion or group discussion with a whole class feedback session afterwards.
- Remind learners about the North-South divide and how it originated.
- Remind them about independence for the colonies, which began in 1947.

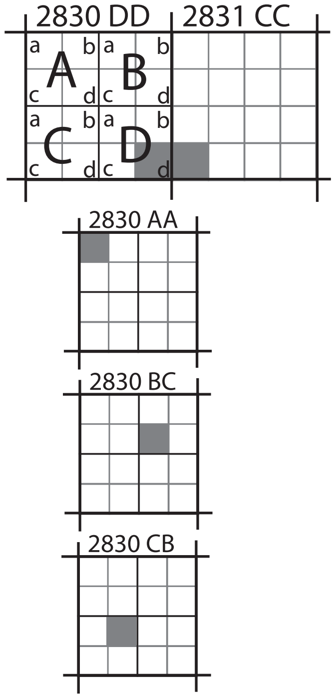
Answers

Activity 1

The answers will depend on the atlas learners have used.

Activity 2

1. – 5.



Activity 3

Examples of answers:

1. If countries in the North look larger than they really are, then it magnifies or exaggerates their importance.
2. The Peters projection shows things as they really are: the former colonies are larger than their 'mother' countries; they could demand support, economic aid, or a measure of representation on international organisations equal to their size. This could give them a potential advantage over their 'mother' countries when it comes to voting in the United Nations, for example.

Informal assessment

Activity 1

- Mark this activity in class by asking learners to share and compare answers.

Activity 2

- Use the chalkboard to draw the 16 squares to fill in the answers. Let learners mark their own work.

Activity 3

- Assess learners' ability to critically evaluate the use of map projections during the course of the group and/or class discussion.

Consolidation/extension

Consolidation:

- Write down the names of capital cities in Africa. Let learners use the index in their atlases to locate the four-digit grid reference. (You may wish to put the learners into mixed-ability groups for this activity so that the stronger learners can guide and assist the others in the group.)
- Refer to Figure 4.4.1 to create more four-digit grid references, for example, 2730AB and 2730BC. Ask learners to create a 16 square block and label the top left corner 2730. They can shade in where AB is and where BC is.

Extension:

- Refer to Figure 4.4.1, and ask learners to find out the answers to these questions: What is the reference for the map to the east of 2730AB? south-east of AB? south-west? south?
- Encourage learners to investigate people involved with map-making. They can use the library or the Internet to research Mercator and Peters.
- Let learners research *The Brandt Report* as well as the United Nation's reason for the adoption of the Peters' projection. Learners can report back to the class.

Learner's Book pages 176–182

REVIEW TERM 2

These activities provide an opportunity for learners to consolidate concepts and skills learnt in Term 2. Learners can complete them in class or as homework. It is suggested that they complete the activities individually as a means of self-assessment.

You can write the answers on the board for the learners and/or call them out where more appropriate. However, if possible, it is suggested that you photocopy the answers and give them to the learners so that they have them for revision purposes.

Activity 1

1. South America, Africa, Antarctic, Australia, India
2. continental drift; the movement of the tectonic plates
3. volcanic activity
4. a) 180 million years old
   b) 250-500 million years old
5. magma is molten rock below the Earth's surface; lava is magma that flows out onto the Earth's surface
6. a) extrusive
   b) dark grey, hard-wearing, fine-grained (any two)
7. a) sedimentary
   b) igneous
   c) igneous
8. a) sandstone
   b) shale
   c) shale
   d) mudstone
9. A – sills; B – dykes

Activity 2

- Learners need to refer to 'What happens when the plates move?' (pages 108–109) and 'Where do volcanoes form?' (page 133).
- Here is an example of a point-form summary:
  Features that form at rift zones:
  - At a rift zone, two plates pull apart, or one plate begins to break into two. The features that form depend on the type of plate.
    - An ocean rift zone produces a mid-ocean ridge – a long undersea mountain range.
    - A continental rift zone produces a rift valley and block mountains.

  Features that form at subduction zones:
  - At a subduction zone, one plate (the lighter plate) is pushed under the other (the heavier plate). The features that form depend on the type of plate:
    - An ocean-to-ocean subduction zone produces arc islands/island arcs.
    - An ocean-to-continent subduction zone produces a deep ocean trench and volcanic mountains along the coast.

Activity 3

1. a crack or break in the rock, caused by movement
2. Folding is caused by blocks of rock or tectonic plates pushing together. Faulting is caused by blocks of rock or tectonic plates pushing together, as well as pulling apart or sliding past each other. When folding rock can bend no more, it cracks – faults.
3. a) A: Rockies
   B: Andes
   C: Cape Fold
   D: Himalayas
   E: Great Dividing Range
   b) A: transform
   B: convergent
   D: convergent
   F: divergent
   c) A: transform
   B: normal – in pairs
   d) A: San Andreas Fault
   B: Great African Rift/East African Rift
   e) block mountains
4. a) Pacific Ring of Fire
   b) An earthquake is a sudden movement in a fault region (that relieves the build-up of strain; in other words, the strain accumulates until something gives). A volcano is an eruption of magma in a rift zone or a subduction zone.
   c) These are examples covered in the features: A: Mount St Helens or Mount Paricutin; F: Mount Nyiragongo or Mount Kilimanjaro

Activity 4

1. 1 cm on the map is equal to 50 000 cm in reality.
2. huts
3. Sample answer: the huts are mostly below the road facing east for the Sun, close to the river, on the less steep contour lines, below 400 m, above and away from the flood plain of the Tugela River.
4. Use the reference for help in identifying features from the map.
5. It is the road running to Stanger and Vryheid
6. Approximately 23 cm. Calculations: $\frac{23}{1} \times \frac{1}{2} = 11{,}5$ km.
7. 484 m; 464 m
8. SSE
9. 174°
10. $174^\circ + 14^\circ 7' = 188^\circ 7'$

Activity 5

1. a) degrees
   b) minutes
2. a) Johannesburg
   b) Polokwane
   c) Nelspruit

Activity 6

1. both show features; both have a scale; both have contour lines; both show spot heights
2. orthophoto is black and white; scale is 1:10 000; contour interval is 5 m; topographic map is colour; scale is 1:50 000; contour interval is 20 m
3. orthophoto shows actual features; shows shadows; shows trees or hedges; while topographic map must use symbols to represent features
4. (b)
5. between 10 am and 2 pm so that the shadows cast by objects are very small
6. long shadows hide features; we can't tell what is there
7. The shadows will fall to the west of an object if it is taken in the morning; the shadows fall to the east of an object if taken in the afternoon.

Term 3
Learner's Book
pages 184–235
Duration: 26 hours

MODULE 5

POPULATION: GEOGRAPHICAL KNOWLEDGE

Population distribution and density explains where people live in the world and the reasons why they live in either dense or sparsely populated settlements. In this module, demographic terms such as, population, birth rate, death rate, life expectancy, fertility rate and natural increase, are defined and unpacked, and the factors that affect them are explained. Learners study ways of interpreting and analysing population statistics, such as the population pyramid, which shows population structure.

The historical changes in the size of the world's population are shown graphically, and the model for studying changes in a population – the demographic transition model – is presented to help learners understand the demography of countries of the world. This model helps us view the standard of living or stage of economic development of a country and provides a projected forecast for what the countries, continents and the world will look like in the future.

Overpopulation does not mean too many people in one place, but rather too few available resources for the number of people in the area. The concern over the increase in the world's population and our interventionist approach to managing population growth has much to do with our over-utilisation and unsustainable use of available resources.

Throughout history people have moved from one place to another – either voluntarily or forcibly. This module reviews some of the causes and effects of various forms of migration, especially the stereotypical fears attached to migrants.

Diseases affecting the population, such as malaria, TB, HIV and AIDS all have a social and economic effect on a population. These diseases sap the wealth and capacity of a nation, and lead to a drop in productivity, dysfunctional family units, and a reduced life span for its inhabitants. The impact of HIV and AIDS, particularly in southern Africa, is studied.

Curriculum and Assessment Policy Statement (CAPS)

Population distribution and density
- Meaning of population distribution and population density.
- World population density and distribution.
- Factors that affect distribution and density of the world's population.

Population structure
- Population indicators – birth rates, death rates, life expectancy, fertility rate, natural increase.
- Factors that influence population indicators.
- Population structure – age, gender represented as population pyramids.

Population growth

- World population growth over time.
- Demographic transition model.
- Concept of overpopulation.
- Managing population growth.

Population movements (includes the use of case studies)

- Kinds of population movement – international migration, emigration, immigration, regional migration, rural-urban migration, urbanisation, voluntary and forced migration.
- Causes and effects of population movements.
- Temporary and permanent movements – migrant labour, economic migrants, political migrants and refugees.
- Attitudes to migrants.

HIV and AIDS

- HIV infection rates in southern Africa.
- Social and economic effects of HIV and AIDS using specific examples from the southern African region.
- The impact of HIV and AIDS on population structure.

Key geographical skills

- Using verbal, quantitative and symbolic data forms such as text, pictures, graph tables, diagrams and maps.
- Practising field observation and mapping, interviewing people, interpreting sources, working with statistics.
- Applying communication, thinking, practical and social skills.
- Practising the following specific skills:
  - Identifying questions and issues
  - Collecting and structuring information
  - Processing, interpreting and evaluating data
  - Making decisions and judgements
  - Deciding on a point of view
  - Suggesting solutions to problems
  - Working co-operatively and independently.

Key words/concepts

population distribution; ecumene area; abiotic, biotic; non-ecumene area; population density; population indicators; birth rate; death rate; zero population growth; life expectancy; fertility rate; natural increase or decrease in population; dependency ratio; carrying capacity; demographic transition model; negative growth rate; sub-replacement fertility stage; overpopulation; migrants; emigration; regional migration; rural-urban migration; depopulated; urbanisation; megacity; voluntary migration; forced migration; counter-urbanism/ suburbanism; temporary migrants; permanent migrants; migrant labour; economic migrants; political migrants; refugees; asylum seekers

UNIT 1 Population distribution and density

Curriculum and Assessment Policy Statement (CAPS) content

Population distribution and density

- Meaning of population distribution and population density.
- World population density and distribution.
- Factors that affect distribution and density of the world's population.

Resources

- Learner's book pages 184–190
- Atlases/maps of the world and Africa
- Calculator
- Useful websites (optional)
  - www.worldpopulation.wikipedia
  - www.worldpopulationdistribution.un

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

Lesson 1

- Read through the module introduction (page 184) with learners. Focus on the key questions that this module addresses. Remind learners that they can use these questions to do quick self-assessments of their understanding and skills as they proceed through the module.
- Read the unit introduction and the information on population distribution on page 185 with learners.
- Write two headings on the board: ecumene and non-ecumene. Explain the meanings of the words to the class. Ask the class for factors which they think would encourage learners to live in an area. Write them on the board.
- Ask the class which of the points on the board are biotic, and which are abiotic.
- Read through the 'Ecumene and non-ecumene areas' in the Learner's Book (pages 185-187). Add factors to your list on the board that the class missed out.
- Refer to Figure 5.1.1 on world distribution of people.
- Use the atlases to work co-operatively at locating the countries with the least distribution of people, and those with most.

Activity 1

- You can choose to do this as a whole class activity. This will encourage discussion about the suitability of using one dot to represent 100 000 people.
- Learners may need the atlases in order to complete question 4.

Lesson 2

- Read the introduction on population density (page 187) with the class.
- Let learners check the figures on population density of the world that are in the introduction as practice in working with figures.
- Discuss Figure 5.1.2. This map uses shading to represent numbers of people. Its problem is that it shades in an entire country to represent density. For example, in Egypt, it shows 75–99 people per km.The area alongside the Nile will have a much higher density, and there will be a much lower density to the south and west of the country, away from the coast and the river. This results in a broad 'generalisation', because exact, precise information is not given.

Activity 2

- Let learners complete this activity in pairs.
- The activity looks at ways of representing information. Try to encourage learners to think of the most fitting way to show this on a map.

Activity 3

- Remind learners what 1 billion is, and what 1 million is. They may need help in framing the formula: $\frac{150\ 000\ 000}{1} \times \frac{60}{100} \div \frac{680\ 000\ 000}{1}$
- Let learners complete this activity individually.

Lesson 3

- Read through the section, 'Population density in Africa' (page 188) with learners.
- Ask the class why the European population density approximately 500 years ago was so much higher than that of Africa. Put their answers on the board. Some of these may be: Europe had a temperate climate; Europe had perennial rivers and adequate rain; European cultivation of crops was easier; In Europe transport routes used rivers; natural vegetation in Europe was easier to keep under control and use; urban settlements developed in Europe more quickly because of access to transport routes.
- Refer to Figure 5.1.3 to find where most people live in Africa.
- Use atlases and pair/group work to help learners identify areas of sparse population density, and those areas more densely populated. The atlases have information about climatic regions and natural vegetation, and show rivers and physical features that either attract people or make settlement difficult.

Activity 4

- Learners will need atlases to identify the countries in West Africa.
- Let them work in pairs or individually to complete this activity.

Lesson 4

- Read through the section, 'Population distribution and density in South Africa' (page 189) with learners.
- Figure 5.1.4 refers to the density of people in South Africa. Let learners study this graph and ask them questions to help them interpret it. For example: Which province has the highest population? (Answer: Gauteng) Can you think of a reason/s for this? (Answer: Many people go to

Gauteng to look for work. It is a business centre and consists largely of urbanised areas that have higher concentrations of people.)

- Ask learners to work together to use an atlas to study the provinces of South Africa, climatic and natural vegetation regions, and physical relief. Explain and show that they can find natural resources in an atlas, which explain why people settle in an area. They can also find communication networks, which explain transport and settlement patterns.
- Read through the section, 'Why are people scattered unequally over the Earth?' (page 190) to summarise what you have discovered with the class. As you do this, refer to the maps in the Learner's Books and in the atlas.
- If you have enough time, return to the key questions for the unit on page 185 and suggest that learners work in pairs to answer the questions.

Answers

Activity 1

1. One dot represents 100 000 people
2. No. Between 1 and 99 999 people would not be represented. This gives a picture of no one being in the un-dotted areas, which is not true. It is inaccurate.
3. use gradations of shading across the continent without breaking for political borders of countries
4. a) flat land; abundant water; good transport access
   b) plentiful water; alluvial, fertile soil; river transport
   c) plentiful water; monsoon rains; perennial rivers; flat plains; river transport

Activity 2

1. both use a reference or key; both show the entire world; both deal with population numbers
2. Figure 5.1.1 does not show political borders, but Figure 5.1.2 does; Figure 5.1.1 uses dots to represent people, but Figure 5.1.2 uses shading per country; Figure 5.1.1 shows population distribution, but Figure 5.1.2 shows population density.
3. The shading used is the same gradation for an entire country; it does change from country to country dependent on population density.
4. A difficulty is in choosing parameters and shading that are most appropriate to representing the population density in the world.

Activity 3

1. 6,8 billion divided by $\frac{60}{100} \times 150$ million km^2 $= 75{,}56$ people per km^2

Activity 4

1. desert conditions: the Sahara in north Africa; the Namib in south-west Africa; factors include lack of water; high temperatures
2. Nigeria, Togo, Ghana, Cote d'Ivoire, Liberia, Sierra Leone, Guinea, Cameroon, Central African Republic, Gabon, Republic of the Congo
3. This type of map is inaccurate: one shade for a whole country cannot show the density of people living in one region of the country. The map shows Egypt with the area alongside the Nile densely populated; the remainder of Egypt is sparsely populated because of desert conditions. One colour does not reflect this.
4. it is useful because it gives a broad, general picture of which countries have a certain population density; it is not useful because it represents the country falsely (because the density is not uniform but in patches)

Informal assessment

Activity 1

- Use the class discussion to assess whether learners have understood how population distribution is represented on maps as well as reasons for the patterns of distribution.

Activity 2

- Go through the answers to the questions and let learners mark a partner's book.
- Alternatively, provide an overhead with the answer memorandum on it, or ask learners for their answers and write them on the board.

Activity 3

- Complete the sum on the board and ask learners to mark their own work.

Activity 4

- Mark this in class by asking learners for their answers and writing the correct points on the board. Allow learners to mark their own work.
- This will encourage discussion and consolidate of the work.

Consolidation/extension

Consolidation

- Encourage learners to figure out which countries are the ecumene areas of the world and which countries are not, by accessing information in the atlases.
- For learners who need extra practice with population distribution and density let them complete Worksheet 17 (pages 294–298) in the Resources section of this Teacher's Guide. This worksheet can also be used for revision purposes.

Extension

- Learners can use the websites on population distribution and density and on ecumene areas of the world, to learn more about the factors which affect distribution and density.

Learner's Book
pages 191–200
Duration: 4 hours

UNIT 2 Population structure

TERM 3, WEEK 2

Curriculum and Assessment Policy Statement (CAPS) content

Population structure

- Population indicators – birth rates, death rates, life expectancy, fertility rate, natural increase.
- Factors that influence population indicators.
- Population structure – age, gender represented as population pyramids.

Resources

- Learner's Book, pages 191–200
- Atlases

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

Lesson 1

- Read through the introduction to the unit (page 191) and the information in the sections, 'What are population indicators?' and 'Birth and death rates' (pages 191–192) with the class.
- The birth and death rate formulae need to be understood and the concepts studied.
- Clarify the concept of 'Zero population growth' (page 192) by reading this section carefully with the class, and encouraging discussion as to why Austria, Germany and Poland had a near zero population growth rate. Possible reasons include: high standards of living; later marriages; fewer children born in a marriage; migration of younger people for economic opportunities elsewhere.
- Refer to the vertical and the horizontal bar graphs in Activities 1 and 2. You may need to remind learners of the two axes: the vertical 'y' and the horizontal 'x' axis, and the way in which the information is shown.

Activity 1

- Let learners work with a partner or on their own to complete this activity.

Activity 2

- Use whole class discussion to complete this activity.
- Let learners work in pairs for (1). They will need to use their atlases to find the countries mentioned in Figures 5.2.4 and 5.2.5.
- You can use this activity to discuss the reasons for high birth rates and show a relationship to position of the countries and reasons for this.

- Discuss the concept of life expectancy and ask learners which factors may affect this. Ask learners which age groups are most likely to be affected by: (a) heart disease; (b) war; (c) contaminated water and infections; (d) HIV/AIDS, and discuss reasons for this. Reasons include: (a) gender and lifestyle for 30–50 year old men; (b) 16–50 year olds because they are physically active and risk-takers; (c) the elderly and very young who do not have good immunity; (d) breast-fed babies or the sexually active population who are receptive to the disease.
- Read the information in the section, 'Life expectancy' (pages 193–195) and 'Fertility rate' (page 195) and study the map and the table with learners.

Activity 3

- Complete this activity as a class discussion.
- Refer to Figure 5.2.7 and let learners answer (1) and (2).
- In (3) learners discuss reasons why the trend was falling in the average number of births per women in South Africa between 1960 and 2008. You need to point show that it is access to education that will cause a fertility trend to decline, and that it is access to sanitation that will indicate a higher standard of living, which is also a reason for a drop in the fertility rate. Increased levels of education also yield later marriages and increased family planning.

Lesson 2

- Read through the information in the section, 'Natural increase in population' (page 195) with learners. Remind the class about the population indicators and ask learners to suggest factors which influence population indicators. Write these on the board to encourage discussion.
- Read through 'What factors influence population indicators?' (page 196) with learners and add to your list on the board, if necessary.

Activity 4

- Use the atlases or a world map to refer to Afghanistan. Ask the class if they can think of topical items to do with Afghanistan. They may mention the opium trade; the American and British troops presently there; the Taliban; the Russians who had invaded prior to the Taliban's presence.
- You can use this activity to establish the relationship between life expectancy, infant mortality and lack of sanitation, no clean water, insecurity, danger, and war, as well as the fact that war brings disturbance to the secure standards that existed: education may be disrupted; there may be new rules and regulations; any of which may impact on women's status and access to control over their lives and bodies.
- Let learners read the case study on Afghanistan on their own and then complete the activity individually (page 197).

Lesson 3

- Read through the information in the section, 'Why is it important to find out about the age and gender of a population?' (pages 197-198) and 'The dependency ratio' (page 198) with the class.
- Discuss the importance of the dependency ratio with learners. The economically active people must use their taxes to build up and maintain the infrastructure of the country, or increase it on behalf of the elderly and the young. If there is a small economically active population, then the elderly and young will suffer because of a lack of investment in their welfare.

Activity 5

- This activity shows the relationship between wealth and a low dependency ratio, and developing countries where there is still a high dependency ratio.
- Learners should use an atlas to identify continents and countries where the dependency ratio is high or low.
- Let learners complete the activity in pairs.
- Refer to figure 5.2.10. Use atlases and work co-operatively to name the countries with a small age dependency ratio and those with high ratios. Ask the class if they notice a relationship between the wealthy North and the less developed South, and dependency ratios. They may see that rich countries have a low dependency ratio; poorer countries have a high dependency ratio.

Lesson 4

- In this lesson learners explore population pyramids. The chief areas of focus will be age, gender and numbers or percentages of the population.
- Read through the information in the section, 'What information can population pyramids provide?' (page 199) with the class.

- Refer to Figures 5.2.11–5.2.13. Point out the male and female population representation on the left and right side of the central axis; the age groups; the histogram or horizontal bars that represent population numbers either in millions or thousands or as a percentage.

Activity 6

- Let learner complete (1) to (3) with a partner and then (4) on their own.

Answers

Activity 1

1. The birth rate is fairly even, dropping gradually from 2003 to 2007 until 2008 when there is a slight increase, and again, a gradual decline until 2010.
2. The death rate is uneven: it rises between 2003 and 2004; then it is stable until 2006 when it rises until 2007. It falls steeply in 2008, but slowly rises after 2008 until 2010.

Activity 2

2. All except Afghanistan are in west or central Africa.
3.

	Birth rate	Death rate
1	Urbanisation	HIV/AIDS
2	Good sanitation	Droughts
3	Good climate	Tropical jungle
4		Deserts
5		Swamps
6		Malaria
7		Harsh climate
8		Conflict
9		Poor sanitation

4. apart from Sierra Leone, they are all in southern Africa
5. People have a higher standard of living close to the coast; they are exposed to European standards in education and lifestyle, later marriages, and access to doctors and clinics is easier.
6. the populations would begin to fall in number

Activity 3

1. 1960–2008
2. The trend is for the fertility rate to decrease or decline or fall.
3. All of them can account for the fall in fertility rate.

Activity 4

1. war; oppression of women; insecurity; lack of education
2. In war, urban areas are first taken captive. This can affect access to both sanitation and clean water; bombardment of settlements means that it is unsafe to go to where there is clean water; fighting and bombardments can destroy pipes and access to sanitation and water.
3. Lack of contraceptives and education would mean more babies born to younger females and older females where this could be injurious to their health and the baby's health. This would cause a decrease in life expectancy and a higher infant mortality.

Activity 5

1. they cover the area of the developed countries of the world where the dependency ratio is low
2. the dependency ratio is generally high
3. in Central America and some of the South American countries
4. Iraq and Afghanistan have been involved in conflict; people are inaccessible; there has been no census of the population; records have been destroyed
5. A high dependency ratio means a large group who do not work, and who are dependent on those who do. They can be both young or old or both. In poor countries, people don't often live to ages over 65, so the economically dependent group is largely the younger group.
6. Cultural reasons for having large families – to work in the fields and to look after you in your old age – account for the high dependency ratios; lack of access to clinics and contraceptives maintain a high birth rate.

Activity 6

1. all have histograms showing male and female population, age groups and numbers of the population
2. a) the ages between 0 and 14 have decreased since 1990
   b) the ages between 15 and 64 declined from 1990 to 2000, but increased slightly in 2010
   c) over the age of 65 has increased slowly since 1990
3. In 1990 the female graph decreased evenly from a large number of young females, to a small number of older females. In 2000, there were more females over 80 years than between 75 and 79, then the decline is even until the age group of 10–14 years. Below 14 years there is a steep drop in the numbers of females; in 2010, the ages 75 and over are almost the same. There is an increase which is even until 30–34 years, when there is a steep growth between the ages of 15–29 years. There is a sharp drop in numbers from 15 years down to 0.
4. A suggested answer is: The demographic trend in the South African population pyramids for the years 1990 to 2010 has been for a drop in the number of births, and an increase in the economically active and older people.

Informal assessment

Activity 1

- Go through the answers to the questions and let learners mark a partner's book.
- Alternatively you can provide a memo on an overhead, or ask learners for their answers and write these on the board.

Activity 2

- Use the class discussion to assess whether learners have understood what birth and death rates are and what information can be derived from studying them.

Activity 3

- Use the class discussion to assess whether learners have understood what the fertility rate is and what factors influence it.

Activity 4

- Go through the answers to the questions and let learners mark their own work. Encourage debate.

Activity 5

- Work with the whole class and encourage learners to give their answers to develop a discussion about the role of standards of living, and security in establishing favourable dependency ratios.

Activity 6

- Take in the learners' books and mark the activity yourself.
- Assess the learners' ability to interpret population pyramids as well as how well they communicate their findings.

Consolidation/extension

Consolidation:

- Let learners work with percentage changes in the population figures using the population pyramids for South Africa.
- Let learners find the world life expectancy patterns for southern African countries and contrast these with the top ten countries in the world, by using the website: www.ciaworldfactbook.

Extension:

- Learners can research various diseases including malnutrition, malaria, TB, HIV/AIDS to see what is being done in Africa to combat them. They can then report back to the class.
- Learners can research areas of conflict in Africa and make a presentation to the class on the effect this has on the populations.

Learner's Book pages 201–213
Duration: 6 hours

UNIT 3 Population growth

TERM 3, WEEK 3–4

Curriculum and Assessment Policy Statement (CAPS) content

Population growth

- World population growth over time.
- Demographic transition model.
- Concept of overpopulation.
- Managing population growth.

Resources

- Learner's Book pages 201–213
- Atlases

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

Lesson 1

- Read through the introductory paragraph (page 201) with the class.
- Refer to Table 5.3.1 which indicates the pace at which the world population reached each billion milestone. Ask learners why they think the table shows that the world's population increased so rapidly between 1927 and 1960. (Answer: This is the longest period between figures so the average annual rate of increase was 30 303. Between 1974 and 1987, the average annual rate of increase was 76 923.)
- Read through the information in the section, 'How do we explain the huge population growth since the 1800s?' (pages 201–202) with the class.

Activity 1

- Figure 5.3.1 is an unusual look at the world and its countries, based on the size of the population.
- Let learners use an atlas to find the countries mentioned here, and their geographical size, for comparison.

Activity 2

- Let learners complete this activity in pairs and then feedback their answers to the rest of the class.

Lesson 2

Activity 3

- Use the lesson to allow learners to complete Activity 3.
- Let them work in pairs but each learner should record their answers in their own books.
- You can begin by doing 1 (a) and (b) on the board, and plotting one or two of the numbers in the table in Figure 5.3.2 to set them off correctly.

- Complete the lesson by reading the paragraph and studying the graph on page 204 (Figure 5.3.3) with learners.
- At the end of the paragraph learners are asked to think of possible reasons for the decline. Let them share their ideas. (Answer: In the 1980s in SA the deaths numbered approximately 25% of all births. This has increased. It is now forecast that by 2021 the deaths will be approximately 90% of all births. There are two reasons for this: the deaths caused by HIV/AIDS; the lower fertility rate amongst women. The lowered fertility rate is due to education and contraception.)

Lesson 3

- Read through the information in the section, 'What does the demographic transition model explain or describe?' (pages 204–205) with the class. Also refer to Figure 5.3.4. If you can draw this on the board you will find it useful to shade in areas and refer to them to point out a period with an increasing population.
- Read the paragraph on page 205 to learners. Relate the population pyramids in Figure 5.3.5 to the stages of the demographic transition model in Figure 5.3.4.

- Use use the flow chart on page 206 to spell out the characteristics of each stage of the demographic transition model. Encourage learners to try to synchronise all three ways of portraying a similar thing: changes in a population caused over time by increases in standards of living in a country.

Activity 4

- This exercise ties the stages in the demographic transition model to population pyramid recognition and the flow chart model. All three say the same thing but use a different visual model to do so.
- Let learners complete the activity individually and allow time for feedback at the end of the lesson. If there is insufficient time, mark the activity with learners at the beginning of the next lesson.

Lesson 4

- Read the information on overpopulation on pages 208–209 with learners.
- Make sure that learners understand that overpopulation means that a country is in a position where over-consumption of resources makes it dependent on others for survival.
- You can use an atlas to look at the resources in the world; and look at the North-South divide. Show the relationship between the wealthy North dependent on the South for raw materials; and the South dependent on the North for final products.
- Investigate where the countries in Table 5.3.3 are in the world, and find out how they rate in terms of wealth and economic development. (Answer: Countries belonging to the developed North are economically developed; those belonging to the developing South are neither wealthy nor rank high with regard to economic development.)
- Instruct learners to read the paragraph at the top of page 210 and then the cartoon in Figure 5.3.11.
- With learners, discuss what problem the cartoon shows. The point it makes is that the rich North, with 20% of the world's population, consumes 80% of the world's resources; while the poorer nations, with 80% of the population, only use 20% of the world's resources.

Activity 5

- Let learners complete this activity individually in class or at home. Remind them to draw on the class discussion about the cartoon.

Lesson 5

- Read through the information in the section, 'How can population growth be managed?' (page 211) with the class.
- Refer to the posters in Figure 5.3.12 A and B which show the happiness and wealth or prosperity that comes with having only one child in a family.
- Read through the case study on India and Kenya. Refer to and discuss the posters with learners. Figure 5.3.13A shows problems that come with having a large family, and contrasts this with Poster B, which shows the happiness and prosperity associated with a small family. Figures 5.3.14A shows an educated man being allowed in to his place of work while the uneducated people are kept out at the gate; B shows what is important for Kenya: family planning to enable a family to feed, clothe and educate their children.

Activity 6

- Let learners complete the activity individually and write responses to the questions.
- Allow some time at the end of the lesson or at the beginning of the next lesson for learners to share and mark their responses.

Lesson 6

- Read through the information in the section, 'Approaches to managing population growth' (page 213) with the class.
- Discuss these approaches with the class by asking learners to comment on how effective they think these measures might be and what some of the pitfalls/drawbacks might be.
- Use the rest of the lesson to recap and summarise the chief factors to take into account in reasons for population growth over time, the demographic transition model and the concept of overpopulation.
- For further consolidation, return to the key questions for the unit (page 201) and ask learners to work in pairs to answer them.

Answers

Activity 1

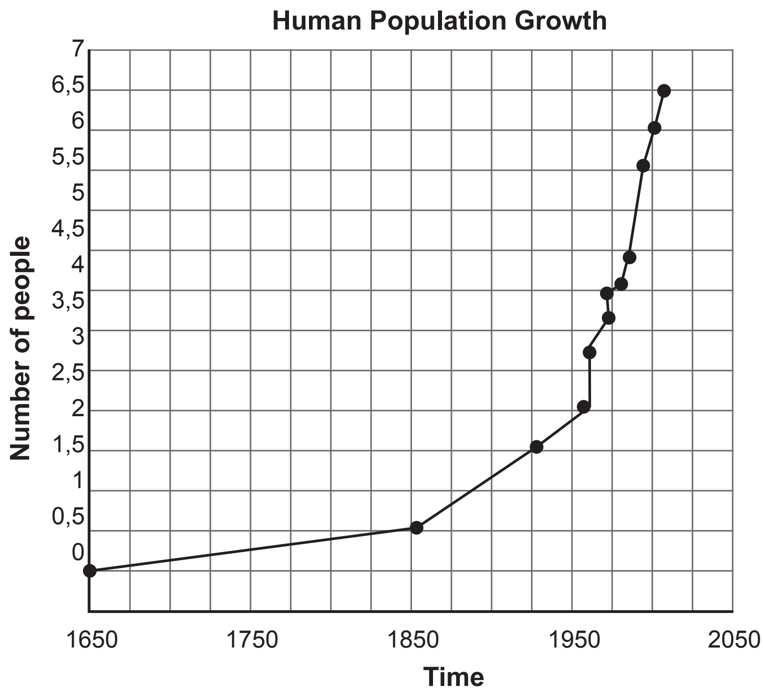
1. it is based on population size, not spatial size
2. it makes a visual impact; we can immediately see similarities in population sizes and compare this with the size of the country. Great Britain is so much smaller geographically than South Africa, but larger with regard to population.
3. Distress is first found in the lesser-developed countries amongst the poor, because of lack of resources to cope with diseases.

Activity 2

1. Asia and Europe
2. Asia is rapidly expanding economically, while Europe is regarded as a developed area with a high standard of living.
3. North and South America and Oceania have the most stable population growth.
4. All of these can be applied to explain a decline in population growth in various countries. (A decline in population growth can be caused by positive advances for women, which makes them set back the time of having babies, and then they have fewer. If the death rate is stable, and the birth rate drops below the number needed to replace those that die, then there is a shrinking of the population. If the number of births is less than the number of deaths and less than the replacement number needed to maintain or expand the population, the population would decline in growth. This would apply to economically developed countries. However, a decline in population growth can also be due to negative factors such as conflict, famine and diseases like cholera, which cause a high death rate.)
5. Level of health and access to clinics, sanitation and clean water, absence of disease. (It is mostly the positive factors that have led to less infant deaths and less deaths amongst the older population, meaning that population has expanded.)

Activity 3

1.



2. It is a very gradual increase in the population line graph. Before 1800, the population growth was slow: From 0,5 billion people in 1650 to 0,7 billion a hundred years later and up to 1 billion by 1850.
3. The population line graph rises rapidly. After 1800, the growth accelerated from 1 billion in 1850 to 2 billion by 1925. In the next 26 years the population increased by 0,5 billion people, and in the following 10 years, it increased by 0,8 billion to 3,3 billion by 1966. By 1976 it had increased 0,7 billion to reach 4 billion people. It took from 1976 to 1980 to notch up another 0,4 billion people.
4. The graph is likely to show a rise in population which should eventually begin to stabilize into a gentler line of increase.
5. A suggested answer may be: Afghanistan and Bosnia have endured wars recently; their population growth is either zero or close to zero as a result.
6. Malthus did not predict the way in which inventions, discoveries, adaptations, high-rise buildings, mariculture, hybrid seeds, and new uses for existing products, would enable the Earth to support an ever-increasing population.

Activity 4

1. a) Nigeria = Stage 1 – expanding
   b) South Africa = Stage 2 – expanding
   c) Italy = Stage 4 – contracting
2. a) This is a steep concave pyramid. Birth and death rates are high and balance each other so population growth has not taken off. Children are needed as workers which explains the high birth rates; high death rates are due to lack of access to education, sanitation and medicine.
   b) This is a fairly even pyramid due to birth rates not having fallen yet, but death rates beginning to fall as a result of improvements in sanitation, education and access to medical treatment, as well as access to food.

c) Birth rates have decreased, resulting in negative growth rate, while death rates are low or stable.

Activity 5

1. A suggested answer is: The cartoon shows a rich representative from the developed countries and a poor person from the developing countries. The argument given by the wealthy nations is that family planning and population control must happen in the poor nations because the world's resources cannot continue to support the growing numbers of people. The reply from the poor person is that the wealthy 20% of the world's population over-consume the world's available resources (80%) . It is not a problem of overpopulation but of over-consumption.
2. Yes. It is an historic colonial tradition of using resources from colonies for the wealth of the 'mother' country.

Activity 6

1. They both show a mother and father with one child. The cock represents wealth and prosperity in Poster B. In A and B, the toys and access to the country for recreation show prosperity.
2. They seem equal in their impact. A shows the problems of a large family; B shows prosperity and peace with a small family.
3. B shows the positive spin-off from a smaller family: clothing, shoes and walking happily to school; while a poor, large family struggles without shoes and clothing.
4. Figure 5.3.13A shows the negative effects of a large family; Figure 5.3.14A shows that a lack of education prevents access to a good job (man in a suit means money!), while B contrasts a small family with a large family; the small family illustrates prosperity and happiness.
5. possibly Figure 5.3.14A as it is more difficult to see the immediate effect of a small family with that of a happy man in a suit being let in to his place of work
6. Parents might want girl children more and so focus on this, thus reducing the number of boys.

Informal assessment

Activity 1

- You can mark this in class by asking learners for their answers. These answers are open-ended, which means you will get various answers.
- You could write the answers given by learners on the board and discuss any interesting opinions.

Activity 2

- Go through the answers to the questions and let learners mark their own work.

Activity 3

- You will need to ensure that their graphs are an accurate representation of what is asked. You can do this by taking in the learner's books or allowing the learners to mark their own work as you complete the graph on the board and go through the other answers.

Activity 4

- Go through the answers to the questions and let the learners mark a partner's book.

Activity 5

- Use the class discussion to assess whether learners have understood the North-South imbalance in consumption of the world's resources.
- Also take in their books and assess how well they have been able to communicate their view in writing. Look for opinions that are supported by facts or information. Provide feedback to learners on how well they did this.

Activity 6

- You will find different responses as these questions are open-ended and encourage learners to express their own opinions.
- Ask a few learners to read their responses to each question to the class. Encourage discussion.
- If a response is clearly not on track, discuss the reasons why with the class.

Consolidation/extension

Consolidation

- Ask learners to summarise the demographic transition model, the population pyramid stages of transition diagrams, and the flow chart until they feel they understand these.

Extension

- Ask learners to comment on the different ways in which information is shown in Module 3 – tables, maps, 3-D compound line graphs, pie-graphs, population pyramid diagrams, cartoons and posters. Ask them to think of other ways to display the information, or to assess the visual impact of the methods used.

Learner's Book
pages 214–229
Duration: 8 hours

UNIT 4 Population movements

TERM 3, WEEKS 4–6

Curriculum and Assessment Policy Statement (CAPS) content

Population movements

- Kinds of population movement – international migration, emigration, immigration, regional migration, rural-urban migration, urbanisation, voluntary and forced migration.
- Causes and effects of population movements.
- Temporary and permanent movements – migrant labour, economic migrants, political migrants and refugees.
- Attitudes to migrants.

Resources

- Learner's Book pages 214–229
- Atlases
- Websites (optional)
  - www.migration.org.za; www.unhcr.org

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

Lesson 1

- Go through the key questions for the unit with learners. Use them to find out what learners may already know about the content of this unit.
- Read through the introduction to the unit (page 214) and the information in the section, 'What are the different types of migration?' and 'International migration' (page 215) with the class.

Activity 1

- Let learners work in pairs and use their atlases to locate the five countries.
- Complete the rest of the activity with the whole class.
- Ask volunteers to name the continents.
- Draw the table on the board and let learners provide the information to complete it (see 3).
- Let learners copy the table into their books.

Lesson 2

- Read the information on emigration and immigration (page 216) with learners.
- Let learners use an atlas and work in pairs to locate the countries in Table 5.4.2.

Activity 2

- If learners are unsure of how to find a percentage increase (see question 3), explain that you subtract the first smaller figure from the second larger figure; place the answer over the first figure and multiply by 100 over 1 to get the percentage.
- Ask learners to imagine what factors would make them decide to immigrate to South Africa. Write these on the board. You can then look at them as push and pull factors.
- Table 5.4.3 provides a summary of push and pull factors. Check the class's responses against those in the table.

Activity 3

- Let learners complete this activity as a homework task.

Lesson 3

- Go through learners' answers to Activity 3.
- Explain that regional migration occurs on all continents. Ask learners to think of a reason for regional migration in South Africa in the 1800s. (Answer: The rush to Kimberley first in 1868, and to Johannesburg in 1886 in response to the discovery of diamonds and gold.)
- Read through the information in the section, 'Regional migration' (page 218) with the class.
- Figure 5.4.3 shows the effect of migration into Pilbara, Australia, in 2001. Ask learners what they notice about the newcomers in terms of age and gender. (Answer: There are more males and most of the migrants are between the ages of 20 and 54. These are the risk-takers and the economically active.)
- Read through the information in the section, 'Rural-urban migration' with the class.

Activity 4

- Refer to Figure 5.4.4 to see where urban development really took off. Point out that the horizontal axis has a time scale that changes in terms of years.
- Let learners work in pairs to complete the activity.
- Allow time at the end of the lesson to go though the answers with learners.
- It is an open-ended question that encourages discussion and a variety of answers. For example, in Question 3, all of the options can contribute to urban increase. Try to find out from learners why or in what way each has contributed to urban increase. Ask if they can classify the possible answers as pull or push factors.

Lesson 4

- Begin the lesson by summarising the main points about rural-urban migration.

Activity 5

- Let learners complete the activity in pairs.
- Allow time for learners to share and discuss their answers with the rest of the class.

- Read through the information in the section, 'What is the rate of urbanisation in different areas of the world?' (page 221) and 'The development of megacities' (page 222) with the class.
- In *Time* magazine (2 May 2011) it is explained that, 'nine of the ten urban areas experiencing the highest GDP growth from 2007 to 2025 are in China, and of the top 25 growth cities, 21 are in the developing world... urbanization is lifting more people out of poverty than any movement in history'.
- Refer to Tables 5.4.4 and 5.4.5 to study the rate of urbanisation around the world and the world's largest cities. Ask learners to find the places mentioned in their atlases.
- Encourage discussion about megacities: Many large industries move their business from the developed to the developing cities where labour is cheaper; this in turn encourages more people from rural areas to come into the cities for jobs.

Activity 6

- Point out to the learners that questions 1–5 have specific answers that are either right or wrong and that questions 6–7 are open-ended. Encourage learners to give reasons for their answers.
- Let learners work on the activity individually and complete it for homework, if necessary.

Activity 7

- Let learners complete this activity for homework.

Lesson 5

- Go through answers to Activities 6 and 7 with learners.
- Read the information on voluntary and forced migration (page 223) with learners. In particular, read through the reasons in Table 5.4.6 that explain these movements.
- Go through the flow chart of global migration (page 224) with learners.

- Ask learners for their thoughts on the effects of migration, and put their ideas on the board under the headings, 'positive' and 'negative' effects.
- Table 5.4.7 summarises the positive and negative effects of migration. Look at it with learners and add anything omitted from your lists on the board.
- Read the feature, 'Urban problems' with the learners. Let them examine the photographs and suggest which urban problems are shown in each. (Answers: (A) South African informal settlement; (B) Factory emissions – pollution; (C) Favelas or informal settlements – Rio de Janeiro; (D) Overcrowding, car pollution.)

Lesson 6

- Read the information on why people migrate and the case study on page 226 with learners.
- You have already discussed with learners why they might migrate to Australia. Point out that in this section you will be covering some of that material again.
- Read the information on economic migrants and the case study on page 227 with learners.
- The case study, 'The United Kingdom and immigrants' highlights the reaction of the British public to immigrants. Discuss the public's views in light of the facts provided. In the light of this, ask learners why they think that the British public holds these views.

Activity 8

- Let learners complete questions 1 and 2 individually.
- Go through their answers and have a short discussion on question 3. Draw a mind-map on the board to capture the learners' suggestions.

Lesson 7

- Ask the class what they think a political migrant is. Also ask whether they think political migrants are different to economic migrants, and if so, how they are different. Encourage discussion.
- Introduce the words 'voluntary' and 'forced' to describe these two types of migrations.
- Read the information on political migrants on page 228.

Activity 9

- Refer to Table 5.4.8 and the five countries with their refugee numbers.
- Let learners work in pairs to locate the places in their atlases.
- Complete question 2 orally with the class.

Activity 10

- Most of these questions are open-ended and so the activity would work best as a small group or class discussion. However, if there is insufficient time, learners can complete the activity as a written assignment for homework.

Lesson 8

- If learners completed Activity 10 for homework, allow some time at the beginning of the lesson to go through their answers.

- Ask learners to list their emotions and feelings concerning refugees and migrants in South Africa. Write their responses on the board and use this as a basis for discussion about the complex responses we sometimes have to people entering our country.
- Refer to Figure 5.4.9 to underline their feelings.
- Discuss xenophobia, which is a global problem. It means a fear or dislike of foreigners. In South Africa, during the years of struggle against apartheid, the countries of Africa took in South African refugees and gave them asylum. It seems however that we have not been able to show the same welcome that our citizens received.

Activity 11

- Let learners answer the questions in pairs and then discuss the questions with the class as a whole.
- Use the activity to encourage discussion about the reasons for xenophobia and the results of xenophobia. Make the point that xenophobia goes against the spirit of the Constitution of South Africa.
- If there is time at the end of the lesson, return to the key questions for the unit (page 214) and ask learners to work in pairs to answer the questions. This provides an opportunity for consolidation.

Answers

Activity 1

2. Afghanistan, Iraq and Burma are in the Middle East and Asia; Somalia and the DRC are in Africa.
3.

	Source of Refugees	Reasons for moving
1	Afghanistan	Invasion
2	Iraq	Invasion
3	Somalia	Civil war; famine
4	DRC	Civil war; famine
5	Burma	Political unrest

Activity 2

1. There was an overall decrease in the numbers of immigrants to Southern Africa between 1990 and 2000.
2. Botswana; Lesotho; Namibia; South Africa; Swaziland.
3. (a) Swaziland; and (b) Namibia
4. (a) South Africa; and (b) South Africa
5. Namibia
6. Experience; skills; cultural richness; languages; positive attitude; entrepreneurship; courage.

Activity 3

1. Hong Kong
2. USA
3. The USA has so many people, that immigrants represent a smaller percentage than those in Hong Kong, where with a smaller number of people the immigrants form a higher percentage
4. Immigrants come in to these countries seeking employment opportunities.

Activity 4

1. it is a steeply rising trend
2. approximately 2004
3. famine; the building of the first shopping malls; commercial farming; industry; jobs; suburban rapid transport systems
4. lack of mechanisation meant more hands were needed on the farms; people supported themselves on farms; commercial farming had not yet taken over from subsistence farming
5. the urban line will increase and the rural will drop; the world global trend will be towards urbanisation

Activity 5

1. 'Push' factors: lack of land, poor agricultural land; 'pull' factors: repeal of discriminatory laws, job opportunities, and government initiatives such as the Urban Renewal Programme.
2. The removal of the Group Areas Act in 1991 allowed people to live where they chose or could afford.
3. 1820 population was 15; in 1854 it was 55 000; in 1899 it was 1 698 575. (Some learners may give the numeric differences in the photos, while others may show what has changed visually with more urban structures developing. Both descriptions are correct.)
4. it was a myth that there was instant wealth; people had to get jobs but may not have had the necessary qualifications; this would have reduced them to poorly paid jobs, if any, and living conditions that were poor and unsanitary
5. By 1990 in the USA nearly 75% of the population were urbanised; in China in 1986 only 37% were urbanised. The USA had freedom of movement whereas the Chinese were subjected to political restrictions on the movement of people. (Point out to learners the differences between America with its free-market economy and China with a command economy: Americans are free to respond to the urban movement and seek jobs where they want to; the Chinese are told where to go, for how long, and in what job capacity.)
6. A common thread was the freedom from restrictions to follow opportunities.

Activity 6

1. Europe, Northern America and Oceania; Africa, Asia and Latin America and the Caribbean belong to the South
2. South
3. Africa
4. Asia
5. Oceania
6. Possible answers may include: Africa lagged behind because of difficulties in communication and a hostile climate and vegetation; trade routes and domestication of animals and sufficient food allowed urban life to develop in Europe, Northern America and Oceania.
7. People want to return to the quiet of rural living or suburban living; computers make working from home a possibility.

Activity 7

1. Tokyo is similar; New York, Mexico City, Delhi, Sao Paulo, Mumbai are different
2. New York is extensive as it has many boroughs or suburbs extending across from Manhattan. It is a huge port on a river that extends into the centre of America for trade; it is the commercial capital; it houses international organisations. Few other cities in the world attract this type of representation.
3. Developing countries are expanding and developing their industries; this provides work opportunities for people formerly in rural areas.

Activity 8

1. Qualities may include: entrepreneurship; industriousness; energy; courage; risk-taking.
2. a) construction worker – migrant labourer
   b) electrician – economic migrant
   c) au pair help – migrant labourer
   d) technician – economic migrant
   e) nurse – economic migrant
   f) restaurant staff – migrant labour
   g) fruit-packer – migrant labour
   h) draughtsman – economic migrant
   i) stevedore – migrant labour
   j) radiologist – economic migrant
3. Possible answers may include: jealousy; anger; xenophobia; threats; unkindness; hatred; conflict; hostility; discrimination

Activity 9

2. Four of the countries are in Africa.

Activity 10

1. Possible answers may include: apprehensive; fearful; anxious; nervous
2. Possible answers may include: forced because no one would choose to flee under those circumstances; or voluntary because no one is sending them out but they are choosing a different country with more opportunities
3. two, but seven in the whole picture
4. men are risk-takers; men earn money and send it back home; women have to look after families
5. Possible answers may include: yes, because our people had refugee status in African countries during the years of the struggle; yes, because we are economically developed and offer job opportunities; no, because the way we have treated the refugees with xenophobic attacks is not acceptable.
6. South Africa offers economic strengths which some of the surrounding southern African countries do not have. (Point out that South Africa is a leading nation in Africa, particularly in southern Africa, and offers stability, an excellent Bill of Rights and Constitution, and job opportunities which makes it attractive to refugees and asylum seekers.)

Activity 11

1. Example: The reference to 'brother' and 'sister' emphasises how we are all connected, like a family. This poster is to make people aware that migrants belong here as much as South African citizens do.
2. Possible answers may include: jealousy; fear for their jobs; fear of foreigners getting housing before the local people do

Informal assessment

Activity 1

- Use the atlas work to identify learners that need some assistance with their atlas and map-reading skills.
- Use the learners' contributions in the rest of the activity to assess whether they are able to identify and understand the reasons that refugees move.

Activity 2

- Go through the answers to the questions with the class and let learners mark their own work.

Activity 3

- Go through the answers to the questions with the class and let learners mark a partner's book.

Activity 4

- Use the class discussion after the activity to assess whether learners have been able to interpret the statistics and can differentiate between push and pull factors.

Activity 5

- Mark this in class by asking learners for their answers and encouraging discussion of these answers. Allow learners to mark their own work.

Activity 6

- Go through the answers to questions 1–5 with the class and let learners mark their own work.
- Take in the learners' books and mark questions 6 and 7 assessing whether they have understood the patterns of urbanisation.

Activity 7

- Go through the answers with the class and let learners mark their own work.

Activity 8

- Let learners share their answers to questions 1 and 2 with the class and let them mark their own work.
- Use the class discussion to assess whether learners have understood the problems facing migrant workers.

Activity 9

- Use the atlas work to identify learners that need assistance with their atlas and map-reading skills.

Activity 10

- If you used group or class discussion in the activity, use learners' contributions to assess whether they understand the issues around political migration.
- If learners complete the activity as homework, allow some of them to share their answers with the class but take in the learners' books and mark their work to assess whether they understand the issues around political migration.

Activity 11

- Use learners' contributions to the class discussion to assess whether they understand some of the issues around xenophobia.

Consolidation/extension

Consolidation

- Ask learners to make a list of the various categories of migration. They can find an example for each kind and list whether it is voluntary or forced migration.
- Learners can write a paragraph on their experiences as: (a) a refugee in a strange land; (b) emigrating from South Africa; or (c) the experiences of being a migrant worker in Europe.

Extension

- Learners can research some of the major migrations in history and make a presentation to the class. This can be either an oral, or a PowerPoint Presentation, or a number of posters to show the story of an historic migration of people.

Learner's Book
pages 230–235
Duration: 4 hours

UNIT 5 HIV and AIDS

TERM 3, WEEKS 6–7

Curriculum and Assessment Policy Statement (CAPS) content

HIV and AIDS

- HIV infection rates in southern Africa.
- Social and economic effects of HIV and AIDS using specific examples from the southern African region.
- The impact of HIV and AIDS on population structure.

Resources

- Learner's Book pages 230–235
- Calculator
- Atlases
- Websites (optional)
  - www.avert.org/safricastats.htm
  - www.unaids.org
  - www.aid.org.za

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- Copy Table 5.5.1 on the board before the lesson.

Teaching the unit

Lesson 1

- Read through the introduction (page 230) and the information on the HIV infection rate in South Africa (page 230) with the class. Point out that HIV has spread rapidly from its identification in 1983 to the position the world is in now.

- Allow learners to share what they know about HIV and AIDS. Challenge any prejudices and/or misconceptions that they may have but be respectful of what the learners share.

Activity 1

- Use atlases to locate the southern African countries in Table 5.5.1.
- For question 1, you may need to remind them how to calculate percentages: Divide the number of people with HIV/AIDS in a country by the total population; then multiply the answer by 100 to get the percentage.
- Let learners complete the activity individually.

Lesson 2

- Go through learners' answers to Activity 1. Encourage discussion of questions 4 and 5 and make sure that they give reasons for their answers.
- With learners, brainstorm the social and economic effects of HIV and AIDS. Capture the learners' ideas on a mind-map on the board.
- Refer to Table 5.5.2. Add any of these ideas to your mind-map, if necessary.
- Divide learners into groups. Let them discuss each of the social and economic effects and decide which effects they consider the most important. Encourage them to give reasons for their answers.
- Allow the groups to share their views and reasoning with the rest of the class.

Lesson 3

- Read through the South African (pages 231–232) and Zimbabwean (page 233) case studies with learners.
- Ask the class to summarise the chief points from the case studies. Write the points on the board and discuss their effect on the social and economic life of South Africa and Zimbabwe.

Activity 2

- Let learners complete the activity in pairs but they should record their answers in their own books.
- Allow some time for learners to share their responses.
- Ask the class for solutions to the problems they identified in case studies and summarised on the board. Put these in a separate column on the board.

Lesson 4

- Read the information on the impact of HIV and AIDS on the population structure (pages 233–235) with the class.
- Use the population pyramids to show the position of HIV/AIDS amongst seven southern African countries in 2000, and the estimate in 2025, which shows a decline.
- Be positive in affirming the role of medication in controlling the effects of HIV and AIDS and preventing HIV Transmission from Mother-To-Child.

Activity 3

- Let learners complete questions 1–3 with a partner and question 4 on their own.
- Go through learners' answers to questions 1–3 with them asking volunteers to explain their answers to the rest of the class.
- Complete questions 5 and 6 with the whole class using discussion.

Answers

Activity 1

1–3

	Country	% of total population	Ranking: % of population living with HIV and AIDS
1	Angola	15,63%	Botswana
2	Botswana	16,8%	Angola
3	Lesotho	13,8%	Swaziland
4	Malawi	6,01%	Lesotho
5	Mozambique	6,11%	South Africa
6	Namibia	8,18%	Zimbabwe
7	South Africa	11,35%	Namibia
8	Swaziland	15%	Zambia
9	Zambia	7,59%	Mozambique
10	Zimbabwe	9,63%	Malawi

4. If we know the rate of infection, we can work out how many people in a year will become infected with HIV/AIDS. This can help with planning for medication such as anti-retrovirals, as well as hospitals, clinics and orphanages needed to cope with the epidemic.
5. The disease could place great demands on the social infrastructure that looks after the welfare of the country. The economically-active may be ill so there is no tax to go towards welfare and jobs don't get done.

Activity 2

1. If women between the ages of 20–40 become ill, they are unable to maintain their jobs; they cannot look after their families; they may infect their babies through breast-feeding; also through blood transmission. A family without a mother puts strain on the older daughter or son to look after the family.
2. A possible answer may include: businesses recruit and train three times the number of people for one job, because of illness and the death rate; absenteeism means reduced productivity or output; money is spent on health care and benefits for sick employees.
3. the economy will be less productive; it will slow down; fewer firms will create jobs because of the cost of maintaining a workforce; this means less money in circulation in the economy; it will cause poverty

Activity 3

1. 30–34
2. 25–29
3. females
4. A possible answer may include: There will be a decline in the fertility rate of the country; infants will die if the disease is transmitted through birth or feeding; the economically-active are most affected.
5. during birth; in bodily fluids; through breast-feeding
6. Possible ideas may be: (a) medication; cleanliness with regard to bodily fluids, especially blood; the use of condoms; (b) use of gloves; supply of anti-retrovirals; education about safe sex; access to condoms; (c) posters and information highlighting the problem; access to condoms in toilet facilities; education of travellers; warnings and advice to tourists;

(d) posters advising how to prevent transmission of the disease; education as to cleanliness; use of gloves; condoms; safe sex; abstinence; (e) education; posters; gloves available in case of a cut; cover cuts or open wounds with plasters; availability of condoms; (f) education about transmission of the disease; advice on safe sex; abstinence; availability of condoms; use of gloves; covering of open wounds

Informal assessment

Activity 1

- Go through the learners' answers to the activity. Draw the table on the board before the lesson starts and then complete it using the learners' responses.
- Use this to assess the learners' understanding of the challenge of HIV and AIDS in southern Africa, as well as their ability to work with statistical data.

Activity 2

- Use learners' answers and their contribution to the discussions to assess whether they are able to identify points relevant to a topic and whether they understand the tremendous impact that HIV and AIDS have had on society and the economies of countries.

Activity 3

- Take in the learners' books and mark questions 1–4. Assess learners' ability to interpret information and to use it to comment on the impact of HIV and AIDS.

Consolidation/extension

Consolidation

- Let learners summarise the social and economic effects of HIV/AIDS and list as many solutions to the problems as they can find.

Extension

- Learners can access websites and research the different African countries' efforts to deal with HIV/AIDS. A presentation can be made to the class either as an oral, or in poster form, or as a PowerPoint.
- Let learners complete Worksheet 18 (pages 297–298) in the Resources section of this Teacher's Guide. It draws on all the concepts in Module 5 and focuses on interpreting population data.

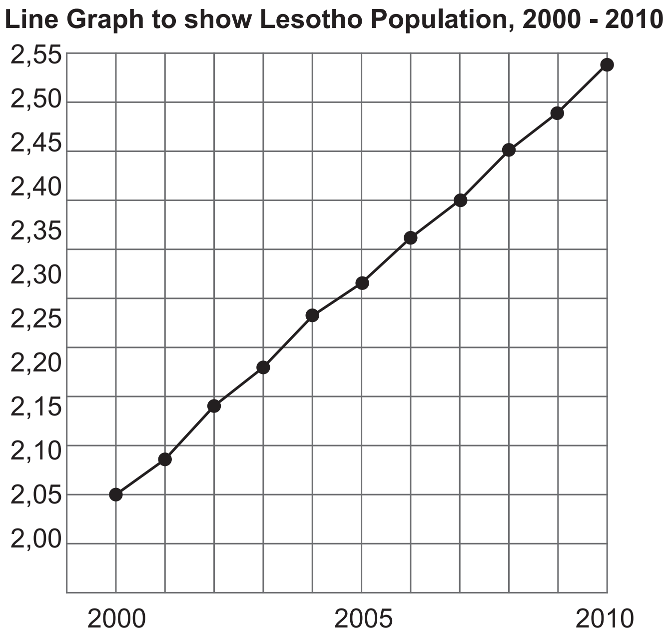
Learner's Book page 236

FIELDWORK 2 — TERM 3

This fieldwork task is linked to the content of Module 5 and will provide learners with practical experience of graph drawing. Allow learners to complete the graph in pairs and display them in the classroom once they have finished. Their graphs should look something like the one on the next page:

- Provide written feedback to learners on how well they achieved the aims of the activity

Answers



x	*y*
2,10	2000
2,14	2001
2,19	2002
2,23	2003
2,28	2004
2,32	2005
2,36	2006
2,40	2007
2,45	2008
2,49	2009
2,54	2010

The line graph indicates that the population of Lesotho is gradually increasing over time.

Term 3
Learner's Book
pages 237–247
Duration: 4 hours

MODULE 6
POPULATION: GEOGRAPHICAL SKILLS AND TECHNIQUES

Population geography is an area of great interest to everyone as it makes us increasingly aware of our environment and the demands made on it for ever-more resources. We are now able to collect and analyse data about population very quickly through the use of Geographical Information Systems (GIS) which has been available in South Africa since the 1990s. This information is used by municipalities for traffic analysis, cabling, sewerage and to obtain and maintain accurate records for schools, clinics and electoral use.

Unlike the GIS, an atlas contains information in print which is static and does not have the same real-time value as GIS data which can be instantly updated on a computer. However, we learn from atlases how to compare information and read maps with understanding.

The interpretation of graphs, population pyramids, photographic information and models is a skill. Part of this skill is the ability to be aware of and recognise bias or the manipulation of information which is presented as facts in the form of text, graphs or symbols.

Curriculum and Assessment Policy Statement (CAPS)

Geographical Information Systems (GIS)
- Satellite images related to topics about population.

Atlas skills
- Map reading – comparing information from different maps.
- Interpreting graphs, population pyramids, photographs, models.

Key geographical skills
- Using verbal, quantitative and symbolic data forms such as text, pictures, graphs tables, diagrams and maps.
- Practising mapping, interviewing people, interpreting sources, working with statistics.
- Applying communication, thinking, practical and social skills.
- Practising the following specific skills:
  - Identifying questions and issues
  - Collecting and structuring information
  - Processing, interpreting and evaluating data
  - Making decisions and judgements
  - Deciding on a point of view
  - Suggesting solutions to problems
  - Working co-operatively and independently.

Key words/concepts
point of origin; Total Fertility Rate; Gross Reproduction Rate; Net Production Rate

UNIT 1 Geographical Information Systems (GIS)

Curriculum and Assessment Policy Statement (CAPS) content

Geographical Information Systems

- Satellite images related to topics about population.

Resources

- Learner's Book pages 238–240
- Websites (optional)
  - www.planetgis.co.za
  - www.ngi.gov.za
  - www.nationsonline.org
  - www.maplandia.com
  - www.maps.google.co.za
  - www.populationpyramid.net
  - www.census.gov

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

Lesson 1

- Remind learners what they learnt about GIS in Module 2. Refer them back to this module in the Learner's Book.
- Read the key questions with learners and then read the unit introduction and the information on page 237.
- Write the words Raster, Vector and pixel on the board. Ask the class what the words mean.
- Refer to the diagrams in Figure 6.1.1 to indicate the difference in presentation of a Raster and Vector model. Ask learners to identify the similarities and differences between A and B. (Answer: The Vector model uses different numbering to indicate population distribution. It shows more discrete areas of population using lines or vectors. The Raster model uses pixels, is less discrete and uses shading to show large numbers of people. Both cover the same area and show population distribution.)
- Refer to Figure 6.1.2 and let learners compare these models in the same way.
- Let learners work in pairs to create a mind-map in their books that summarises the uses of GIS and the advantages and disadvantages of the Raster and Vector models. They should consult the information in Module 6 Unit 1 and Module 2 Unit 1.

Activity 1

- Learners can work individually to complete questions 1 and 2 and then go through the answers with the class.
- Spend some time discussing questions 3 and 4 with the whole class. Write learners' ideas on the board.
- Let learners complete questions 3 and 4 in their books, using the information you wrote on the board.

Answers

Activity 1

1. Raster model: uses more people in each population group; is built in layers of groups upon other groups; is able to pin-point exact areas of greater population density; shows information more precisely; shows more information because of higher numbers; uses pixels. Vector model: uses fewer people in each population grouping; it is less precise because large areas are shaded in; uses rectangles and blocks; shows less information because of lower numbers in its groups; uses an 'either-or' approach to shading in population.
2. Vector model: lines, nodes, less differentiation; Raster model: pixels, more differentiation
3. GIS can be used in the following ways to classify, store or create layers of information in:
   a) An urban area: for population distribution; population density; traffic routing; cable routing
   b) A rural area: for soil types; for natural vegetation types; for communication routes; for forestry
   c) A provincial area: for population distribution; population density; electoral and census information; access to clinics and schools
   d) A national area; for population distribution; population density; economic wealth; electricity supply; telecommunications
   e) A continental area: resources; vegetation types; rainfall; temperature; population language groups
   f) A global area: population distribution and density; trade routes; electrical consumption; CO_2 output.
4. GIS is important because: it has changed our way of storing information; speeded up our retrieval of information; aided the integration of different types of information; helped us to create maps which are relevant to the issues at hand, the moment they are required.

Informal assessment

Activity 1

- This can be completed and marked in class using a mixture of independent and co-operative methods.
- Write the answers to questions 1 and 2 on the board for consolidation and discussion. Encourage learners to give additional answers until you feel that you have a good sample of correct answers.
- For questions 3 and 4, let learners swap books and mark each other's work, comparing it with what you have written on the board during the discussion.

Consolidation/extension

Consolidation

- Encourage learners who find the activity difficult, to go back to Module 2 and read through that before re-doing the activity.

Extension

- Encourage learners to spend some time looking at how GIS is used. Let them access the websites www.planetgis.co.za and www. ngi.gov.za. The latter is the portal for the department of surveys and mapping, and deals with all geo-spatial information.

Learner's Book
pages 241–247
Duration: 2 hours

UNIT 2 Using atlases

TERM 3, WEEKS 8–9

Curriculum and Assessment Policy Statement (CAPS) content

Atlas skills

- Map-reading – comparing information from different maps.
- Interpreting graphs, population pyramids, photographs, models.

Resources

- Learner's Book pages 241–247
- Calculator (optional)
- Glass of water

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

Lesson 1

- Read the unit introduction on page 241 with learners.

Activity 1

- You may wish to answer these questions based on the satellite interpretation as a quick question-and-answer session with learners. Alternatively, you can let learners work individually and write the answers in their books.
- Encourage learners to look at the colour of the imagery: the deeper blue signifies greater depth in the ocean off Cape Town. In New York, it is more difficult to distinguish between the darker blue and lighter colour in the water of the Hudson River. The lighter colour would refer to sandbanks and shallow water.
- Comment on the areas of greenery in New York and Cape Town. To the west of the Hudson River in New York is New Jersey which has more open spaces and greenery. This is because land is comparatively less expensive and can be conserved as open parkland.

- Read through the information in the section, 'Interpreting graphs' (page 244) with the class. The interpretation of graphs is something that learners do in most subjects and so will have had practice.
- You will need to explain the three concepts of TFR, GRR and NRR to remind the learners of work done in Module 5.

Activity 2

- This activity focuses on reading, understanding and analysing graphs: the axes, the type of graph, the variables used, and the trend of the information.
- Let learners complete questions 1–6 on their own; questions 7 and 8 require more focus and discussion.
- Use class discussion to complete this part of the activity.
- Remind learners that they learnt about negative population growth and government interventions and incentives offered to boost population figures, in Module 5. Also point out that war causes disruption to normal life, and so there is often an increase in births after a war as people commit to returning 'normality' again.

Lesson 2

- Read through the information on the manipulation of data (pages 245–246) with the class and discuss the examples.
- Manipulation of data is an important concept. Have a glass of water which is half filled. Ask the class if it is half full or half empty, and the effect on morale of choosing one description over the other. Explain how truth can be distorted, and why in history we use many sources rather than rely on one source to interpret events.

Activity 3

- The activity practices reading and analysing statistical information from a table.
- Remind learners of the time intervals used. Point out that much of this data is not reliable because it is projected information. We cannot yet tell what the figures will be in 2050.
- Let learners complete questions 1 to 3 on their own and then go through the answers with them.
- Before starting questions 4 and 5 have a general class discussion about the social advantages and disadvantages of economic development in Africa, Asia and Europe. Discuss the issues of foreign aid to countries and changes to traditional lifestyles. For example, ask: 'Is it a good thing to impose 'western' values on Africa and Asia?'
- Complete questions 4 and 5 by discussing them as class. Let learners write these answers in their books for homework as consolidation.

Activity 4

- This activity provides further practice in interpreting population pyramids and so consolidates work covered in Module 5.
- Let learners begin the activity in class and complete it for homework.
- Allow time at the start of the next lesson to go through the answers.

Answers

Activity 1

1. both taken from a great height; both are satellite images; both in colour; both include densely populated areas; both include waterways/sea; both show urban areas with patches of open parkland; both show road networks
2. Grey is representative of built-up areas as in a typical urban area.
3. Green shows trees or open grass areas.
4. trees take in CO_2 and give out O_2 ; this gives the city 'fresh' air essential for our respiration; aesthetically, green is calming and 'pretty'; green areas provide recreational space
5. There is not enough evidence to support the statement that Cape Town is more densely populated than New York because the satellite images do not give us the scale used, so it is difficult to get precise details of comparative size. However, New York appears more densely populated than Cape Town. This is because the grey (indicating urban areas) appears as a mass; in Cape Town this is more widely spread and interspersed by more greenery indicating open areas.

Activity 2

1. horizontal axis
2. five year interval
3. line graph
4. NRR: no information available; GRR: 3,25; TFR: 6,75
5. NRR: 1,0; GRR: 1,25; TFR: 2,6
6. NRR trend: this begins in 1950 with a value of 2,0 and increases slowly until 1970 where it is approximately 2,125, before dropping down gradually to 1,0 in 2000. GRR trend: this begins in 1945 at 3,25 and very gradually drops to 1,25 in 2000. TFR trend: this begins at 6,75 in 1945, rising slightly to 6,85 in 1950, and then dropping evenly until 1975 when it reaches 5,3. After this the drop is steeper until 1995 when it is 2,75. It slows to 2,6 in 2000. The trend in each line is to decrease over time.
7. Significance: 1 is the figure for replacement of population; more than 1 would mean more girls would survive to increase the population; less than 1 would mean that there would be no females to continue reproduction
8. The end of World War II was in 1945. The population needed to re-generate to make up for the loss of life; men and women were re-united and family life could continue without the disruption of war.

Activity 3

1. Africa
2. Europe
3. To calculate the percentage, subtract the smaller from the larger amount. Place the difference over the original figure (4,91) and multiply this by 100 over 1, to work out the percentage change. Example: the smaller figure is 2,4 and the larger is 4,91. The difference is 2,51. $\frac{2{,}51}{4{,}91} \times \frac{100}{1} = 51{,}12\%$
4. TFR in Africa will decline because of: civil-wars; starvation; refugee status; dire poverty as well as access to birth-control; access to education; delayed births; greater wealth; urban living. All these factors affect the number of births a woman may have in her life time. The TFR in Europe will increase because: movement of people into Europe establishing new lives; greater economic freedoms; government intervention to encourage more births.

5. Asia has the largest number of people. The TFR may be lower than Europe, but because it is a factor of reproduction for a large base population, the outcome will be larger than the higher TFR in Europe, which has a smaller base population figure.

Activity 4

1. Mexico
2. Japan
3. negative growth: Japan; rapid growth: Mexico; slow growth: Norway
4. Similarities: each have female on the right, male on the left; each have a vertical axis with age groups; each have a horizontal axis with population figures. Differences: Mexico and Japan have population in millions but Norway in thousands; Mexico and Japan have intervals of 1 million but Norway has intervals of 50 000; Japan shows the smallest number of people in the age group of 0–4 but in Norway and Mexico it is over 85.
5. A visual comparison could be misleading because Norway's graph is for thousands, while the graphs for Mexico and Japan are for millions.
6. Mexico
7. Social problem: there aren't enough people to look after the aged or the young. Economic problem: there isn't enough tax revenue from the economically active to pay for the welfare of the elderly and young.
8. Japan
9. Social advantages: there is a large population to help service the needs of the young and elderly. Economic advantages: tax revenues can go to the elderly for old age homes, health and welfare schemes and pensions, as well as providing for clinics, pre-school and school education and welfare for the young.
10. Women's oestrogen helps combat the build up of cholesterol which leads to heart attacks and strokes; women have less testosterone which contributes to a less risky lifestyle; women traditionally occupy less dangerous jobs; in many countries, women are made to live at home; there is a chivalric tradition of 'protecting' women; women are occupied with the nurture of children and are less exposed to risk.

Informal assessment

Activity 1

- Use learners' response to assess whether they are able to interpret satellite images.

Activity 2

- Go through the answers to questions 1–6 and let learners mark a partner's work.
- Alternatively, provide an overhead with an answer memorandum on it, or ask learners for their answers and write them on the board.

Activity 3

- Go through the answers to questions 1–3 and let learners mark their own work.
- Take in learners' books and mark questions 4–5. Note whether learners have recorded the essence of the class discussion each time.

Activity 4

- Mark this in class by asking learners to share their answers. Allow learners to mark their own work.
- This will encourage discussion and consolidate the work.

Consolidation/extension

Consolidation

- For learners who struggled with Activity 1 or need extra practice, let them use their atlases to find similarities and differences between maps. Look at urban areas, scale, transport routes, suburbs, industrial areas, green areas, forestry and recreational areas. Look for features such as canals, reservoirs, rivers and lakes. Schools, hospitals and churches give a good indication of the level of infrastructure available in a particular area. You can contrast a densely populated city with a smaller town, for example.
- Learners may need extra practice with calculating percentages. You can choose figures from Table 6.2.1 for them to practise.
- Show learners where the continents are and remind them of the concept of the North-South divide between more advanced countries and those that are less economically advanced. Discuss what this means to the people in terms of access to birth control, education, work and opportunities for self-advancement. Mention the role of poverty, malnutrition, refugees, civil wars, genocide, xenophobia, and climate change in threatening the security of people.
- Remind learners about the concepts of population pyramids covered in Module 5. You may find other population pyramids in the atlases, or use those in Figure 6.2.5 to discuss the concepts of dependency ratio; economically active population; the grey population; ageing of a population; a small, young population or a large, young population.
- Ask learners to draw the outline of the three types of population pyramids found in Module 5, and to summarise the pros and cons associated with the shape of each. This will help them recognise the features in a population pyramid, and read the information with greater ease.

Extension

- Learners may be encouraged to access more satellite images and contrast the population density of other areas by accessing the websites: www.nationsonline.org; www.maplandia.com; and www.maps.google.co.za.
- Ask learners to research the effects of World War II and the 'baby-boomers', and report back to the class.
- Learners can work in groups, each group taking one of the continents. Ask learners to research demographic trends in the continents. They can look at factors that affect demographics such as wars, migration, economic down or upturns, political interventions, and the effects of severe weather phenomena. The groups can make a poster that summarises their investigation. They can present a PowerPoint slide to the class or report back verbally.
- Learners can access the following websites for more information on population pyramids: www.populationpyramid.net; www.census.gov.

Learner's Book pages 248–250	REVIEW	TERM 3

These activities provide an opportunity for learners to consolidate concepts and skills learnt in Term 3. Learners can complete them in class or as homework. It is suggested that they complete the activities individually as a means of self-assessment.

You can write the answers on the board for the learners and/or call them out where more appropriate. However, if possible, it is suggested that you photocopy the answers and give them to the learners so that they have them for revision purposes.

Activity 1

1. a) Africa = $\frac{890}{6\ 433} \times \frac{360^o}{1} = 49{,}80^o$

Asia = $\frac{3\ 900}{6\ 433} \times \frac{360^o}{1} = 218{,}24^o$

Europe = $\frac{720}{6\ 433} \times \frac{360^o}{1} = 40{,}29^o$

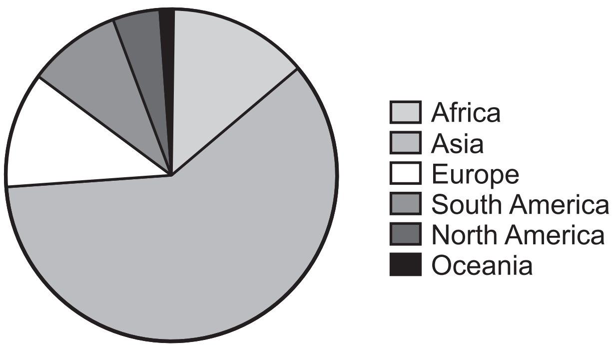
South America = $\frac{560}{6\ 433} \times \frac{360^o}{1} = 31{,}33^o$

North America = $\frac{330}{6\ 433} \times \frac{360^o}{1} = 18{,}46^o$

Oceania = $\frac{33}{6\ 433} \times \frac{360^o}{1} = 1{,}84^o$

b) World population in millions in 2005

c) and d)



	Degrees
Africa	49,8
Asia	218,24
Europe	40,29
S America	31,33
N America	18,46
Oceania	1,84
Total	**359,96**

Activity 2

1. j
2. h
3. f
4. i
5. a
6. b
7. c
8. d
9. g
10. e

Activity 3

1. It is a campaign by the SA National AIDS Council to encourage responsibility and co-operation for our sexual behaviour.
2. Answers will vary. Possible answers for a list may be from 1–10: use condoms; get tested every six months; organise a testing campaign; offer support and advice to the people in our lives who may be engaging in risky sexual behaviour; talk to our family, friends and colleagues; organise or host a community dialogue to talk; provide care and support to those affected; work together to stop discrimination to minimise the stigma; wear red ribbons to show our collective support; talk to the youth in our lives to encourage them to delay their sexual debut.
3. Acquired Immuno-deficiency Syndrome
4. Human Immunodeficiency Virus
5. social: orphans; death of a parent; shorter life expectancy; high infant mortality. Economic: economic stress for those supporting the family; low productivity at work; high absenteeism; medical costs
6. the sexually active from 15 upwards; young infants through transmission from an infected mother

Activity 4

1. 6,6 billion
2. South
3. (c) declining
4. 744 million people (add Oceania, North America and Europe)
5. 943 million people
6. They are projected to continue rising after 2010.
7. Answers may vary. A possible answer is: Less developed countries will decline in the future if the demographic transition model has any credit. Countries move through stages of expansion until contraction or shrinkage or negative growth occurs.
8. a) Developing: Stage 2
   b) Developed: Stage 4 or 5
9. a) they are expanding; birth rates are still high, death rates are reducing because of better medical science and access to this, as well as better sanitation and more money
   b) They are going through a period of increasing aging of the population as the death rate is reduced, but the birth rate has also decreased due to lifestyle and later marriage, causing a declining population or one where the replacement rate is lower than the death rate.
10. A suggested answer may include: Social problems may be lack of facilities, homes and food for the developing countries and especially the poor. Economic problems for the poor may be: no job opportunities because of lack of education; access to the world's resources may be fought over as the wealthy continue to need them but the developing countries now want them for job creation.

MODULE 7

Term 4
Learner's Book
pages 252–293
Duration: 15 hours

WATER RESOURCES: GEOGRAPHICAL KNOWLEDGE

This module focuses on these aspects of water as a resource in the world and in South Africa: the water cycle, the oceans, water supply and water provision. It also looks at floods, which are a natural part of the water cycle, and at how floods can be managed.

The time allocation for this module is less than for the other modules, but the content is not as technical. It should therefore be quicker to work through.

Curriculum and Assessment Policy Statement (CAPS)

Water in the world
- Different forms of water in the world – liquid, solid, gas.
- Occurrence of salt water and fresh water – oceans, rivers, lakes, ground water, atmosphere.
- The hydrological cycle.

The world's oceans
- Oceans as sources of oxygen, food, energy.
- Ocean circulation – warm and cold currents.
- Ocean currents and their importance for fishing, trade and tourism.
- Relationship between oceans and people – pollution, overfishing, desalination.
- Strategies for managing the world's oceans.

Water management in South Africa
- Rivers, lakes and dams in South Africa.
- Factors influencing the availability of water in South Africa.
- Challenges of providing free basic water to rural and urban communities in South Africa.
- Role of government – initiatives towards securing water – interbasin transfers; building dams.
- Role of municipalities – provision, water purification.
- Strategies towards sustainable use of water – role of government and individuals.

Floods
- Causes of flooding – physical and human.
- Case study of flooding in South Africa.
- Characteristics of floods: analysis and interpretation of flood hydrographs.
- Managing flooding in urban, rural and informal settlement areas.

Key geographical skills
- Using verbal, quantitative and symbolic data forms such as text, pictures, graphs tables, diagrams and maps.

- Practising field observation and mapping, interviewing people, interpreting sources, working with statistics.
- Applying communication, thinking, practical and social skills.
- Practising the following specific skills:
  - identifying questions and issues
  - collecting and structuring information
  - processing, interpreting and evaluating data
  - making decisions and judgements
  - deciding on a point of view
  - suggesting solutions to problems
  - working co-operatively and independently.

Key words/concepts

salt water; fresh water; aquifer; glacier; groundwater; hydrological cycle; runoff; infiltration; transpiration; water vapour; phytoplankton; photosynthesis; food chain/food web; fossil fuel; off-shore drilling; wave energy; tidal energy; tide; ocean current; warm current; cold current; fishing bank; continental shelf; upwelling; commercial fishing; subsistence fishing; mariculture; pollution; over-fishing; by-catch; desalination; river; lake; dam; free basic water; water transfer scheme/interbasin transfer; hydroelectricity; water conservation; water management; flood; flash flood; storm surge; hydrograph; discharge; flood/storm hydrograph; lag time; floodline

Learner's Book pages 252–258
Duration: 2 hours

UNIT 1 Water in the world

TERM 4, WEEK 1

Curriculum and Assessment Policy Statement (CAPS) content

Water in the world

- Different forms of water in the world – liquid, solid, gas.
- Occurrence of salt water and fresh water – oceans, rivers, lakes, groundwater, atmosphere).
- The hydrological cycle.

Resources

- Learner's Book pages 252–258
- Activity 1: 1 litre plastic cooldrink bottles or measuring cylinders; jars; teaspoons and droppers; food colouring (optional); water
- Atlases
- Websites (optional):
  - For a good, general article on water resources: http://en.wikipedia.org/wiki/Water_Resources
  - www.nasa.gov/vision/earth/.../warm_wetworld.html

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- Create a 'fact/quote' poster relating to water, for the classroom. Write some quotes and facts on a large sheet of card, for example:
  - The Pacific Ocean alone covers half the globe. You can fly across it non-stop for 12 hours and still see nothing more than a speck of land.

- Between the Earth and its atmosphere; the amount of water remains constant – not a drop more; not a drop less.
- About 1,1 billion people don't have access to safe drinking water.
- 2 million people die every year from unsafe water; most of these are children.
- It takes 1 000 tons of water to produce 1 ton of grain…Aquifer depletion is largely an invisible threat; but that does not make it any less real.
- Water is the oil of the 21st century.
- Wa(r)ter.

Teaching the unit

Lesson 1

- Read through or ask learners to read through the Module 7 introductory paragraph on page 252. Give learners a chance to reflect on the importance of water – as a habitat for plants and animals and as a resource on which all life depends.
  - Point out that the presence of life on other planets depends on the presence of water. For example, the moon is lifeless because there is no water.
  - If you have used the quotes (see pages 151–152 above), discuss them briefly with the class.
- Read through or ask learners to read through the Unit 1 introductory paragraph on page 253. Most learners should already be familiar with the water cycle.
  - Ask learners why the water cycle is nature's water desalination system. Answer: The process of evaporation desalinates salt water. The water evaporates and the dissolved salt is left behind.
- Work through the section, 'What are the three forms of water?' (page 253). Emphasise that water is unique – it occurs naturally as ice, water and water vapour.
- Work through the section, 'How much of the Earth's water is fresh water?' (page 254).

Activity 1

- This is a simple, practical activity that shows learners that:
  - only 3% of the Earth's total water supply is fresh water (i.e. 30 ml out of 1 000 ml or 1 litre);
  - only 0,3% of the fresh water supply is surface water (i.e. 0,1 ml out of 30 ml) which means that only 0,01% of the Earth's total water supply is fresh surface water (i.e. 0,1 ml out of 1 000 ml). It really is just a drop!
  - If you don't have measuring cylinders or measuring spoons, use a teaspoon to measure out 30 ml. 1 teaspoon is about 5 ml, so 6 teaspoons makes 30 ml.
  - A drop from a dropper equals 0,1 ml

Activity 2

- Read the feature, 'What's the difference between oceans and seas?' (page 255).
- In this activity on seas, learners expand their general knowledge.
- The learners will need their atlases to identify the seas.
- Let them complete the activity individually or in pairs.

- Read the feature, 'What's the difference between glaciers, ice sheets, ice caps and icebergs?' (page 256). Draw attention to Figure 7.1.5.

Activity 3

- This activity is quick to work through. Allow about 2 minutes, once you have read through the feature.
- Let learners volunteer answers. Work with the whole class.

- Work through the section, 'How does the hydrological cycle work?' (page 257).
  - Learners should by now be familiar with the concepts of evaporation and condensation (from Module 1). Focus on the processes of runoff – which produces surface water supplies in rivers and lakes; and infiltration – which produces ground water supplies.

Activity 4

- This is an easy summary activity on the water cycle – terms and concepts.
- Set this activity as a homework task.

Activity 5

- Spend the rest of the lesson on Activity 5 – the class quiz.
- Get learners fired up to be the first to answer the questions in this quiz. Let them work in groups of 3 or 4 to complete the task as quickly as possible (i.e. it is a race against time). Alternatively; divide the class into two teams and ask each team a different question until all questions have been completed.
- The learners need access to atlases to help them answer these questions.

Answers

Activity 1

5. a) 3% (i.e. 30 ml/1 000 ml × 100 = 3%)
   b) 0,01% (i.e. 0,1 ml/1 000 ml × 100 = 0,01%)
6. The pie chart under 'Earth's total water' in Figure 7.1.2 shows that only 0,01% of fresh water is surface liquid water.
   How is this calculated? 3% of Earth's total water is fresh. Now look at 'Earth's fresh water' (a pie chart in the form of a rain drop) in Figure 7.1.2: only 0,01% of this is surface water (rivers and lakes).
   0,3% of 3% = 0,3 × 3% = 0,009% which we can round up to 0,01%.

Activity 2

1. a) Mediterranean and Red Sea
   b) Mozambique Channel
   c) Strait of Gibraltar
3. a) the Yellow Sea is between China and Korea; North Pacific Ocean
   b) the Labrador Sea is between Canada and Greenland; North Atlantic Ocean
   c) the Black Sea is a landlocked sea between eastern Europe; Russia and Turkey; it is connected to the North Atlantic Ocean via the Mediterranean Sea
   d) the Caspian Sea is surrounded Russia; Kazakhstan; Turkmenistan; Iran; and Azerbaijan; it is not linked to any ocean
   e) the Aral Sea is between Uzbekistan and Kazakhstan; it is not linked to any ocean

Activity 3

1. True
2. True
3. False
4. True

Activity 4

1. A4; B5; C7; D1; E2; F6; G3
2. a) the higher the temperature; the faster and the more evaporation
   b) the more air movement; the more evaporation
   c) the higher the water content of the air; the less evaporation

Activity 5

1. a) Nile; Africa
   b) Amazon; South America
   c) Lake Superior; USA
   d) Lake Baikal; Russia
   e) Caspian Sea; Eastern Europe/Middle East
   f) Dead Sea; Middle East
   g) Lambert Glacier; Antarctica
2. a) Lake Vostok
   b) Pacific
   c) Congo
   d) Lake Victoria
   e) Lake Kariba
   f) Okavango Delta

Informal assessment

Activity 1

- Display the models in class so that learners can compare their model with others.
- Comment on some of the best models.
- Use this activity to informally assess learners' model building skills, i.e. their ability to depict or represent something.

Activity 2

- Go through the answers with the class. Ask learners to offer answers. Allow learners to mark their own work.

Activity 3

- Indicate to learners whether their answers are correct as they offer them.

Activity 4

- Ask learners to swap books with a partner and check each other's work as you go through the answers with the class.

Activity 5

- If learners worked in groups to find the answers, go through the answers with the class asking learners to offer answers.
- If you had a class quiz, award 1 mark to the team for each correct answer and ½ a mark if the question is correctly answered by the other team.

Consolidation/extension

Extension:

- Suggest the website feature, 'A warmer world might not be a wetter one' for advanced learners. Website address: www.nasa.gov/vision/earth/.../warm_wetworld.html.

Learner's Book pages 259–274
Duration: 4 hours

UNIT 2 The world's oceans

TERM 4, WEEKS 1–2

Curriculum and Assessment Policy Statement (CAPS) content

The world's oceans

- Oceans as sources of oxygen, food, energy.
- Ocean circulation – warm and cold currents.
- Ocean currents and their importance for fishing, trade and tourism.
- Relationship between oceans and people – pollution, overfishing, desalination.
- Strategies for managing the world's oceans.

Resources

- Learner's Book pages 259–274
- Atlases
- Website (optional)
  - The University of the Western Cape has an education page on coastal conservation: www.bcb.uwc.ac.za/envfacts/facts/coastal.htm
- DVDs (optional):
  - *Blue Planet* (2001) by David Attenborough. This is a BBC documentary series on the oceans. It is available as a 3-disc set – try your public library or a DVD store. These episodes are especially relevant for your Geography learners: *The Deep*; *Frozen Seas and Tidal Seas*. Disc 3 of the set includes another documentary, *Deep Trouble*, which exposes some shocking fishing practices.
  - *Oceans* (2009) is a documentary movie on the Earth's five oceans.
- Facts sheets and posters: Coastcare has a useful Fact Sheet and poster series. The Fact Sheet series covers a wide range of topics, many of which are relevant for this unit. Coastcare is a project of the Department of Environmental Affairs.

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- A word of warning: There is a lot of content to cover in this unit. You will need to plan these lessons carefully in order to get through all the material.

Teaching the unit

Lesson 1

- Read through or ask learners to read through the Unit 2 introductory paragraph on page 259.

- Work through the section, 'In what ways are the oceans a useful resource?' on pages 259–261.
  - Write up the three main resources on the board: oxygen, food, energy.
  - For 'A source of oxygen', point out that the phytoplankton of the oceans are as important as the plants on the land. Learners should be familiar with the process of photosynthesis.
  - For 'A source of food', point out that phytoplankton makes up the 'grasslands' of the oceans. Learners should be familiar with the concept of food chains and food webs. Phytoplankton are the producers of the oceans.
  - For 'A source of energy', emphasise that oceans are a source of:
    - Non-renewable energy – oil and natural gas
    - Renewable energy – wave energy and tidal energy.

Refer to Figure 7.2.3 that shows how the tidal energy barrage system works.

Activity 1

- In this activity learners summarise the advantages and disadvantages of fossil fuel energy and wave and tidal energy.
- Let learners complete this activity on their own or in pairs.

- Work through the section, 'What drives the ocean currents?' (page 261).
  - Remind learners that they learnt of convection as a method of heat transfer or heat re-distribution in air in Module 2.

Activity 2

- This is a quick activity. Allow about 5 minutes.
- Complete the activity with the whole class but allow learners to write the answers in their books so that they can consult them later when revising.
- If there is not enough time, learners can do this activity for homework.

Lesson 2

- If learners completed Activity 2 for homework, go through the answers with the class.
- Work through the section, 'Why are the ocean currents important?' (page 263).
  - Write up the three sectors on the board: fishing, trade, tourism.
  - For 'Fishing'; focus on the mechanism of cold upwelling – it's an important phenomenon. Refer to the Interest box that explains why the water in Cape Town is often colder in summer than it is in winter.
  - Talk briefly about fishing, focusing on these terms: commercial fishing; subsistence fishing; mariculture.
- Read the feature, 'The sardine run' (page 264).

Activity 3

- This activity is based on the feature on the sardine run.
- Let learners work individually on it, writing the answers in their books.

- For 'Trade' (page 265), ask learners to think about how ocean currents might affect shipping. Then highlight their effect on fuel consumption and on the European ports in winter.

Activity 4

- Do this activity in one of two ways:

1) Collectively as a class: Learners offer suggestions and you write up each correct suggestion on the board until the list is complete.
2) Learners work in groups: The groups race to see who can come up with the full, correct list first.

- Give clues if necessary to help learners complete the list.
- Let learners use an atlas to help them.

- For 'Tourism' (page 265), ask who has spent a holiday or day visiting the seaside. Ask which coast in South Africa is more popular – east or west – and why. Briefly talk about the effect of cold currents on water temperature and climate.
- Read the feature, 'Some of South Africa's beaches' (page 265).

Activity 5

- This activity is based on the feature on some of South Africa's beaches.
- Let learners complete this activity for homework.

Lesson 3

- Go through the answers for Activity 5 with the class.
- Begin the section, 'How do humans impact on the oceans?' (page 267).
- Write up these three aspects on the board: pollution, over-fishing, mining, settlements and tourism.
- For 'Pollution' (page 267), refer to the table that summarises the sources and effects of sea pollution. Ask learners to identify:
  - the biggest pollutant of the oceans
  - a big source of nutrient pollution
  - the effect of dumping sewage in the sea
  - the problem with plastics and the effect of plastic litter on sea animals.
  - Read through the case study, 'The BP/Gulf of Mexico oil disaster' (pages 268–269) and the feature, 'The impact of shipping on marine pollution in South Africa' (page 269).

Activity 6

- Learners summarise details of the cause, clean-up and impact of the BP oil spill. They then answer questions on marine pollution.
- Let them work in pairs or individually.
- If there is not enough time, learners can complete this activity for homework.

- For 'Solutions to pollution' (page 270), ask learners for their thoughts and ideas before going through the information in the Learner's Book.

Lesson 4

- If learners completed Activity 6 for homework, go through the answers with the class.
- Continue the section, 'How do humans impact on the oceans?' by looking at over-fishing.
- For 'Over-fishing' (page 270), ask learners what they think the term means.
- If necessary touch briefly on responsible consumerism. For example; dolphins are common by-catch in tuna fisheries. Some brands of tuna carry a 'dolphin-friendly' label, although this still doesn't guarantee that the tuna you eat was caught without dolphins being harmed or killed.

- For 'Solutions to over-fishing' (page 270), focus on Figure 7.2.13 which illustrates five ways of regulating over-fishing.
- Briefly talk about the reason behind fishing permits and fishing seasons and how it is important that even recreational fishermen comply.
- You might also want to briefly talk about abalone poaching and why this is a big problem in South Africa.

Activity 7

- This activity is based on the pocket guide for fish consumers.
- Encourage learners to make their parents and family members aware of it (if they aren't already).
- Let learners work individually to complete the activity, writing the answers in their books.
- If there is not enough time for the learners to complete this activity in class they can do so for homework.

- For 'Mining, settlements and tourism' (page 271), ask learners to suggest how these each can harm oceans and coasts.
- Briefly talk about the process of desalination – its advantages and disadvantages.
- Work through the section, 'How can we protect our oceans and coastal resources?' (page 274). Ask learners for their thoughts and ideas.

Activity 8

- Do this as a class or group discussion activity. You will need to co-ordinate and guide the discussion.

Answers

Activity 1

1. Table 1: Fossil fuel energy

Advantages	Disadvantages
• Our cars and power stations are designed for using fossil fuels.	• A non-renewable resource. / The energy supply will not last forever.
	• Non environmentally-friendly. / Burning fossil fuels generates carbon emissions, which contribute significantly to the greenhouse effect and global warming.

2. Table 2: Wave and tidal energy

Advantages	Disadvantages
• Renewable resources. / The energy supply will last forever.	• Limited to coastal areas.
• Environmentally-friendly. / Do not contribute to the greenhouse effect.	• Not many coastal areas have a high enough tidal range to make use of tidal energy.
	• Development costs are high.
	• Maintenance costs are high because salt water rusts equipment.

Activity 2

1. a) clockwise
   b) anti-clockwise

2. a) North Atlantic Drift
   b) California Current
3. a) A = Cape Point; B = Cape Agulhas
   b) C = cold Benguela; D = warm Mozambique

Activity 3

1. single-celled, microscopic organisms that float in the sea and carry out photosynthesis
2. the rise of icy cold water to replace the surface water that is blown off the coast; this cold water is rich in nutrients
3. the feeding hierarchy in an ecosystem/the order of who eats who
4. fish that occupy the top layers of the sea/surface-water fish
5. the annual (usually) influx of sardines along the coast of KZN

Activity 4

from east to west: Richards Bay; Durban; East London; Ngqura (Coega); Port Elizabeth; Cape Town; Saldanha Bay

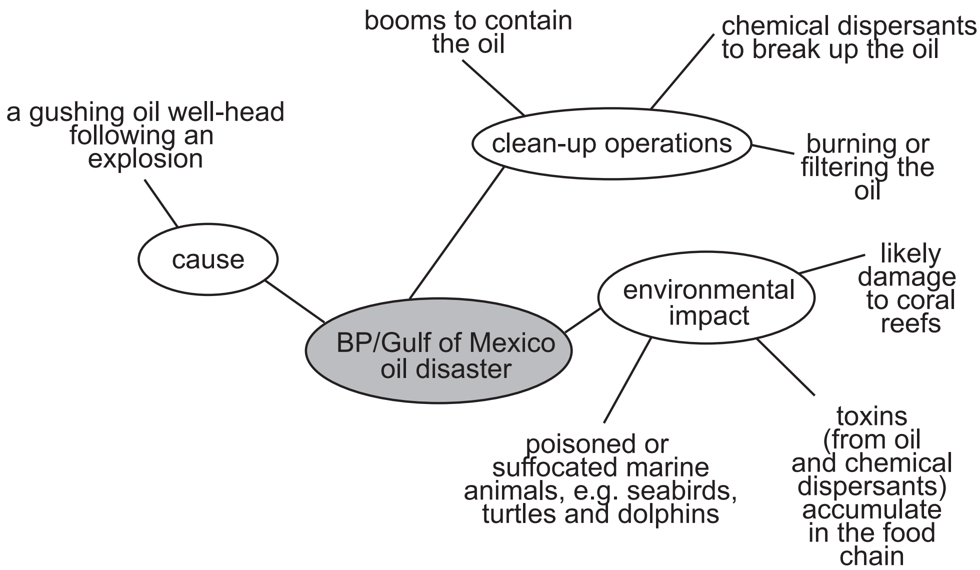
Activity 5

1. a) Atlantic Ocean (1)
   b) The cold air over the sea doesn't hold much moisture. (1)
   c) It is cooled by the cold Benguela Current. (1)
   d) The strong south-east winds (1) in summer (1) blow away the surface water off the coast (1); causing upwelling of colder water. (1)
2. a) Indian Ocean (1)
   b) It is warmed by the warm Mozmabique Current. (1)
   c) Any two of the following: (2)
      - The sea of the Indian Ocean is warm and pleasant.
      - The climate is warm and pleasant all year round.
      - KZN is relatively near to Gauteng so it is easy for holiday-makers to get there.
3. Any three of the following: Beaches are places of natural beauty/relaxation/recreation – e.g. walking, swimming, sun-tanning, fishing, or water sports such as surfing, natural interest e.g. shells to collect and creatures in rock pools. (3)

[13]

Activity 6

1.



2. a) Ships are likely to run aground and spill their cargoes during bad weather and sea conditions
   b) oil spills; spillage of toxic cargoes such as nuclear waste; littering/disposing of rubbish into the sea; introduction of alien marine species attached to hulls or released in discharged ballast water. (Note: Ships need a certain amount of weight (ballast) to keep them stable. Sometimes seawater is carried as ballast.)

Activity 7

1. Any fish on the green list, for example: anchovy; angelfish; dorado; snoek; yellowtail
2. a) langoustine; prawns; sole
   b) trawling damages the seabed – for example, it breaks coral and uproots seaweed; trawling has a high by-catch
3. a) Any four of the following: Only fish above a certain size can be caught. Equipment control: fishing nets must have a minimum net size. Catch limits: A limit is set for the number of fish species that can be caught in an area. Zoning: fishing is controlled in some areas. Quotas: each fishing company is allowed to catch a fixed amount of fish within a certain period.
   b) Any fish on the red list, for example: galjoen; seventy-four; white musselcracker; white steenbras
   c) they are highly endangered/at risk of extinction
4. a) orange
   b) No, because it is over-fished and I don't want to contribute to over-fishing. OR Yes, because it is only a caution/the fish has already been caught.

Activity 8

Here are some examples of how tourism can put pressure on coastal environments:

- Many people build holidays homes close to the beach. Development spoils the natural beauty of the coast, causes loss of habitat for animals and seabirds, and destabilises dunes.
- Beach activity, such as the driving of vehicles on the sand, damages dunes. Driving on the beach is now banned.
- Tourists and visitors to the beach often litter! Plastic bags can blow into the sea where they are sometimes swallowed or eaten by marine animals, such as seals that mistake them for jelly-fish.
- Large numbers of beach bathers/swimmers can pollute sea water with bacteria. Small children often wee (or do worse) in the sea.

Also:

- The population of small seaside towns can increase dramatically during the Christmas summer holidays, putting pressure on the towns' infrastructure such as its water resources. Examples of such towns are Sedgefield and Kenton-on-Sea. Towns such as these are forced to explore desalination options. Although there are advantages to desalination, the process can impact on ocean ecosystems.

Informal assessment

Activity 1

- Draw the tables on the board. Complete them using the learners' answers. This will encourage discussion and consolidate the work.
- Allow learners to mark their own work.

Activity 2

- Correct learners as you work through the activity with them. Use their responses to assess how well they are able to interpret the map.

Activity 3

- Go through the answers with the class. Ask learners to offer answers. Allow learners to mark their own work.

Activity 4

- Assess learners' general knowledge as they suggest the names of the important ports.

Activity 5

- Take in the learners' books and mark the activity.
- Assess the learners' ability to use their geographical knowledge to find reasons for the statements in the extract.
- You can mark this activity according to the mark allocation given in the Answers section.

Activity 6

- Ask two learners to write up their mind-maps on the board. Select learners who would be able to provide good models of the mind-map.
- Let learners use the mind-maps on the board to assess a partner's mind-map.
- Also take in their books and assess how well they have been able to summarise the case study. Provide feedback to learners on how well they did this.
- Go through the answers to (2) with the class.

Activity 7

- Go through the answers with the class. Ask learners to offer answers.
- Allow learners to mark their own work.

Activity 8

- Use the discussion to informally assess learners' sense of environmental awareness.

Consolidation/extension

Consolidation:

- Ask learners who struggled with this unit to draw a simple and uncluttered mind-map to summarise the unit. You could also give them a photocopy of Worksheet 19 (page 299) to do this. (See Resources in this Teacher's Guide.)

Extension:

- If you have a Coastcare Fact Sheet File (see the Resources section above), allow learners to browse through it.
- If possible, show learners an ocean documentary (see the Resources section).

Learner's Book
pages 275–284
Duration: 5 hours

UNIT 3 Water management in South Africa

TERM 4, WEEKS 2–3

Curriculum and Assessment Policy Statement (CAPS) content

Water management in South Africa

- Rivers, lakes and dams in South Africa.
- Factors influencing the availability of water in South Africa.
- Challenges of providing free basic water to rural and urban communities in South Africa.
- Role of government – initiatives towards securing water – interbasin transfers, building dams.
- Role of municipalities – provision, water purification.
- Strategies towards sustainable use of water – role of government and individuals.

Resources

- Learner's Book pages 275–284
- Websites (optional):
  - The sections in this general article on water resources are relevant: Uses of fresh water; Water stress; and World water supply and distribution: http://en.wikipedia.org/wiki/Water_Resources
  - The Department of Water Affairs website has a page that list projects and programmes: http://www.dwa.gov.za/projects.aspx
  - The excellent State of the Environment website, courtesy of the Department of Environmental Affairs, has a good section on Inland water with pages on: Water quality and Water availability, http://soer.deat.gov.za/23.html
  - For information on the Lesotho Highlands Water Project, try these sites:
    www.dwaf.gov.za/orange/Up_Orange/lhwpover.htm
    www.lhwp.org.ls/overview/overview.htm
  - Water transfer schemes: For information on the Palmiet Pumped Storage Scheme: www.eskom.co.za/live/content.php?Item_ID=186
    www.eskom.co.za/content/Palmiet%20FA%20Pg%2001–08.pdf
  - For a summary page on free basic water implementation, from which you can also access data for each province (under Project status): http://www.dwaf.gov.za/dir_ws/fbw/department of environmental affairs; South Africa

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

Lesson 1

- Read through, or ask learners to read through, the Unit 3 introductory paragraph on page 275. Point out to learners that this unit is about:

- keeping South Africa's water balance positive – by not overdrawing on water supplies; and
- keeping South Africa's bank balance positive – by making sure that water provision for all is done in a financially sustainable way.

- Work through the section, 'What are South Africa's water resources?' (page 275).
  - Ask learners to name rivers and dams in your region.
  - Refer to the map of dams and rivers in Figure 7.3.1. Ask learners to identify the significant rivers and dams in your province.

Activity 1

- Learners can do this activity on their own as a written activity, or you can do it as a class activity – in the form of a quiz.

Activity 2

- Read the feature, 'Lake Sibhayi/Sibaya – South Africa's largest freshwater lake' (page 277). Point out the inset map on Figure 7.3.3 that shows where the lake is.
- Read the feature, 'Zeekoevlei – once the home of the hippopotamus' (page 277).
- Let learners work individually to write answers to the questions on the two extracts.

Lesson 2

- Work through the section, 'What influences the availability of water in South Africa?' (page 278).
- Ask learners to offer suggestions in answer to the question.
- Focus on the two maps that show rainfall distribution (Figure 7.3.5) and water availability per person (Figure 7.3.6).

Activity 3

- Learners refer to the two maps to answer questions.
- Let them work in pairs to complete the activity.

- Work through the sections, 'What is the role of the government in water management?' (page 279).
- Emphasise that the role of government is to make the laws and policy on the management of South Africa's water resources and water supply. For example:
  - The National Water Act is responsible for the protection, development and use of South Africa's water resources. The act acknowledges that 'water is a natural resource that belongs to all people'. It is concerned with:
    - sustainability: balancing the drive for development with the need for protection
    - equity: the fair sharing of the water resources
    - efficiency: using water without wasting it.
  - The Water Services Act deals with:
    - provision of water to households
    - sanitation
  - Emphasise that the role of municipalities is to provide water.

Lesson 3

- For 'Developing water transfer schemes' (page 279), write up the four main water transfer schemes on the board.

Activity 4

- Let learners work in pairs to identify rivers and dams that are part of water transfer schemes. Ask them to write down their answers.

Activity 5

- Read the feature, 'The Lesotho Highlands Water Project' (page 280).
- Let learners work individually to answer the questions.

Lesson 4

- Work through the section, 'What is the role of municipalities in water management?' (page 281).
- Emphasise that responsibility for water supply involves ensuring safe drinking water and responsibility for sanitation involves waste water treatment.
- Read the case study, 'Challenging the adequacy of free basic water in Phiri, Soweto' (page 282).
- Have a class discussion in which learners share their opinions. Remember to encourage them to provide reasons for their opinions.

Activity 6

- Learners can do this activity on their own or in pairs.
- Let them complete (1) to (6) and (9) in class and (7) and (8) as homework.

Lesson 5

- Work through the section, 'How can we use water sustainably?' (page 283).
- Point out or ask learners if they have seen the notices in some towns such as Grahamstown and Sedgefield declaring: 'This is a water-stressed area'.
- Spend some time talking about:
  - competing demands for water (see the scheme in Figure 7.3.11)
  - practical and creative ways of saving water.

Activity 7

- In this activity learners look at data on past and future water-use.
- Learners can do this activity on their own or in pairs.

Answers

Activity 1

1. Orange/Gariep River; Limpopo River
2. Namibia (Orange River); Botswana (Molopo River); Botswana and Zimbabwe (Limpopo River) – it goes through Mozambique where it empties into the sea; but it doesn't form part of the boundary
3. Breede River; Olifants River
4. uTukela/Tugela River
5. Gariep Dam
6. they're concentrated in the highest rainfall region

Activity 2

1. it serves as supply of water, so it needs to be protected from pollution; it is part of the iSimangaliso Wetland Park, an important wetland habitat for animals.
2. a shallow lake
3. slightly salty water; it is linked to the sea
4. a hippopotamus (in Afrikaans); zeekoe is the Dutch version of hippopotamus – the lake was named after the hippopotamuses that inhabited it long ago

Activity 3

1. KwaZulu-Natal, parts of Mpumalanga and the Eastern Cape
2. Northern Cape and parts of the Western Cape and Eastern Cape
3. The cold Benguela Current makes the water of the Atlantic Ocean on the west coast of the country cold. This means that the air over this part of the sea brings very little moisture to the neighbouring part of the country.
4. Orange/Gariep River
5. rivers and dams and occasionally lakes – for example, Lake Sibaya
6. Upington has low rainfall and low water availability; both Cape Town and Johannesburg have a relatively high rainfall but low water availability. Cape Town and Johannesburg are water-stressed because they are heavily populated cities.
7. Gauteng

Activity 4

1. Palmiet/Boland water scheme – Palmiet River; Steenbras Dam
2. Gariep/Orange River scheme – Gariep/Orange River; Gariep Dam; Vanderkloof Dam
3. Lesotho Highlands Water Transfer Scheme/Project – Katse Dam; Vaal River
4. Tugela-Vaal scheme – Tugela River; Sterkfontein Dam; Vaal River

Activity 5

1. a) hydroelectricity
   b) Excess water from one dam or reservoir is pumped to another dam or reservoir higher up. This store of water serves as an extra water supply and a source of water for generating hydroelectricity – by letting the water flow downhill again.
2. a) Katse Dam
   b) loss of habitat for animals; disrupt the natural flow of rivers; can reduce the river water supply downstream; trap fertile sediment

Activity 6

1. from using/drinking water contaminated with cholera bacteria (1)
2. it's the handing over of government-based services that have been traditionally provided by government to private companies/The transfer of government services to the private sector. (2)
3. it is Zulu for 'conserve/save water' (1)
4. Many households have a high number of occupants which means the free basic allowance per person works out to be very low. (2)
   Some households don't or can't pay for the water they use above the free basic quota – sometimes the supply is cut off once the allowance is used up. (2)

5. 6 000 litres ÷ 30 (assuming 30 days in the month) = 200 litres per day (2)
   200 litres ÷ 8 people = 25 litres per person per day (2)
6. 12,5 litres (i.e. 25 litres ÷ 2) (2)
7. Learner's own answer. Award one mark for completion of the information. (1)
8. Learner's own answer. Award two marks for completion of the information. (2)
9. Example answers are: No. People have a right to water for basic needs. The poor people in our society need to be supported by government or subsidised by the rich people in our society. (3) OR Yes. The poor are getting a basic amount of water for free, they should pay for the extra that they use. Not paying for services encourages a culture of non-payment. (3)

[20]

Activity 7

1. Copy of Table 7.3.1
2. Percentage increase: $\times 10^6$ m^3 per year/annum

Sector	Urban & domestic	Mining & industry	Irrigation & afforestation	Total use	Maximum available
1996	2 171	1 598	12 344	20 045	33 290
2030	6 936	3 380	15 874	30 415	33 290
Percentage increase	**319%**	**212%**	**128%**	**152%**	

3. a) i) For 1996, the total use is 60,2% of the maximum available, i.e. 20 045 ÷ 33 290 × 100
      ii) For 2030, the total use is 91,4% of the maximum available, i.e. 30 415 ÷ 33 290 × 100
   b) The population is growing and urbanisation and development/economic activity/industrialisation are increasing.
   c) irrigation and afforestation – in other words, agriculture
   d) i) increase most: urban and domestic
      ii) increase least: irrigation and afforestation

Informal assessment

Activity 1

- If learners completed the activity as a written task, go through the answers with the class. Ask learners to offer answers and allow them to mark their own work.
- If they complete the activity as a quiz, award 1 mark for each correct answer and ask the learners to add up their scores at the end of the quiz.

Activity 2

- Go through the answers with the class. Ask learners to offer answers and allow them to mark their own work.

Activity 3

- Go through the answers to the questions and let learners mark a partner's book.

Activity 4

- Go through the answers with the class. Ask learners to offer answers and allow them to mark their own work.

- Use the activity to assess the learners' map reading skills as well as their knowledge of the South African water transfer schemes.

Activity 5
- Take in the learners' books and mark the activity.
- Assess learners' ability to interpret information as well as their ability to express their ideas in writing.

Activity 6
- Go through the answers with the class. Ask learners to offer answers.
- Alternatively, you can mark this activity according to the mark allocation given in the Answers section.You can use this activity to informally assess learners' comprehension skills and ability to do simple calculations.

Activity 7
- Go through the answers with the class. Ask learners to offer answers.
- Ask who had trouble calculating the percentage increases.

Consolidation/extension

Consolidation:
- For learners who struggled with calculating percentages in Activity 7, or with the calculation in Activity 6, show them how to do percentage calculations. Then give them Worksheet 20 (page 300) in the Resources section of this Teacher's Guide, to complete. You could also use this worksheet for revision purposes.
- Let learners complete Worksheet 21 (pages 301–302) in the Resources section of this Teacher's Guide. It focuses on water resources and their management. You could also use this worksheet for revision purposes.

Extension:
- Let learners complete Worksheet 22 (pages 303–304) in the Resources section of this Teacher's Guide. It focuses on the debate around fracking for gas in the Karoo.
- Ask learners to find out more about a water transfer scheme. See suggested websites for the Lesotho Highlands Water Project and the Palmiet Pumped Storage Scheme listed in the Resources section above.
- Suggest learners look at and comment on the free basic water implementation status for your province on: www.dwaf.gov.za/dir_ws/fbw.

Learner's Book
pages 285–293
Duration: 4 hours

UNIT 4 Floods

TERM 4, WEEKS 3–4

Curriculum and Assessment Policy Statement (CAPS) content

Floods
- Causes of flooding – physical and human.
- Case study of flooding in South Africa.
- Characteristics of floods: analysis and interpretation of flood hydrographs.
- Managing flooding in urban, rural and informal settlement areas.

Resources

- Learner's Book pages 285–293
- Websites (optional)
  - For information on floods for you or your learners: http://environment.nationalgeographic.com/environment/natural–disasters/floods–profile
    www.esa.int/esaKIDSen/SEMD0LXJD1E_Earth_0.html
    http://library.thinkquest.org/5818/floods.html
  - For an interview: see the article 'Managing Flooding on the Orange River' relating to the 2011 floods on http://ipsnews.net/news.asp?idnews=55245

Preparation

- Read through the unit and familiarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- Collect newspaper cuttings about floods.

Teaching the unit

Lesson 1

- Read through, or ask learners to read through, the Unit 4 introductory paragraph on page 285.
- Work through the section, 'How are floods caused?' (page 285) and 'River floods' (page 285).
- Emphasise that rivers flood after long or heavy rains.
- Point out the margin notes on the deadliest flood in China and the high incidence of floods in Asia, particularly in Bangladesh.
- For 'Sea floods'(page 286), point out that sea floods can be:
  - estuarine – sea tidal surges caused by high tides and storm surges/cyclones can flood river mouths, or the stretch of the river upstream, with sea water
  - coastal – storm surges or tsunamis can flood coastal areas with sea water.
- For 'How human activity contributes to flooding' (page 286), go through the list of examples. Draw attention to the map of the Netherlands (Figure 7.4.4) to show how in some coastal cities the sea is pushed back, i.e. land is reclaimed from the sea.

Activity 1

- This is a quick and easy activity that links to the water cycle.
- Let learners work individually and write their answers to the questions.
- If there is time at the end of the lesson, go through the learners' answers. Otherwise you will need to allow time for this at the beginning of Lesson 2.

Lesson 2

- Work through the section, 'Can we predict river floods?' (pages 287–288).
  - Emphasise that discharge is how much water passes a point in the river at a particular time. Discharge is velocity × volume. In other words, discharge is a measure of how fast the river flows and the amount of water in the river.
  - Point out that a hydrograph shows the change in river flow over time.

  - Emphasise that a flood hydrograph shows how a river responds to a particular storm and can be used to predict flooding.
  - Talk learners through the flood hydrograph in Figure 7.4.5. For example:
    - When the rain starts to fall, the runoff first has to make its way to the river. Also, if infiltration is good, it takes a while for the soil to become soaked with water and the amount of runoff to increase. This is why there is a lag time.
    - For flash floods, the river rises quickly soon after the rain begins. In other words, the lag time is short.

Activity 2

- In this activity learners practice interpreting a flood hydrograph.
- Let them work in pairs to complete the activity.
- Go through their answers before moving on to the next section of the unit.

- Work through the section, 'What are the effects of floods?' (page 289). Point out, for the negative effects that:
  - the primary effects of floods are loss of life and damage to roads, bridges, pipes, cars, crops, etc.
  - the secondary effects of floods are contamination of water supplies, outbreaks of disease, food shortages, etc. These are consequences of the primary effects.

Lesson 3

- Work through the section, 'How can floods be managed or prevented?' (page 289)
  - Point out that these types of structures are used to control floods:
    - levees or dykes – slopes or walls or embankments often used for coastal cities
    - dams or reservoirs – to store or temporarily hold back flood water
    - weirs – small overflow dams.
- Read the features, 'The Thames Flood Barrier' (page 290) and 'Planning for a stormy season' (page 290).

Activity 3

- Learners answer questions on the feature, 'Planning for a stormy season'.
- Let them complete this individually or in pairs.
- Go through the learners' answers with them or if the learners need to complete the activity for homework, do this at the beginning of the next lesson.

Lesson 4

- Work through the section, 'Case study: The 2010–2011 southern African floods' (pages 291–293).
- Ask learners what they remember of this flood event or their experience of these floods.
- Read through all the features that make up this section.

Activity 4

- Let the learners discuss (1) to (4) as a class or in groups.

- If you use group discussion allow some time for the groups to share their answers with the rest of the class.
- Let learners complete (5) individually.

Answers

Activity 1

1. Infiltration is the trickling or soaking of water into the soil and the air spaces in permeable rock. Runoff is the surface flow of water towards lower ground – it collects in rivers and lakes.
2. a) heavy rain
   b) steep slopes
   c) compacted soil
   d) naked land

Activity 2

1. the amount of water that passes a point at a particular time (2) OR it is a measure of the volume (1) and speed of water flow (1)
2. a) B (1)
   b) A (1)
   c) A (1)
   d) B (1)
3. A (1)

[7]

Activity 3

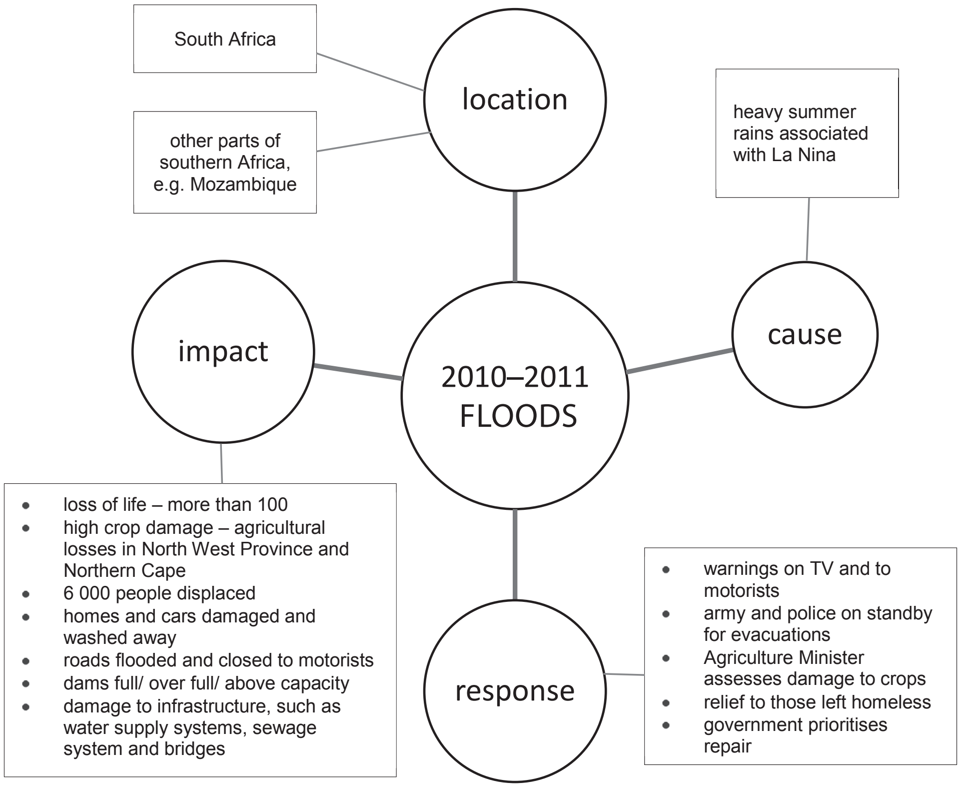
1. a rise in sea level caused by strong winds, usually at the time of high tides
2. it is flat and low-lying/more or less at sea level; water tables are high
3. Proactive means taking the initiative or acting in advance to deal with an expected difficulty. The city's plan is proactive because it is taking measures to prevent or reduce the problem of flooding before the rainy winter season/before it takes place.
4. a flood disaster action plan; effective drainage systems
5. Water runoff on tarred streets/roads is high. If stormwater drains are blocked, the streets (and nearby areas) flood.

Activity 4

(1) to (4) are points for class discussion. Learners will then incorporate some of these in their mind-maps

1. measuring rainfall and river flow (with hydrographs); monitoring the weather closely
2. Informal settlements are often built on river banks (for close access to water/the river; or because space/land is limited).
3. The damage caused by the floods included:
   - loss of life
   - homes flooded and some informal shacks swept away
   - cars damaged and washed away
   - crop losses (because of flooding of agricultural fields)
   - infrastructure such as bridges; roads and stormwater drainage and sewage systems damaged
   - rail freight disrupted (because of flooded tracks or danger); causing export delays and financial losses
4. Rescue and relief operations included:
   - army placed on standby for evacuations
   - non-government organisations donated relief supplies
   - police and traffic police closing flooded roads

5.



Informal assessment

Activity 1

- Mark this in class by asking learners for their answers and allowing learners to mark their own work.

Activity 2

- Ask learners to swap books and mark each other's work according to the mark allocation (given in the Answers section) as you go through the answers with the class.
- Ask who struggled with this activity and provide them with the consolidation activity below. They should complete this for homework.

Activity 3

- Go through the answers with the class. Ask learners to offer answers and allow them to mark their own work.

Activity 4

- During the discussion, informally assess learners' comprehension and ability to pick out the main points, as well as their understanding of the effects and management of floods.
- Once learners have done their mind-maps, put up an example mind-map on the board. Allow learners to mark their own mind-map, adding anything to it that they may have omitted.

Consolidation/extension

Consolidation:

- For learners who struggled with the hydrograph in Activity 2, or would like more practice, ask them to refer to the flood hydrograph in Figure 7.4.5 of the Learner's Book and complete Worksheet 23 (page 305) in the Resources section of this Teacher's Guide. This worksheet can also be used for revision purposes.

Extension:

- Ask learners to find out more about monsoon floods in Asia and examples of monsoon flood events.

Learner's Book page 294

FIELDWORK 3 TERM 4

This fieldwork task is linked to the content of Module 7, Unit 3 and will provide learners with practical experience of water resources. It would be best to plan the fieldtrip for during or after Unit 3.

The learners' reports should include:

- a title
- headings
- the name and location of the fresh water resource
- if it is not evident from the name, what type of water resource it is
- other water resources it is linked to
- who uses the resource and how they use it
- the condition or state of health of the resource
- the water level
- factors that affect the water level

In addition to assessing the above, consider how well learners have structured their reports and made use of words (paragraphs, headings and captions) and visual material (diagrams, photographs and pictures) to communicate their findings.

Learner's Book pages 295–297

Assessment Task 3 Water resources (case study)

TERM 4

For information on how to assess the learners' completed tasks, please see pages 207–210 of this Teacher's Guide.

Term 4
Learner's Book
pages 298–314
Duration: 6 hours

MODULE 8

WATER RESOURCES: GEOGRAPHICAL SKILLS AND TECHNIQUES

In this module we apply the work we have done with topographical maps, photographs of landscapes, oblique and vertical aerial photos and orthophotos, to study the effect that water makes on the landscape. We work with topographic maps to practise recognising features, especially those associated with running water and the sea.

We use orthophotos together with aerial photos and topographical maps to interpret landforms and practise our map reading skills. Contours, symbols and scale on electronic maps generated by GIS are explored and further practice with Raster and Vector models is given.

Curriculum and Assessment Policy Statement (CAPS)

Topographic maps
- Landforms and contours.

Aerial photographs and orthophoto maps
- Photographs of landscapes.
- Oblique and vertical aerial photos.
- Orthophoto maps to be used in conjunction with 1:50 000 maps and aerial photos.

Geographical Information Systems (GIS)
- GIS concepts: spatial objects, lines, points, nodes, scales.

Key geographical skills
- Using verbal, quantitative and symbolic data forms such as text, pictures, graphs tables, diagrams and maps.
- Practising field observation and mapping, interviewing people, interpreting sources, working with statistics.
- Applying communication, thinking, practical and social skills.
- Practising the following specific skills:
  – Identifying questions and issues
  – Collecting and structuring information
  – Processing, interpreting and evaluating data
  – Making decisions and judgements
  – Deciding on a point of view
  – Suggesting solutions to problems
  – Working co-operatively and independently.

Key words/concepts
braiding; sandbank; island; alluvial soil; mudflat; wetland; spatial objects; spatial database; point; node; line; polygon

Curriculum and Assessment Policy Statement (CAPS) content

Topographic maps

- Landforms and contours.

Resources

- Learner's Book pages 298–304
- Atlases
- Topographic maps 1:50 000 (optional)
- Websites (optional)
  - www.ngi.gov.za
  - www.googleearth
  - www.nationsonline.org

Preparation

- Read through the unit and familarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

Lesson 1

- Read the module (page 298) and unit introductions (page 299) and the information on identifying coastal waters and freshwater rivers on maps (page 299) with the learners.
- Ask learners to find Upington in their atlases, or show the class where it is on a map of South Africa.

Activity 1

- The learners can begin Activity 1 in class and complete it for homework.
- The activity provides consolidation of work related to running water geomorphology.
- Let them work individually on the activity.

Lesson 2

- Go through the learners' answers to Activity 1.
- Ask learners to find Plettenberg Bay on a map or in their atlases.
- Ask learners what type of a town it is: commercial, industrial, fishing, recreational, retirement, educational or judicial centre.
- Look at a map of South Africa and try to judge distances of travel by car to visit Plettenberg Bay from various cities in South Africa.
- Discuss the impact of the increase in petrol prices on people visiting Plettenberg Bay.
- Ask learners to find Durban on a map or in an atlas.
- Ask learners what sort of town they think it is, based on the size of its harbour and urban, industrial extent, as well as its beaches.

- Talk about the tourist attractions in Durban that they may know about (e.g. uShaka Marine World and the Moses Mabhida Stadium.
- The activities that follow focus on coastal, marine features and rivers affected by tidal action, so remind learners of the work they have completed in Module 7.

Activities 2 and 3

- Let learners complete the activities in pairs. They can begin them in class and complete them for homework.
- Activity 2 relates to marine and coastal geomorphology.
- Activity 3 focuses on marine features shaped by tidal and wind action, as well as urban development and the ability to read different types of maps.

Answers

Activity 1

1. Examples of braiding: below the 'N' of Upington 28°27´S; 21°17´–19´E
   sandbank: (white in river) 28°27´S; 21°17´–19´E
   island: 'Die Eiland' at 28°27´–28´S; 21°15´E
   bridge: (across the Orange River) 28°15´S; 21°15´20˝E (which is one third between 15´ and 16´E)
2. sensible because access to water for irrigation, domestic, commercial and industrial use is assured; not sensible because too close to the water if there are floods
3. approximately 800 m
4. they are only between 1–10 m above the level of the river
5. The 'green Kalahari' owes its name to the commercial farming and intensive agriculture along the banks, with vineyards and orchards making this a very green area.
6. Alluvial soil is rich in nutrients; it leaves a top layer over the fields that it floods. This acts as a natural fertiliser.
7. There are numerous non-perennial rivers flowing into the Orange River.
8. There is evidence of canals and wind pumps.

Activity 2

1. The Robberg shoreline is rocky. This is shown on the map by the hachuring, or very close indents made along the shore, and an absence of sand.
2. The Piesang and Keurbooms Rivers have fairly narrow mouths into the sea; there are mud banks in both of them; and they are shallow.
3. Mudflats and wetlands are important to the environment because: they sustain eco-systems; they act as a sponge for the water and reduce the effects of flooding; they are the breeding ground for rare birds; they can be beautiful for painters, photographers and people interested in wildlife and birds.
4. Sea erosion has an effect on:
   a) Seagull breeding colonies: it removes their sandbank, or sand spit, habitat
   b) Tourism: it reduces the available beach area by removing sand
   c) Water-sports: it may reduce surfers and fishermen because of an absence of beach
   d) Estuarine fishing: the fishing will not be protected by sandbanks
   e) Housing, caravan parks and developments along the shore do not have a safe river estuary; they are exposed to the tidal range of the sea which is dangerous.

Activity 3

1. There is little or no evidence of rocks along the Durban shoreline. It is a sandy area.
2. The topographic map section of Durban is clearer than the satellite image or atlas map. This is because of the scale used in it, which is larger than the others appear to be. This means we see less of the map, but what we do see, is in great detail.
3. The land is built up as an urban area to the north of the harbour. It has road and rail transport including a railway station and industrial area alongside the harbour. This would require fairly level land.
4. Durban harbour is a safe port because: it has two long breakwaters protecting the entrance from sea swells; it is large; it offers protection from the sea; there is ample room for industry, railways and sheds around the harbour.
5. The Umgeni River mouth is closed to the sea; it is a narrow river; there are sandbanks extending from both sides of the river to close the mouth; there is evidence of braiding in the river; there are sandbanks in the river. These factors mean the river is shallow.
6. If the Umgeni River flooded, there would be the following negative effects:
   a) Industries: there would be flood damage to machinery and goods
   b) Recreational areas: games could not be played if fields were flooded; facilities could be destroyed
   c) The transport route: this would be disrupted; bridges could be washed away
7. Factors for a safe harbour include: deep anchorage; protection from the sea swells; protection from prevailing winds; ample space for off-loading goods; ample space for sheds; ample space for railways and roads.

Informal assessment

Activity 1

- Mark this in class by asking learners for their answers and writing the correct points on the board. This will consolidate the work.
- Allow learners to mark their own work.

Activity 2

- Go through the answers to the questions and let learners mark a partner's book.
- Alternatively, provide an overhead with the answer memorandum on it, or ask learners for their answers and write them on the board.
- Question 3 can open up discussion on conservation and eco-tourism: bird-watching, fishing and beach recreation.

Activity 3

- Go through the answers to the questions and let learners mark a partner's book.
- Alternatively, provide an overhead with the answer memorandum on it, or ask learners for their answers and write them on the board.

Consolidation/extension

Consolidation

- Look for marine features on the maps such as headlands, marine beacons, breakwaters, jetties, and ask learners to find these.
- Let learners compare Durban and Plettenberg Bay in terms of what the two settlements and the coastline have in common.

Extension

- Learners can research the Gariep River and how it got its various names, and make a presentation to the class.
- Learners can research the history of Port Natal or Durban and discuss its tourist attractions.
- The 'Garden Route as a tourist destination' can be a research topic, with environmental and eco-tourist ventures being a focus of the investigation.

Learner's Book pages 305–311
Duration: 2 hours

UNIT 2 Aerial photographs and orthophoto maps

TERM 4, WEEK 5

Curriculum and Assessment Policy Statement (CAPS) content

Aerial photographs and orthophoto maps

- Photographs of landscapes.
- Oblique and vertical aerial photos.
- Orthophoto maps to be used in conjunction with 1:50 000 maps and aerial photos.

Resources

- Learner's Book pages 305–311
- Rulers
- Atlases
- Calculators (optional)
- 1:50 000 topographic maps to use in the lesson or refer to on the board (optional)
- orthophoto maps for the lesson or board (optional)
- Website (optional)
  – www.aerialimage.co.za

Preparation

- Read through the unit and familarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.

Teaching the unit

Lesson 1

- Put three headings on the board: 'topographic maps', 'orthophotos' and 'aerial' photos. Let learners copy these headings into their books and use them to make a summary of the similarities and differences between the three types of maps/photos.
- Remind the class about topographic maps, using the Upington topographic excerpt: scale is 1:50 000 which means 1 cm on the map is a ½ km in reality; the contour intervals are in 20 m with every 100 m in a darker line; altitude is shown with spot heights, benchmarks, trig beacons or contours; there is a reference with symbols representative of what is on the map; magnetic north and the magnetic declination is always shown; true north is shown; it is in colour; there is latitude and longitude along the sides for co-ordinates; it has a four-digit reference and two letters which refer to its exact place amongst some 1 900 other topographic maps in South Africa.

- Remind the class about orthophoto maps: scale is 1:10 000 which means 1 cm on the map is 100 m in reality; the contour intervals are 5 m with a darker contours every 20 m; spot heights are shown; there is no reference given, but symbols are the same as found on the topographic map; there is no indication of direction, magnetic declination or bearing; latitude and longitude is marked along the side; it is in black and white; it has a four-digit reference and two letters, plus a number – this shows where the precise area is on the topographic map, if cut into 9 squares.
- Remind the class about aerial photographs: scale is not used; no contour lines; no spot heights; no reference or symbols; direction is shown but no magnetic declination given; it may be direct, high oblique or low oblique; shadows can hide features; it can be in colour or black and white. Its advantage lies in showing the real object. However, there is a distortion of reality because of perspective.
- Learners may need help with calculations. Remind them about reading scale. There are 100 000 cm in 1 km, therefore an orthophoto with a scale of 1:10 000 has a scale of 1 cm on the map being equal to $\frac{1}{10}$ km, (or 100 m).
- Remind learners about landform recognition and contours from Module 4.
- Read through the introduction to the unit (page 305) and the information on using orthophotos with topographic maps and/or aerial photographs with the class.

Activity 1

- Locate the area on a wall map of South Africa and/or let learners do this in their atlases. Ask learners to trace the Orange River from its source to its mouth. Comment on the landscape it flows through and its value to South Africa. Point out the Gariep Dam.
- This activity focuses on the effects of a river and the features it creates.
- Let learners work individually on this activity, begin it in class and complete it in the next lesson.

Lesson 2

- This is a continuation of working with aerial photos, orthophotos and topographic maps.
- Discuss the role of Upington as a junction town or node, and a central point for the surrounding farmers. Ask learners why tourists would travel to this area.
- Remind learners that the orthophoto distance is multiplied by 100 m because 1 cm is equal to 10 000 cm, which is the same as 100 m.

Activity 2

- Let learners work individually on this activity.

Answers

Activity 1

1. Similarity: both show the same area; both have the same code.
   Difference: an orthophoto is in black and white and the topographic map is in colour.
2. 1:10 000
3. 5 m
4. a) convex slope is steep at the bottom and levels off gradually at the top
   b) concave slope is gentle at the bottom but becomes steep towards the top

5. a) yes – but if the tide is out, the sand is exposed and it is not a true ‘island’
   b) yes
6. The sand dunes and sand bars from both sides of the river mouth have joined across the river mouth.
7. too much sand moved by the waves, tidal currents or the wind
8. a) it has good views; it has immediate access to the beach
   b) sand dunes are unstable, causing cracks in the buildings; sand blows everywhere; high tides or storm damage could erode the foundations
9. the south-west side has a gradual slope; the north-east side is very steep

Activity 2

1. 2 cm on the orthophoto; calculation: scale of orthophoto is 1:10 000 which means 1 cm on the map is equal to 10 000 cm in reality or 100 m. Therefore 2 cm on the map is equal to 2 x 100 m = 200 m
2. An aerial photo does not have scale.
3. yachts and small boats tied up to jetties
4. Advantage: an orthophoto has a larger scale than a topographic map; we see more detail. Disadvantage: an orthophoto is in black and white, and we cannot make out what is in the shadow.
5. Suggested answer: I agree that it is better to use an orthophoto in combination with a topographic map rather than an aerial photo, because they have scale which allows us to measure the size of objects and distance. The contour intervals help us read how steep or gradual a slope is. The shadow on an orthophoto can indicate what time of the day it was taken (there is no shadow on a topographic map), but too much shadow will hide objects. The clarity and detail of an orthophoto is greater than that of a topographic map, because the scale is larger. Information is given on a topographic map in its ‘reference’ or ‘key’, which helps us to read detail. Directions can be given because of latitude and longitude, as well as the topographic and orthophoto maps always pointing to true north.

Informal assessment

Activity 1

- Mark this in class by asking learners for their answers and writing the correct points on the board. Allow learners to mark their own work.
- This will encourage discussion and consolidate the work.

Activity 2

- Mark this in class by asking learners for their answers and writing the correct points on the board. Allow learners to mark their own work.

Consolidation/extension

Consolidation

- Give more practice with measuring distances on: (a) a topographic map; and (b) an orthophoto.
- Allow learners more opportunities to contrast and compare the topographic map, orthophoto map and aerial photograph.

UNIT 3 Geographical Information Systems (GIS)

Curriculum and Assessment Policy Statement (CAPS) content

Geographical Information Systems (GIS)

- GIS concepts: spatial objects, lines, points, nodes, scales.

Resources

- Learner's Book pages 312–314
- Ruler
- Cotton/ wool/ string/ shoe lace/ dental floss
- Websites (optional)
  - www.nationsonline.org.za
  - www.googlemaps
  - www.ngi.com.za
  - www.maplandia.com

Preparation

- Read through the unit and familarise yourself with the content that you will need to teach. Think about what learners may already know about the topics and any areas of difficulty that you think they might encounter.
- You may wish to refer to Modules 2 and 6 to refresh your memory of the GIS component, and Raster and Vector models in particular.

Teaching the unit

Lesson 1

- Read through the introductory paragraph (page 312) with learners. Remind them of GIS work covered in Modules 2 and 6.
- Read through 'How information is shown on a GIS map?' (page 312) and refer to Figure 8.3.1. You can ask learners how they would imagine the same map to be shown if it used a Raster model and not a Vector model (Answer: Pixels showing equal altitude would be shaded in various colours with a key for example.) Ask learners how they imagine a non-perennial river would appear on a Raster map.
- Read the information in the section, 'Spatial objects' (page 313) with learners.
- Refer to Figure 8.3.2 which shows the tools for a Vector model, and Figure 8.3.3 which shows how these tools are implemented.

Activity 1

- This activity is largely a consolidation of work done in Modules 2 and 6.
- Let learners begin the activity in class and complete it for homework. They should work on it individually.

Lesson 2

- Go through the learners' answers to Activity 1.
- Read through the information on scale with the class (page 314). Point out that the map in Figure 8.3.4 was electronically generated.

Activity 2

- The learners may need help with measurement. Explain that using cotton thread or similar material (see Resources section on page 180 of this Teacher's Guide) they should follow the curves of the road and then straighten out the thread against a ruler in order to get a measurement.
- Let learners to work in pairs as they can help each other with the measuring.

Answers

Activity 1

1. Vector; both Figures 8.3.1 and 8.3.3 use nodes, lines, polygons and points
2. A geographer can create layers of information electronically.
3. Example: I would start with soil types, then vegetation, then transport routes, and water pipes, electricity cabling, and housing.
4. Example: A municipality uses electronic data captured by satellite imagery to understand population density and distribution, peak traffic along routes, to locate all telecommunication cabling, all water and electricity distribution forms, and public or government offices, such as police stations, clinics and schools.

Activity 2

1. 8,5 cm distance on the map
2. 1 cm on the map is equal to 204,08 km in reality. (Usually a line scale is marked off in 1 cm units. If the actual distance is 1 734,74 km and the measured distance on the map is approximately 8,5 cm, then 1 cm of the line scale will be equal to $\frac{1\ 734{,}74}{8{,}5} = 204{,}08$km. There may be a little variation in the initial measurement, but take the above as your guide.)

Informal assessment

Activity 1

- Mark this in class by asking learners for their answers and writing the correct points on the board. Allow learners to mark their own work.
- (2)–(4) are open-ended questions. Encourage discussion, writing the best points on the board.

Activity 2

- Go through the answers to the questions and let learners mark a partner's book.

Consolidation/extension

Consolidation:

- Learners will benefit from the opportunity of accessing interactive maps as found on the recommended websites in the Resources section.
- An atlas is good for practising measurements, calculating scale, or using the scale to calculate exact distances.

Extension

- Encourage learners to access electronic maps of the areas in which they live and then to zoom in and out. If their map does not have a scale attached, it will be impossible to calculate distance. The altitude from which the image is taken will affect what can be seen and learners can research the optimum altitude for seeing road names in the area in which they live.

REVIEW

These activities provide an opportunity for learners to consolidate concepts and skills learnt in Term 4. Learners can complete them in class or as homework. It is suggested that they complete the activities individually as a means of self-assessment.

You can write the answers on the board for learners and/or call them out where more appropriate. However, if possible, it is suggested that you photocopy the answers and give them to learners so that they have them for revision purposes.

Activity 1

1. A. evaporation; D. infiltration
2. a) infiltration – D
   b) condensation – B
   c) precipitation – C
3. 1: 97%; 2: 2%; 3: 1%; 4: 0,01%
4. fertiliser
5. oil spills

Activity 2

1. a) the amount of water that passes a particular point in a given time
   b) the time between the peak in the rainfall and the peak in the discharge
2. A: stream flow after urbanisation; B: stream flow before urbanisation;
3. The removal of vegetation and tarring or paving of surfaces increases runoff. Wetlands are often drained or destroyed – they play a role in natural flood control.
4. Any two: maintenance of stormwater drains; no settlements on the banks of rivers below the floodline; river maintenance; flood disaster action plan; etc.

Activity 3

1. high tidal range and, constricted/narrow bay
2. A barrage system is a barrier system. As the tide flows in, the barrage/barrier/gates are opened. Before the tide flows out, the gates are closed. The water level behind the barrier is then higher than the level of the sea. Falling water from behind the barrier is then used to turn/drive turbines to generate electricity – in the same way that hydroelectricity is used to generate a dam.
3. the trapping of sediment
4. no carbon emissions; a renewable form of power generation
5. no, tidal range isn't big enough
6. Cabora Bassa Dam, Lesotho Highlands Water Project, Gariep Dam, Palmiet water transfer scheme/Steenbras Dam

Activity 4

1. low rainfall, uneven rainfall, not many big rivers
2. Tourists significantly increase the number of water-users during the December holiday season. December is the dry season in the southern Cape.

3. Salt is removed from sea water – either by distillation or reverse osmosis (filtering through a membrane with very small holes.) In the process of distillation, the water is boiled so that it evaporates; the water vapour is then cooled so that it condenses. The condensed water is salt-free.
4. sea water is plentiful; salt is a by-product
5. It is an energy-expensive process that requires electricity to heat or pump the water. Maintenance costs are high because the salty sea water rusts equipment.
6. household water that has been used for washing
7. Any one of: cholera, typhoid, amoebic dysentery, hepatitis
8. • Long-term planning to meet growing water demands
   • Implementing innovative/creative technologies, such as water harvesting and water recycling
   • Monitoring/ensuring water quality of stored water/water in dams and reservoirs/of supplied water/healthy dams.

Activity 5

2. Zimbabwe and Zambia
3. Sinyati River (Some atlases may not show this in detail; Google maps will show it)
4. yes
5. yes; it collects water from the catchment area surrounding it
6. Lake Kariba is approximately 220 km long
7. People are forced to move their homes, their work, their subsistence agriculture; wildlife has to be moved or it will drown.
8. development removal
9. Answers will vary. A suggested answer may include: Social results of a large lake are: loss of recreation, loss of housing, loss of wildlife, loss of agricultural land, villages and cultural history, but bird-watching and fishing will increase. Economical results are: tourism will grow because of bird-watching and fishing; commercial fishing and hydroelectricity will occur, there is the creation of industry and jobs, irrigation and farming because of abundant water.
10. the border between Zambia and Zimbabwe

Activity 6

1. There is so much of the blue oceans and seas visible from space.
2. Tiros, meteosat
3. In layers, an oceanographer can have the area of the Indian ocean, off the coast of Durban mapped in spatial extent, then a layer of its differing temperatures, and water density variations, and water depth, and ocean currents.
4. GIS could show: (1) the area; (2) the access routes; (3) the closest clinics.

Activity 7

1. Learners work independently and locate this on the map.
2. steep-sided gorge or ravine
3. move in a west direction
4. approximately 5 km (use a piece of twine along the path of the map)
5. No, people walk approximately 4 km in one hour. This may take longer because it is along the coast and care has to be taken. It also passes a stream entering the sea.
6. 40 m

7. There are two river mouths to negotiate: the Elandbos and Lottering Rivers. The contours are steep on either side of these mouths, making climbing a necessity and possibly swimming – depends on the tide.
8. Contours are closely packed which indicates steep slopes. This demands fitness and agility as you are climbing up and down all the time.
9. No. There are power/telephone lines near Oakhurst Hut but these are on the plateau above where you will be hiking.
10. A suggested answer would include: This area sustains the ecology as it is a nature reserve. There is no pollution or noise, and it is unspoilt. The views of the ocean and the river valleys will be lovely. It offers a place to enjoy recreation in a healthy way, and encourages eco-tourism.

Learner's Book pages 321–340

EXAMINATION PREPARATION

These exam papers help learners to prepare for the end-of-year examination. Learners can complete the papers in class or as homework. It is suggested that they complete them individually as a means of self-assessment.

You can write the answers on the board for learners and/or call them out where more appropriate. However, if possible, it is suggested that you photocopy the answers and give them to learners so that they have them for revision purposes.

Paper 1: Geographical knowledge

Marks: 225

Section A

Question 1 (75 marks)

1.1 One mark each.

1.1.1 O
1.1.2 N
1.1.3 K
1.1.4 L
1.1.5 M
1.1.6 D
1.1.7 I
1.1.8 G
1.1.9 E
1.1.10 C
1.1.11 S
1.1.12 Q
1.1.13 A
1.1.14 F
1.1.15 R

[15]

1.2

1.2.1 a) H (2)

b) D (2)

c) B (2)

d) G (2)

1.2.2 a) Any one of the following:

- causes increased incidence of skin cancers in humans (via DNA damage)
- causes eye cataracts in humans
- kills phytoplankton, disrupting marine food webs
- disrupts photosynthesis, reducing yields of crop plants (2)

b) The use of chlorofluorcarbons (CFCs) as propellants in aerosol cans and coolants in refrigerators (2). CFCs have been phased out and replaced with HFCs (2). (4)

1.2.3 a) It insulates the Earth or keeps it warm by trapping in some of the radiated heat. (2)

b)
- large-scale, intensive cattle farming (2)
- large-scale, intensive cultivation of rice (2) (4)

c) Any two of the following: (2 marks each)

- the burning of coal for power generation
- the burning of oil-based fuels for transport
- deforestation (4)

d) Increasing greenhouse gas emissions means that more terrestrial radiation is trapped, increasing the greenhouse effect (2). This leads to global warming – the slow and gradual increase in the Earth's average temperature – and climate change (2). Effects include melting of glaciers and polar ice, extreme weather and rising sea levels (2). (6)

[30]

1.3

1.3.1 convergent (1), ocean-to-continent (1) (2)

1.3.2 the Pacific Ring of Fire (2)

1.3.3 three (2)

1.3.4 stratovolcano/composite volcano (2)

1.3.5 it can still erupt/it erupted less than 300 years ago (2)

1.3.6 moment scale (2)

1.3.7 It measures the total energy of an earthquake by measuring not only size but also duration. (2)

1.3.8 Until the main earthquake has taken place, it is difficult to tell the difference between a small tremor or earthquake and a foreshock. (2)

1.3.9 A large destructive wave caused by an earthquake under the sea floor. (2)

1.3.10 Any two of the following:

- wash away and drowns people and animals
- damage settlements, buildings, roads, bridges and other infrastructure
- cause salt water infiltration, which can damage vegetation or crop plants
- deposit large amounts of debris that has to be cleared away (4)

1.3.11 The generators in the basement of the power station were damaged by tsunami flood water (2). This meant that the shut-down reactors overheated, leading to a nuclear explosion and radioactive contamination (2). (4)

1.3.12 As the Earth shakes, the walls or foundations of a dam can crack or break. (2)
1.3.13. Earthquakes can damage or topple telephone lines, cellphone masts and Internet cables. (2)
[30]

Question 2 (75 marks)

2.1 One mark each.
2.1.1 B
2.1.2 D
2.1.3 D
2.1.4 B
2.1.5 D
2.1.6 A
2.1.7 C
2.1.8 C
2.1.9 D
2.1.10 C
2.1.11 B
2.1.12 B
2.1.13 B
2.1.14 A
2.1.15 D
[15]

2.2
2.2.1 A – nitrogen (2), B – oxygen (2), C – argon/noble gases (2) (6)
2.2.2 Pressure caused by the weight of the air in the atmosphere pressing down on the Earth's surface. (2)
2.2.3 As altitude increases, the air molecules become further apart. (2) This is because the pull of gravity is not as strong as it is near the Earth's surface (2). (4)
2.2.4 9 km (2)
2.2.5 troposphere (2)
2.2.6 In the troposphere, temperature decreases with altitude. (This is because the further apart or less concentrated the air molecules become, the less heat is absorbed by terrestrial radiation) (2). At low temperatures, the precipitation is snow. (2)
2.2.7 Fresh, clean snow is white and so it reflects a large amount of insolation (2), i.e. snow has high albedo (2). (4)
2.2.8 Himalayas (2)
2.2.9 The Indian Plate/Indo-Australian Plate has converged with the Eurasian Plate (2), pushing up the edge of the plate at this boundary/convergent zone to form fold mountains (2). (4)
[30]

2.3
2.3.1 paragraphs 3 and 4 (2)
2.3.2 a) precipitation (2)
b) runoff (2)
c) limestone (2)
d) continental drift (2)
e) mantle (2)
f) subduction (2)

2.3.3 The evaporated water or water vapour must condense to form clouds. (2)

2.3.4 a) i) basalt (2)

ii) granite (2)

b) it is melted by heat (2)

c) an ocean trench (2) – for example the Mariana Trench (2) (4)

d) island arcs (2) – for example, the Philippine / Mariana / Tonga / Aleutian Islands (2) (Note: Any one example) (4)

[30]

Section B

Question 3 (75 marks)

3.1 One mark each:

a) glaciers
b) glacial lake outburst flood (GLOF)
c) warm
d) over-fishing
e) hydropower
f) flash flood
g) land reclamation
h) biotic
i) ecumene
j) equal to the death rate
k) per 1 000
l) too much consumption of scarce resources in one area
m) emigration
m) chosen
o) foreigners [15]

3.2

3.2.1 Strong winds along a cold current coast displace the sun-warmed, nutrient-depleted surface layer of water (2). Icy-cold, nutrient-rich water moves up from deep below to take its place (2). (4)

3.2.2 It supports the ocean food webs because it is the primary source of food in the oceans (2). It produces oxygen (2). (4)

3.2.3 Atlantic Ocean (2)

3.2.4 cold Benguela Current (2)

3.2.5 the cold upwelling provides nutrients for good growth or blooms of phytoplankton, on which other sea animals feed directly or indirectly (by feeding on other animals that eat phytoplankton) (2)

3.2.6 The east coast (2). The warm Mozambique Current warms the sea, which makes it pleasant for swimming (2). It also brings moisture to land, which means the coast has a warm climate with good rainfall (2). (6)

[20]

3.3

3.3.1 a) B (2)

b) A (2)

c) hydroelectricity/hydropower (2)

d) Any one of the following:
- it combines water storage/supply with electricity generation
- the electricity generated is carbon emissions-free (2)

e) Palmiet (2)

[10]

3.4

3.4.1 Answers can be either for or against, or a combination) may include:
- it is forced (1) because there is a weak economy in Afghanistan, no peace, no security, and little welfare available (1)
- it is forced (1) because it is as a direct result of war in Afghanistan (1)
- it is voluntary (1) because young males choose to work where they can get paid (1)
- It is voluntary (1) because it is 'seen to be a repeated one influenced by economic as well as historical, political and environmental causes', (1) which could be that in the past, climatic effects such as droughts or floods, or changes in government, have caused young men to emigrate to Iran. (4)

3.4.2 Any two of the following: the young age group takes risks (2); the young age group does not have responsibilities, such as homes or families (2); the young have energy (2). (4)

3.4.3 Any 2 of the following: women play a role in the background (2); they are not allowed to travel alone, do business alone, and in some cases not allowed to be educated (2). They would not be allowed or be able to emigrate and work (2) (4)

3.4.4 Any three of the following: negative effects in Afghanistan include a lack of young men of economically active age (2); a lack of young risk-takers (2); a lack of entrepreneurs (2); lack of strong workers (2); a lack of men of marriageable age (2); a possible lack of a family head and direct provider of food, security and money (2) (6)

3.4.5 Any two of the following: positive effects for Iran include plentiful workers (1); possibly a cheaper work force (1) (2)

3.4.6 Any two of the following: migrants may be targets of hatred (1), jealousy (1), and in extreme cases, violence (1); they may be deported (1) as many are illegal (1) (2)

3.4.7 a visiting worker (2)

3.4.8 yes (2) because the workers are there to work for short periods (2) OR no (2) because they have not been invited and many are illegal (2) (4)

3.4.9 Any one of the following: Lesotho to South Africa (2); Mozambique to South Africa (2) (2)

3.4.10 Any one of the following: Mexico to USA (2); North Africa to Europe (2) (2)

[30]

Question 4 (75 marks)

4.1 One mark each:

a) False
b) True
c) True
d) False
e) True
f) False
g) True
h) False
i) True
j) False [10]

4.2 One mark each:

a) discharge
b) interbasin transfer sheme/water transfer scheme
c) Total Fertility Rate
d) demography
e) ecumene [5]

4.3

4.3.1 Lesotho Highlands Water Project (2)

4.3.2 Katse Dam (2)

4.3.3 Carbon emissions-free electricity generated by falling water (which turns the turbines) (2)

4.3.4 Any two of the following:
- people have been displaced
- plants and animals have lost their habitat
- people have lost their livelihood, for example, they can no longer harvest plants or collect firewood from the dam-flooded area
- the natural flow of rivers has been disrupted, for example, rivers downstream of the dams are not as full as they used to be (4)

4.3.5 Gauteng (2)

4.3.6 Two marks for each reason:
- it has a large population, which needs water for domestic use (2)
- it is an industrialised province and industries such as mines and manufacturing and processing plants often use large amounts of water (2) (4)

4.3.7 Tugela-Vaal water scheme (2); water is transferred from the Tugela River to the Vaal River via the Sterkfontein Dam (2). (2)

[20]

4.4

4.4.1 15–59 = economically active (1) ; 0–14, and 60+ are the economically dependent (1) (2)

4.4.2 1990

4.4.3 Any two of the following: (conditions in Africa are harsh and people don't have a long life expectancy (2); malnutrition (2); HIV/AIDS (2); diseases such as cholera and malaria (2)

4.4.4 1950: 15–9 rises a little unevenly (1) from 1950 to a peak in 2005 and then descends in a projected decline (1); 0–14 rises from 1950 to 1965 (1) then evens out gradually, including the projected line until 2050 (1); 60+ rise evenly but not very steeply (1) from 1950 with a small plateau of stable growth in 1975 and 1980 (1). (6)

4.4.5 1995 (2)

4.4.6 Any one of the following: more elderly (2); more pensions to pay out (2); more social welfare needed (2); more homes for the elderly (2) (2)

4.4.7 Any one of the following: we view them as being on the same scale, which is incorrect (2); it gives a false picture (2) (2)

[20]

4.5 Give ½ a mark for each calculation:

North America $\frac{5}{100} \times \frac{360^o}{1} = 18^o$

Latin America and Caribbean $\frac{9}{100} \times \frac{360^o}{1} = 32{,}4^o$

North Africa and Middle East $\frac{6}{100} \times \frac{360^o}{1} = 21{,}6^o$

Sub-Saharan Africa $\frac{12}{100} \times \frac{360^o}{1} = 43{,}2^o$

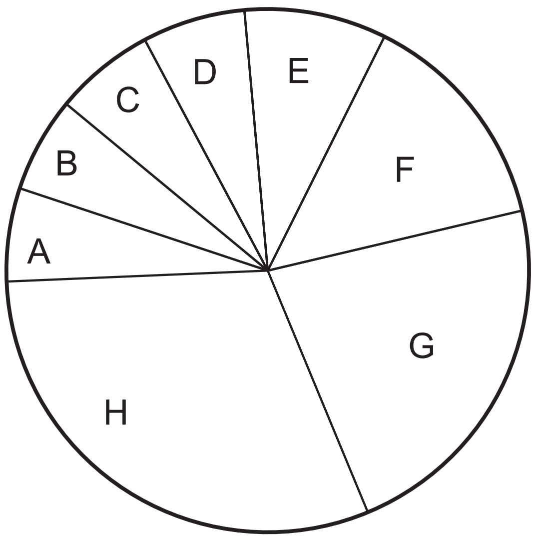
Western Europe $\frac{6}{100} \times \frac{360^o}{1} = 21{,}6^o$

Central, Eastern Europe and Central Asia $\frac{6}{100} \times \frac{360^o}{1} = 21{,}6^o$

East Asia and Pacific Area $\frac{32}{100} \times \frac{360^o}{1} = 115{,}2^o$

South Asia $\frac{24}{100} \times \frac{360^o}{1} = 86{,}4^o$

Give the pie-graph a mark out of six: (6)



Key

A North America
B North Africa and Middle east
C Western Europe
D Central, Eastern Europe and Central Asia
E Latin America and Caribean
F Sub-Saharan Africa
G South Asia
H East Asia and Pacific Area

[10]

4.6

4.6.1 (i) Social: disease causes disrupted families and orphans (2)

(ii) Economic: disease costs industry and commerce and the nation in absenteeism, re-training, low productivity (2) (4)

4.6.2 HIV/AIDS is transmitted in the womb and through breast-feeding (2)

4.6.3 This age group is the new sexually active group (2)

4.6.4 Any one of the following: there are very few doctors per 1 000 people (2); transport is difficult (2); there is no money for medication (2) (2)

[10]

[Total marks: 225]

Paper 2: Geographical skills and techniques

Marks: 75

Question 1 (one mark each)

1.1 False
1.2 False
1.3 False
1.4 False
1.5 True (5)

Question 2 (one mark each)

2.1 b
2.2 d
2.3 a
2.4 d
2.5 b (5)

Question 3 (two marks each)

3.1 g
3.2 e
3.3 f
3.4 d
3.5 a
3.6 b
3.7 c (14)

Question 4 (21 marks)

4.1 1 centimetre on the map (1) is equal to 10 000 cm in reality (1) (2)

4.2 1,5 cm on the orthophoto (2);
$\frac{1,5}{1} \times \frac{1}{10} = 0,15$ km (1);
0,15 km $\times$ 1 000 m = 150 m (1) (4)

4.3 SSW (2)

4.4 Approximately 203° (2)

4.5 203° + (2) 24°6′(2) = 227°6′(1) (5)

4.6 Spot heights 11 + 14 + 10 + 36 + 4 (2) = $\frac{75}{5}$ = 15 m (2) (4)

4.7 ‘W’ stands for ‘winkel’ or shop (2)

[21]

Question 5 (20 marks)

5.1 he has access to a water supply (2)

5.2 Any two of the following:
Wolwedans Dam (2); reservoirs (2); non-perennial rivers (2); irrigation furrows (2) (4)

5.3 flooding (2)

5.4 Any two of the following:
uneven topography (2); hills (2); marshy wetlands (2) (4)

5.5 sparsely populated (2); there are only a few farms shown on the map relative to the space (2) (4)

5.6 Any two of the following:
farms stand alone (2) with a couple of barns for storage (2), and a dam (2) for irrigation and clearly visible, large, cultivated fields (2). This can be seen on the topographic map and the orthophoto. Trees are used as wind-breaks (2); there are furrows for irrigation (2). These are signs of commercial farming because of the extent of the farm and the investment in it. (4)

Question 6 (10 marks)

6.1 Any one of the following:
wetlands absorb flood water (2); wetlands sustain eco-systems (2); wetlands are attractive to nesting birds (2) (2)

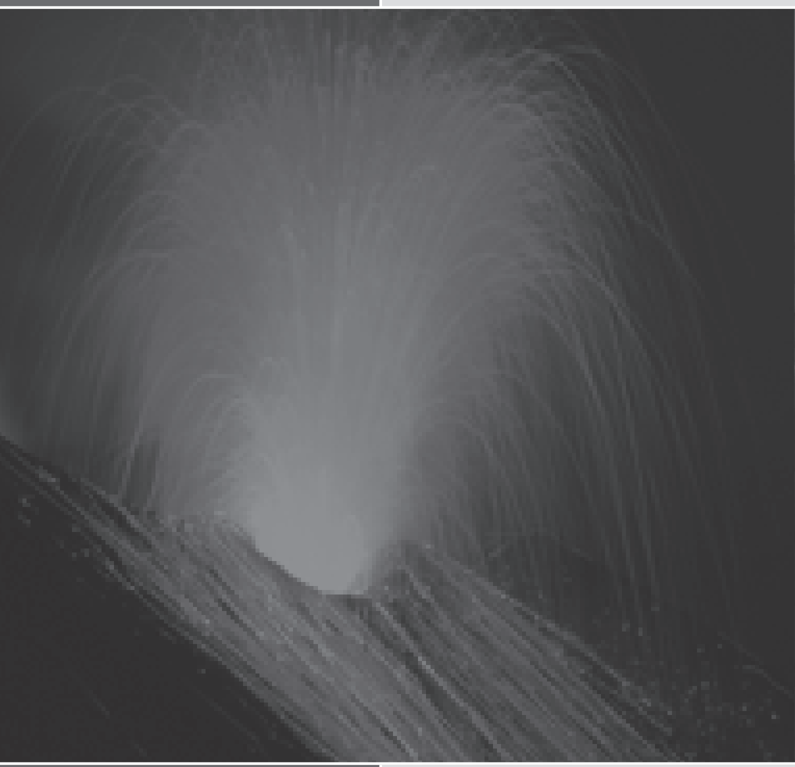
6.2 Any two of the following:
This area attracts tourists (2); this is a malaria-free area so tourists feel secure (2); it is easily accessible by air and road from George, Cape Town or Port Elizabeth (2); it is in a tourist enriched area so there are lots of other things to see here (2) (4)

6.3 Any one of the following:
wildlife is endangered by farming (2); urban expansion (2); and poaching (2) (2)

6.4 Any one of the following:
'H' for hospital (2); 'W' for winkel or shop (2); grey shaded urban settlement of Klipheuwel (2) (2)

[10]

3. FORMAL ASSESSMENT



1. ASSESSMENT IN GEOGRAPHY IN GRADE 10

Assessment in Grade 10 is made up of:
- informal or daily assessment
- formal assessment.

In *Study & Master Geography Grade 10*:
- informal assessment advice in given as part of the lesson guidance in the Lesson-by-lesson section (pages 18–192) of this Teacher's Guide
- formal assessment guidance and assessment tools are provided below.

2. PROGRAMME OF ASSESSMENT

The programme of assessment provided in *Study & Master Geography Grade 10* is in line with the Curriculum and Assessment Policy Statement for Geography and thus spreads out the formal assessment tasks throughout the year. It is made up of three tasks, two tests and two examinations. For promotion purposes, a year mark is added to the end-of-year examination mark. The year mark is made up of marks obtained in the tasks, tests and mid-year examination. This is reflected in the table below.

Term	Week	Type of formal assessment	Content and skills focus of assessment	Learner's Book and/or Teacher's Guide page reference	Total number of marks	Contribution to year mark
Term 1	8	Test	The atmosphere	Teacher's Guide pp. 213–216	40 or 60 marks*	10 marks
Term 1	10	Assessment Task 1	The atmosphere	Learner's Book p. 79; Teacher's Guide pp. 198–199	40 marks	20 marks
Term 2	7	Assessment Task 2	Geomorphology	Learner's Book p. 142; Teacher's Guide pp. 219–220	30 marks	20 marks
Term 2	9–10	Mid-year examination	Work covered in Terms 1 and 2	Teacher's Guide pp. 226–228 and 232–233	180 marks	20 marks
Term 3	8	Test	Population	Teacher's Guide pp. 225 and 222–225	40 or 60 marks*	10 marks
Term 4	4	Assessment Task 3	Water resources	Learner's Book p.295; Teacher's Guide pp. 207	30 marks	20 marks
Term 4	9–10	End-of-year examination	Work covered throughout year	Teacher's Guide pp. 236–247 and 254–257	300 marks	300 marks

* depends on which of the tests provided you choose

For more information on formal assessment, see the CAPS in Section 5 of this Teacher's Guide.

3. FORMAL ASSESSMENT: TASKS, TESTS AND EXAMINATIONS

Test — The atmosphere

TERM 1, WEEK 8

Geography topic: The atmosphere

Resources
Photocopies of either Test 1 (pages 213–216) or Test 2 (pages 217–218)

Background
- This test focuses on Module 1 of *Study & Master Geography Grade 10* and therefore should be scheduled for after the learners have completed this module and had time to do some revision activities. (See year plan on pages 6–7.)
- Allow between 45 minutes and 1 hour for the test, depending on your learners.
- The test is out of 40 marks or 60 marks, depending on which of the tests you choose. You will need to convert this to a mark out of 10 for this assessment to contribute to the year mark. (See page 261 ** footnote.)

Preparing the learners
- Remind the learners that they should answer all questions.

The test
You will find two tests on the 'the atmosphere' on pages 213–216 or 217–218 of this Teacher's Guide. You need to choose one of these for your class. You may photocopy the test. A marking memorandum for each test is supplied below.

Assessment guidance
Memorandum: Test 1 on The atmosphere (Teacher's Guide page 213)

1. One mark each:
   1. G
   2. F
   3. H
   4. A
   5. B
   6. D
   7. E
   8. C [8]
2. a) chlorofluorocarbons (1)

b) Any one answer: aerosol can (used as propellants); fridges and air conditioners (used as coolant) (1)

c) They destroy ozone/deplete the ozone layer (1), which exposes the Earth to higher levels of UV. (2)

d) Any one answer:
- CFC production was replaced with hydrofluorocarbons
- CFC production has been banned
- The Montreal Protocol was introduced to stop CFC production. (1)

e) the late 1980s (also accept 1990s) (1)

f) Any two of the following:
- Humans are the source of the problem and other environmental problems (1).
- Humans need to be phased out too (1).
- Humans will phase themselves out by mistake (1) if they damage the Earth irreversibly (1).
- Humans will be phased out by increased UV exposure (1), which leads to increased incidences of certain types of skin cancer (1). (2)

[8]

3. a) i) absorption (1)
ii) more heat (1)
b) The atmosphere is transparent to the Sun's short-waves (1). The Earth can absorb the short-waves, which it turns into long-waves (infrared heat). The atmosphere absorbs the long-wave heat radiated by the Earth (1). (2)
c) i) B convection; C evaporation/latent heat; D (terrestrial) radiation (3)
ii) greenhouse effect (1)

[8]

4. a) i) relief/orographic rainfall (1)
ii) relief/orographic rainfall (1)
b) it cools (1)
c) i) A (1)
ii) B (1)
d) B (1)
e) the north-west wind (1)
f) it's brought by the cold front system (1)

[8]

5. a) A cold air; B warm air (2)
b) True (1)
c) i) maximum temperature (1)
ii) dew point (1)
d) more (1)
e) 25 knots, north-west (or west north west) (2)

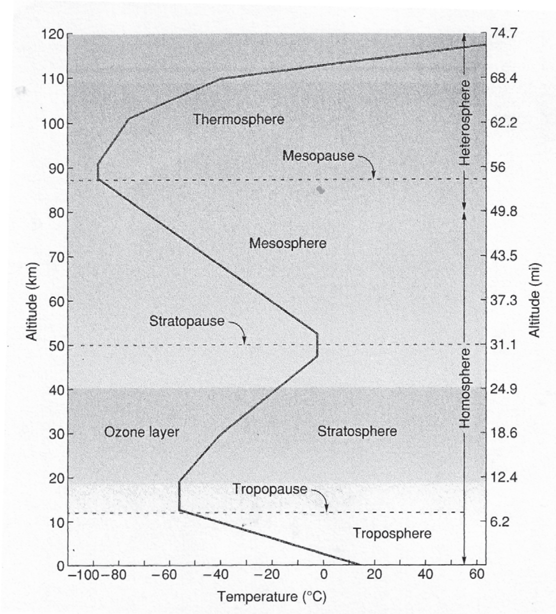
[8]

[Total marks: 40]

Memorandum: Test 2 on The atmosphere (Teacher's Guide page 217)

1. One mark each:
1.1 c
1.2 a
1.3 b
1.4 3
1.5 d [5]

2.



[10]

3. One mark each:
   3.1 thermosphere
   3.2 mesosphere
   3.3 troposphere
   3.4 stratosphere [4]

4.
   4.1 Ozone is a tri-atomic oxygen (1) molecule of blue gas (1). It protects us (1) from ultra-violet radiation from the sun (1). (4)
   4.2 Any two of the following: skin cancer; cataracts; damage to DNA; kills phytoplankton; disrupts photosynthesis. (2)

[6]

5. terrestrial radiation (1); evaporation and release of latent heat (1); convection (1); conduction (1) [4]

6. The Sun's rays strike the Earth at right angles at the equator (1)/ therefore the heat is distributed over a smaller surface area than at the Poles (1). The Sun's rays also pass through less atmosphere at the equator (1) and so lose less heat through absorption, scattering and reflection (1). [4]

7. The rate at which temperatures decrease (1) with altitude (1) [2]

8. The Benguela Current is a cold ocean current (1) and so causes temperatures to decrease in Cape Town (1). [2]

9.
   9.1 The insulating effect of gases (1) in the lower atmosphere (1) that absorb and trap radiated long-wave heat (1), keeping the Earth's average temperatures warm (1). (4)
   9.2 This is a good cartoon because just as the glass of a greenhouse allows short-wave solar radiation to pass through it (1), it traps long-wave terrestrial radiation, making the greenhouse warm (1). The greenhouse gases in the atmosphere allow short-wave solar radiation to pass through the atmosphere (1), but trap the long-wave terrestrial radiation, keeping the Earth warm (1). (4)

9.3 Any three of the following: carbon dioxide from burning fossil fuels (1); methane from flatulence in cows and rotting vegetation (1); emissions from factories (1); pollution from cars (1) (3)

[11]

10. Points that should be included in the paragraph. Any eight points:
    - Drought: Southern Africa is likely to become warmer and is at risk of drought (1).
    - This leads to decreased food production and famine (1).
    - Expanding deserts (1): As land becomes desert-like subsistence farmers lose their livestock and livelihood (1).
    - Floods (1): East Africa could experience higher rainfall and floods (1).
    - Rising sea levels (1): Low lying coastal areas are vulnerable (1).
    - Shrinking tropical glaciers (1): Mount Kilimanjaro's glaciers are shrinking (1). [8]

11.

11.1	United States and China	(2)
11.2	Developed countries are far more industrialised than developing countries.	(2)

[4]

[Total marks: 60]

Assessment Task 1 — The atmosphere

TERM 1, WEEK 10

Geography topic: Climate graphs (geographical skills and techniques)

Resources

- Learner's Book pages 79–80
- Quad or graph paper
- Rulers

Background

- This task focuses on Module 2 of *Study & Master Geography Grade 10* and therefore should be scheduled for after the learners have completed this module and had time to do some revision activities. (See year plan on page 8.)
- The skills covered in this task are drawing graphs; working with data and doing calculations; and analysing and synthesising information.
- Allow 1 hour of class time for the learners to begin the task. Learners who have not completed the task in class, should do so for homework.
- The task is out of 40 marks. You will need to convert this to a mark out of 20 for this assessment to contribute to the year mark. (See page 261 ** footnote.)

Preparing the learners

- Remind the learners that they should work on their own and answer all questions.
- Let them read through the task and ask questions about any part of the task that they do not understand.

- Remind them that they can consult Modules 1 and 2 in the Learner's Book if they need to.
- Give them a due date for their completed tasks.

The task

You will find Assessment Task 1 on pages 79–80 of the Learner's Book.
A marking memorandum is supplied below under the heading, Assessment guidance.

An alternative task is supplied on page 219 of this guide. You may photocopy this task. A marking memorandum for this task is also provided below under the heading, Assessment guidance.

Assessment guidance

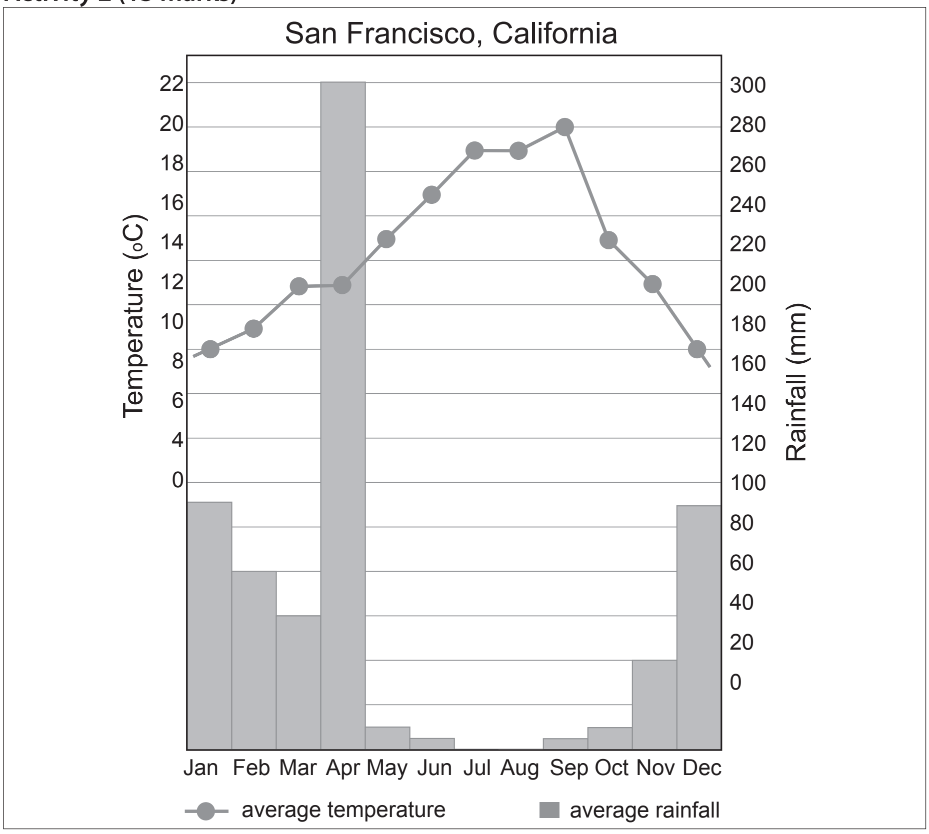
Memorandum: Assessment Task 1 (Learner's Book pages 79–80)

Activity 1 (12 marks)

1. temperature, rainfall, time (3)
2. June, July (1)
3. June, July (1)
4. Northern hemisphere (1)
5. The Northern hemisphere has its summer in June and July hence the hotter temperatures then. (1)
6. 45 °C (from –20 to 25) (1)
7. Manaus is 3 °S, which is almost on the equator and close to the sea, so there is very little variation (1). Winnipeg is 50 °N and far from the ocean, so the temperatures are extreme (1). (2)
8. Any two of the following: latitude; ocean currents; altitude; distance from the sea (2)

[12]

Activity 2 (13 marks)



[13]

Activity 3 (15 marks)

1. August and September (2)
2. Northern hemisphere, (1) as it has summer (1) in June, July, August and September (1). (3)
3. Winter (1), which is January, February, March (½) and, November and December (½). (2)
4. a Mediterranean climate (2)
5. Approximately 20 °C (2)
6. There is no rain in the summer (2) so this may cause droughts (1) or fires (1). (4)

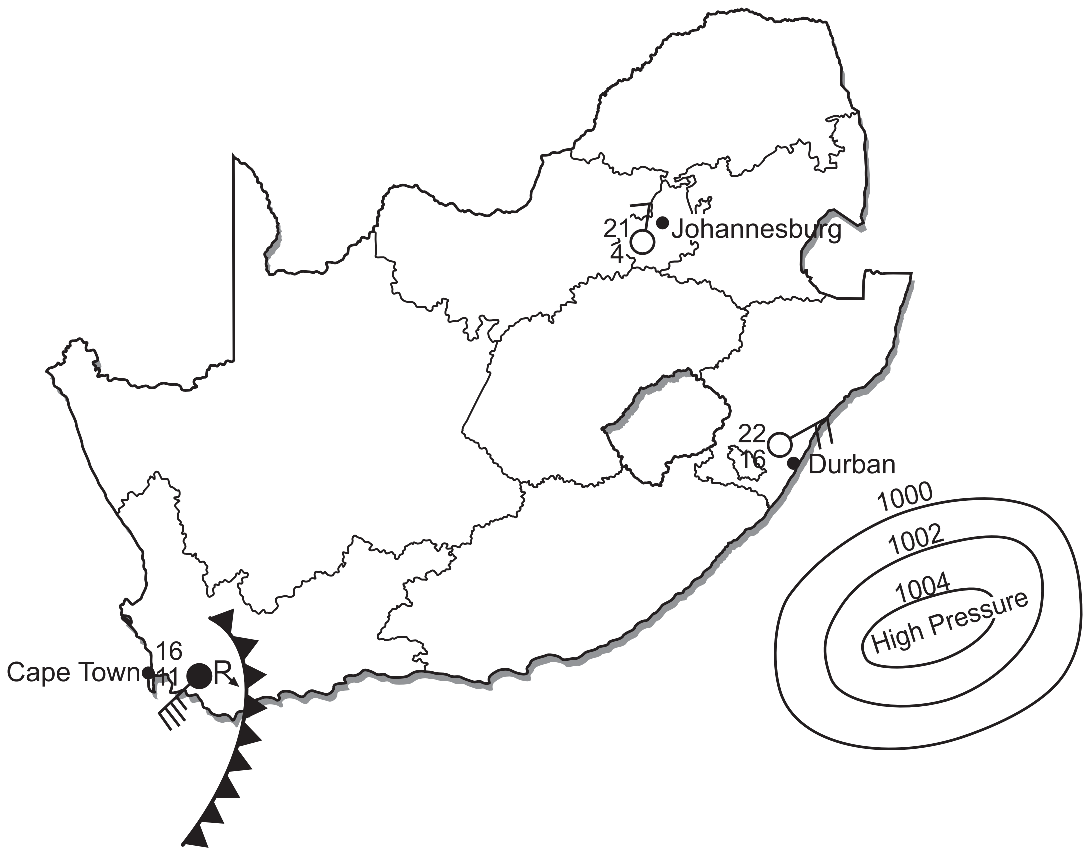
[15]

[Total marks: 40]

Memorandum: Alternative Assessment Task 1 (Teacher's Guide page 219)

Activity 1 (27 marks)

1. Sketching of map (2)
2. Labelling of cities (3)
3. Indicating of six atmospheric conditions for each city (18)
4. Drawing of high pressure cell (2)
5. Drawing of cold front (2)



[27]

Activity 2 (13 marks)

1. Durban: 6 °C; Johannesburg: 17 °C (2)
2. Johannesburg is landlocked and Durban is coastal (1). The sea has a moderating effect on the temperatures in Durban (1). (2)
3. Winter (1). The temperatures are low (1) and there is a cold front passing over Cape Town (1). (3)

4. Durban is affected by the warm Mozambique Current (1), and Cape Town by the cold Benguela Current (1). (2)
5. The temperatures are low (16 °C and 11 °C) (1); overcast conditions (1); thunderstorms (1); south westerly winds of 35 knots (1). (4)

[13]

[Total marks: 40]

Assessment Task 2 — Geomorphology (assignment)

TERM 2, WEEK 7

Geography topic: Geomorphology

Resources

Learner's Book pages 142–144

Background

- This task focuses on Module 3 of *Study & Master Geography Grade 10* and therefore should be scheduled for after the learners have completed this module and had time to do some revision activities. (See year plan on pages 9–10.)
- The skills covered in this task are reading and interpreting maps; labeling diagrams; analysing and synthesising information; and writing paragraphs.
- The questions for this task are mainly (although not exclusively) lower order questions (knowledge and remembering), which makes this a relatively easy task.
- Allow some class time in Week 7 to go through the task with the learners. Let the learners complete the task for homework.
- The task is out of 30 marks. You will need to convert this to a mark out of 20 for this assessment to contribute to the year mark. (See page 262 ** footnote.)

Preparing the learners

- Remind the learners that they should work on their own and answer all questions.
- Let them read through the task and ask questions about any part of the task that they do not understand.
- Remind them that they can consult Module 3 in the Learner's Book if they need to.
- Give them a due date for their completed tasks.

The task

- You will find Assessment Task 2 on pages 142–144 of the Learner's Book.
- A marking memorandum is supplied below under the heading, Assessment guidance.
- An alternative task is supplied on pages 220–221 of this guide. You may photocopy this task. A marking memorandum for this task is also provided below under the heading, Assessment guidance.

Assessment guidance

Memorandum: Assessment Task 2 (Learner's Book pages 142–144)

Activity 1 (16 marks)

1. a) extruded magma/molten rock that erupts from a volcano (1)
   b) the hollow at the top of a volcano (1)
   c) a very large crater formed by collapse or explosion of the top of a volcano (1)
   d) a volcano that is inactive, but not extinct/a volcano that has not erupted for a very long time (1)
   e) a volcano that does or still can produce lava (1)
2. stratovolcano/composite volcano (1)
3. Tanzania (1)
4. its animal wildlife; its grassland plains (any one) (1)
5. The volcanic ash hardens like cement in the rain, making it difficult for tree roots to penetrate deep into the soil. (2)
6. Tourists wish to see:
   - the spectacular volcanic mountains
   - the large herds of grazing animals and their predators that are supported by the grasslands – the volcanic ash makes the soil fertile (2)
7. a) A graben/rift valley; B horsts (2)
   b) block mountains. (1)
8. Lake Turkana (1)

[16]

Activity 2 (14 marks)

1. DRC or Rwanda (1)
2. It measures the total energy of large earthquakes – not only the size of the quake, but also the length/duration of the quake (2)
3. seismometer (1)
4. Define these terms:
   a) two parts of a plate or masses of rock are pulled apart; one part drops down (1)
   b) two parts of a plate or masses of rock are pulled in a direction that is parallel to the fault OR shearing of two parts of a plate or masses of rock so that they slide past each other (1)
   c) the point at the Earth's surface closest to the earthquake (1)
5. East Africa is a developing region. It does not have the infrastructure for easy evacuations or rescue and relief operations (2)
6. Volcanic activity and earthquakes are caused by movements/disturbances in the Earth's crust, which is broken up into tectonic plates (1). 65 million years ago, the African Plate began to split in two – the Nubian Plate (Plate A, that carries the bulk of the continent) (1) and the Somalian Plate (Plate B, which carries the horn of Africa) (1). A rift zone has formed (1) and continues to develop at this divergent continental-continental boundary (1). (5)

[14]

[Total marks: 30]

Memorandum: Alternative Assessment Task 2 (Teacher's Guide pages 220–221)

Activity 1 (10 marks)

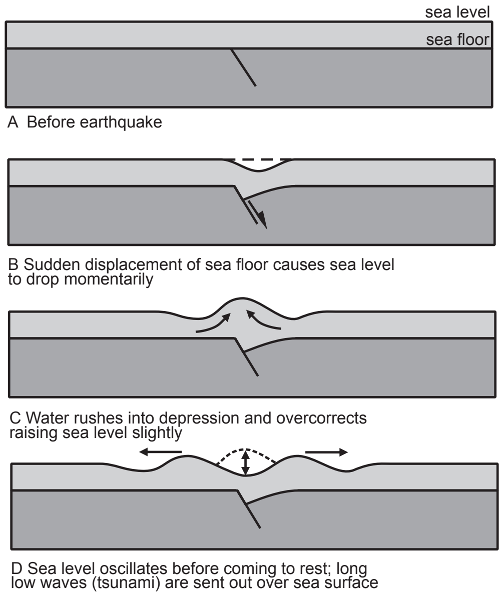
1. a) the Earth's crust
   b) the mantle
   c) outer core
   d) the inner core (4)

2. e) atmosphere
   f) sial (continent)
   g) sediments
   h) sima (ocean floor)
   i) Moho Discontinuity
   j) mantle (6)

[10]

Activity 2 (20 marks)

1. a) The Phillipine Plate, the North American Plate (1) and Eurasian Plate moved towards each other (1). (2)
   b) 8.9 (1) on the Richter scale (1) (2)
   c) A tsunami is a series of waves generated in the ocean by earthquakes when a sudden shift in the ocean floor occurs (1). They travel outward from the area of disturbance in concentric expanding rings (1). (2)
   d)



(8)

   e) Any six points: entire towns destroyed; loss of life; nuclear radiation threat; massive fires; infrastructure destroyed; communication networks destroyed; homes destroyed; shortage of food; shortage of medical supplies. (6)

[20]

[Total marks: 30]

Mid-year examination

TERM 2, WEEKS 9–10

Geography topics: The atmosphere, Geomorphology (geographic knowledge, skills and techniques)

Resources

- Photocopies of the mid-year exam (Teacher's Guide pages 227–229 and 233–234)
- Quad or graph paper

Background

- The mid-year examination focuses on all material covered in Terms 1 and 2 and the questions require lower order, middle order and higher order thinking skills from the learners. The examination is divided into two papers as follows:
  - Paper 1: focuses on geographical knowledge; all questions are compulsory; 1½ hours; total of 120 marks
  - Paper 2: focuses on geographical skills and techniques; all questions are compulsory; 1 hour; total of 60 marks
- The mid-year examination is out of 180 marks. You will need to convert this to a mark out of 20 for this assessment to contribute to the year mark. (See page 262 ** footnote.)

Preparing the learners

- At the beginning of Term 2, spend some time discussing with the learners the material they will need to cover in the examination.
- In week 4 or 5 of Term 2, spend some time discussing the format of the examination with the learners, including how much time they will be given to complete it. You can refer to the notes in the section, Background (above) to help you with this explanation.
- Remind the learners that they will need to revise all the work covered in Modules 1 to 4.
- Explain that the way that the examination is structured means that they will not be able to leave out any sections of work as they prepare for it.

The mid-year exam

You will find a mid-year examination that you could use on pages 227–229 and 233–234 of this Teacher's Guide. You may photocopy this examination.

Assessment guidance

You will find a memorandum for the mid-year exam on pages 230–232 and 235–236 of this Teacher's Guide. You may photocopy this memorandum if you wish.

Test — Population

TERM 3, WEEK 8

Geography topic: Population

Resources

Photocopies of one of the tests (pages 222–225)

Background

- This test focuses on Module 5 of *Study & Master Geography Grade 10* and therefore should be scheduled for after the learners have completed this module and had time to do some revision activities. (See year plan on pages 12–13.)
- Allow between 45 minutes and 1 hour for the test, depending on your learners.
- The test is out of 60 marks. You will need to convert this to a mark out of 10 for this assessment to contribute to the year mark. (See Recording and reporting, on page 211.)

Preparing the learners

- Remind the learners that they should answer all questions.

The test

You will find two tests on 'Population' on pages 222–225 of this Teacher's Guide. You may photocopy them. A marking memorandum for each test is supplied below under the heading, Assessment guidance.

Assessment guidance

Memorandum: Test 1 on Population (Teacher's Guide pages 222–223)

Question 1 (30 marks)

1. 6,8 billion (2)
2. South (2)
3. c) declining (2)
4. 2–2,5 billion people (2)
5. 9,1 billion people (2)
6. They are rising steeply or sharply upwards (1); the developed countries are stable or declining (1). (2)
7. No (1). The lesser-developed countries will continue to rise (1) before flattening (1) and finally declining (1). (4)
8. a) i) developing countries in stage 1 or 2 (2);
   ii) developed countries in stage 4 or 5 (2) (4)
   b) i) Developing countries are pre-industrial or just developing (1), with improvements in sanitation, nutrition, medicine all slowing down the death rate, but not the birth rate (1).
   ii) Developed countries have a lower or even contracting growth rate and zero population growth (1), or they may have a sub-fertility growth rate so that the replacement rate cannot be met and the population numbers decline (1). (4)
9. The South has a developing population but not the ability or money to develop its own resources (1); the North has a declining population, but an expanding need for the resources from the South (1). Economic problems in developing the infrastructure of the developing countries may occur (1); for the North there will be increasing economic competition and rising prices, or even wars, for control over and access to resources in the developing nations (1). Social problems for the South may include exploitation, poor wages, no education, poverty and illnesses (1); for the North – obesity, heart disease and pollution threaten society (1). (6)

[30]

Question 2 (10 marks)

Migration		Examples
1.	forced	j)
2.	emigration	h)
3.	economic labour	f)
4.	rural-urban	i)
5.	migrant labour	a)
6.	immigration	b)
7.	refugees	c)
8.	political	d)
9.	religious	g)
10.	regional	e)

[10]

[Total marks: 40]

Memorandum: Test 2 on Population (Teacher's Guide, pages 224–225)

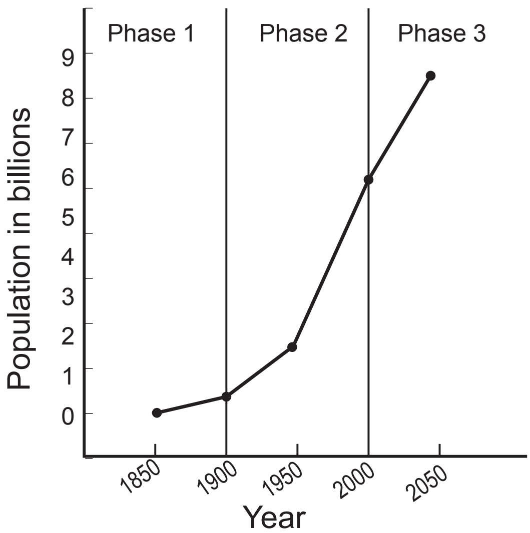
1. a) where people live in the world (2)
   b) the number of people living on each square kilometer in the world (2)
   c) areas where there is little sign of human or even animal life (2)
   d) the difference between the number of births per 1 000 people and the number of deaths per 1 000 people (2)
   e) the average number of children a woman will have (2)
   [10]

2. Population density = Total population of a country ÷ the area of the country [2]

3. a) Gauteng 7,35 × 1 000 000 ÷ 17 010 = 432,1 people per square kilometer (2)
   Northern Cape 0,84 × 1 000 000 ÷ 361 830 = 2,3 people per square kilometer (4)
   b) Gauteng
   c) Gauteng is highly urbanised (1) and people migrate to Gauteng in search of work/business opportunities (1). The Northern Cape is a chiefly rural province (1) with very few big towns (1). (4)
   [10]

4. a) There are fewer people between 0–14 years (½); more between 15 and 60 years (½) and then a decrease above 60 years (1). (2)
   b) developed (1); low birth rate and low death rate (1) (2)
   c) approximately 50%
   d) There will be a decrease in the total population. (2)
   e) There will not be enough people in the workforce (1) to sustain the country economically (1). (2)
   f) A high birth rate and high death rate (1) so it would be triangular shaped (1). (2)
   [14]

5. a)



(6)

b) Phase 1: Pre-1900 (1): small population growth (1) due to high birth and death rates (1) due to early stages of development of science and medicine (1). (4)
   Phase 2: 1900–2000 (1): 1900–1950 – slightly larger growth in population (1); 1950–2000 – enormous increase in population (1) due to vast advances in technology (1) which lead to lower death rates and higher birth rates (1). (5)
   Phase 3: 2000-2050 (1): tapering off of increase in population (1) due to increasingly materialistic lifestyles of people (1) – lower birth rates and death rates (1). (3)

c) China's (1) one child only policy (1); Kenya (1) developed a family planning campaign (1); India (1) encouraged women to develop economically, academically and socially (1). (6)

[24]

[Total marks: 60]

Assessment Task 3 Water resources (case study)

TERM 4, WEEK 4

Geography topic: Water resources

Resources

Learner's Book pages 295–297

Background

- This task focuses on Module 7 of *Study & Master Geography Grade 10* and therefore should be scheduled for after the learners have completed this module and had time to do some revision activities. (See year plan on pages 13–15.)
- The skills covered in this task are reading and interpreting graphs; analysing and synthesising information; working with data and doing calculations; writing paragraphs; expressing and supporting a point of view.
- The questions for this task are mainly middle order questions (understanding and applying), which makes this a challenging task.
- Allow 1 hour of class time for the learners to begin the task. Learners who have not completed the task in class, should do so for homework.
- The task is out of 30 marks. You will need to convert this to a mark out of 20 for this assessment to contribute to the year mark. (See page 262 ** footnote.)

Preparing the learners

- Remind the learners that they should work on their own and answer all questions.
- Let them read through the task and ask questions about any part of the task that they do not understand.
- Remind them that they can consult Module 7 in the Learner's Book if they need to.
- Give them a due date for their completed tasks.

The task

You will find Assessment Task 3 on pages 295–297 of the Learner's Book. A marking memorandum is supplied below under the heading, Assessment guidance.

An alternative task is supplied on page 226 of this guide. You may photocopy this task. A marking memorandum for this task is also provided below under the heading, Assessment guidance.

Assessment guidance

Memorandum: Assessment Task 3 (Learner's Book pages 295–297)

1. An allocation of 60 kilolitres of free water every month (1) to needy households (1). (2)
2. It formed a Water Services Trust which has upgraded infrastructure and developed a plan and strategy for water use (1). It is recycling water – sewage effluent water is treated and sold to the mines (1). (Water for mine operations does not need to be high-quality drinking water). (2)
3. a) i) about 55% (1)
   ii) about 78% (1)
   b) Any two of the following: community standpipes; boreholes; water from pools, streams; springs (2)
4. a) Polokwane – 10 kilolitres; Rustenburg – 12 kilolitres (2)
   b) increases; increases OR decreases; decreases (2)
   c) Polokwane (1)
   d) 12 kilolitres – 10 kilolitres FBW = 2 kilolitres
   2 kilolitres at R5,10 per kilolitre = R10,20 (2)
   e) i) 12 kilolitres × R5,68 per kilolitre = R68,16 (2)
   ii) 50% of R68,16 = R68,16 × 50/100 = R34,08
   (or just divided by 2) (2)
   iii) R0 (1)
5. a) i) 14% + 10% + 7% = 31% (accept answers that range from 28% to 34% to allow for approximate readings of values from the bar graph) (2)
   ii) 21% + 26% + 14% = 61% (accept answers that range from 58% to 64% to allow for approximate readings of values from the bar graph) (2)
   b) Rustenburg (1)
6. Here is an example paragraph; other possible/valid points are listed below. Learners need to include 5 points.
   Providing free basic water is a challenge to municipalities for two main reasons:
   1) the cost of free basic water has to be recovered from elsewhere – for example, from other municipality revenue or from the those who can afford to pay more for their water to subsidise the poor. (1)
   2) fair assessment of the income or means of households is a big, expensive administrative task. (1)
   I think South Africa has made good progress with water services delivery because:
   - the free basic water policy means that most households in towns or informal settlements get at least some safe water, which is better than nothing (1)
   - a lot more South Africans have access to water now than ever before (1)

- it is very expensive and impractical to supply tapped water to every scattered rural household. (1)

Other valid points are:

Providing free basic water is a challenge to municipalities because:

- There is the problem of what to do when poor households use more than their free basic quota. Although this is usually because households have a high number of occupants and the allowance per person is low, it can encourage a culture of non-payment where citizens could expect services for free.

South Africa has made good progress with water services delivery because:

- The country's Constitution has enshrined access to safe water as a basic need and taken action to achieve this – it is a human rights success story.

South Africa has not made good progress with water services delivery / could have made better progress because:

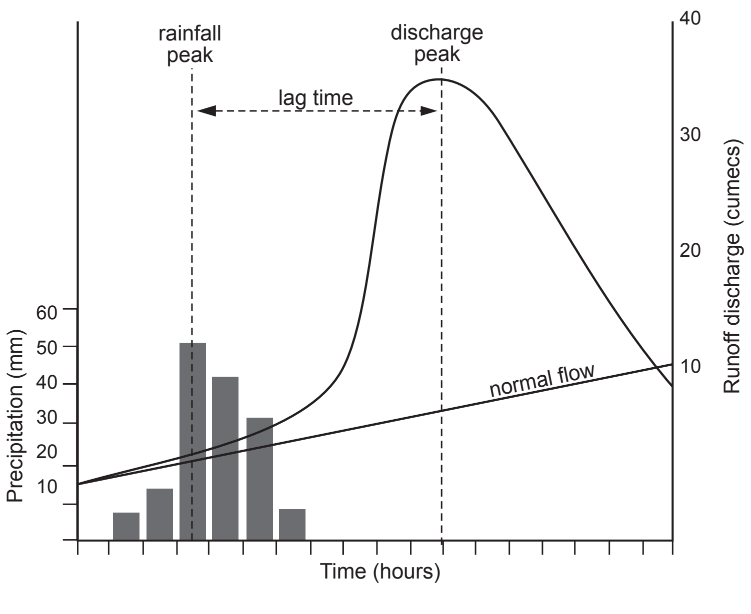
- Many households still do not have access to piped water (1). For example, according to 2009 figures (see the graph in the section headed, 'Proportion of households with piped water', on page 296 of the Learner's Book), only 55% of residents in the Polokwane municipality have access (1). (Note that most of these are rural residents in scattered settlements.)
- The free basic water allowance of 6 kilolitres per month is too low for households with a high number of occupants or AIDS patients. These households could run out of water before the end of the month.
- There are problems with water quality. In some municipalities, the quality of piped water is much better than in others. (5)

[Total marks: 30]

Memorandum: Alternative Assessment Task 3 (Teacher's Guide page 226)

Activity 1 (15 marks)

1. A graph that measures the change in a river's discharge (1) over time (1). (2)
2. A flood hydrograph shows how a river responds after heavy rainfall (1). It is used by hydrologists to help them predict floods (1). (2)
3. 1 mark per correct item drawn and labelled on the diagram. (7)



4. Discharge is a measure of the volume and speed (1) of water flow (1). (2)
5. cumecs (1) – cubic metres per second (1) (2)

[15]

Activity 2 (15 marks)

The following nine points should be included in the learners' essays:

- Every second, the urban population grows by two people.
- 493 million people in cities share their sanitation.
- One out of four city residents worldwide lives without access to improved sanitation.
- A lack of safe water and sanitation in cities leads to cholera, diarrhoea and malaria.
- 95% of the urban population growth in the next decades will take place in the developing world.
- In Africa and Asia the urban population will double between 2000 and 2030.
- 827,6 million people live in slums often lacking adequate drinking water and sanitation facilities.
- 250 to 500 cubic metres of drinking water leaks from the supply systems in many megacities each year.
- A slum dweller in Nairobi pays 5 to 7 times more for a litre of water than the average North American. (9)

Learner's own three points. (3)

Marks for the appropriate style of writing as well as spelling and grammar usage. (3)

[15]

[Total marks: 30]

End-of-year examination

TERM 4, WEEKS 9–10

Geography topics: The atmosphere, Geomorphology, Population, Water resources (geographic knowledge, skills and techniques)

Resources

Photocopies of the end-of-year exam (pages 237–247 and 254–258)

Background

- The end-of-year examination focuses on all material covered in the year and the questions require lower order, middle order and higher order thinking skills from the learners. The examination is divided into two papers as follows:
  - Paper 1: focuses on geographical knowledge; 2½ hours; total of 225 marks. There are two sections to the paper, each of which has two questions. Learners must answer one question from each section and a third question from either section.
  - Paper 2: focuses on geographical skills and techniques; all questions are compulsory; 1½ hours; total of 75 marks.
- The end-of-year examination is out of 300 marks. The year mark is added to this to create a final mark for Geography for promotion purposes. (See page 264.)

Preparing the learners

- At the beginning of Term 4, spend some time discussing with the learners the material they will need to cover in the examination.
- In week 4 or 5 of Term 4, spend some time discussing the format of the examination with the learners, including how much time they will be given to complete it. You can refer to the notes in the section, Background (above), to help you with this explanation. Refer the learners to page 321 of the Learner's Book where this information appears.
- Remind the learners that will need to revise all the work covered during the year.
- Explain that the way that the examination is structured means that they will not be able to leave out any sections of work as they prepare for it.

The end of year exam

You will find an end-of-year examination that you could use on pages 237–247 and 254–258 of this Teacher's Guide. You may photocopy this examination.

Assessment guidance

You will find a memorandum for the end-of-year exam on pages 248–253 and 259–260 of this Teacher's Guide. You may photocopy this memorandum if you wish.

4. RECORDING AND REPORTING

The results of all formal assessments should be recorded and are used for reporting on learners' performance each term. The Programme of assessment (page 194) details how the learner's Geography mark for each term is calculated.

The following photocopiable assessment recording tools are provided in this guide:

- Record sheet for formal assessment: Term 1 (page 261)
- Record sheet for formal assessment: Term 2 (page 262)
- Record sheet for formal assessment: Term 3 (page 263)
- Record sheet for formal assessment: Term 4 (page 264)

Reporting on the learners' progress in Geography should be done using the following rating codes and descriptors:

Rating Code	Description of competence	Percentage
7	Outstanding achievement	80–100
6	Meritorious achievement	70–79
5	Substantial achievement	60–69
4	Adequate achievement	50–59
3	Moderate achievement	40–49
2	Elementary achievement	30–39
1	Not achieved	0–29

5. PHOTOCOPIABLE ASSESSMENT RESOURCES

The following assessment resources may be photocopied for use with *Study & Master Geography Grade 10*.

Time: 45 minutes	**Test 1** The atmosphere
	TOTAL MARKS: 40

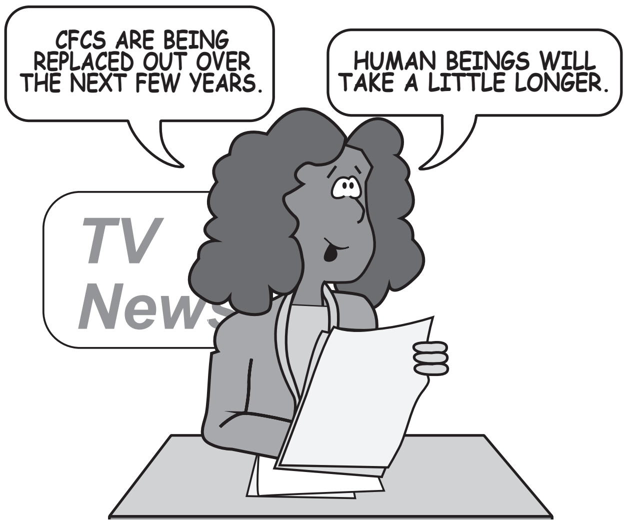
Answer all the questions.

1. Match the term with the correct definition or example. Write down only the number and the correct letter.

Term		Definition/Example	
1.	stratosphere	A.	methane
2.	mesosphere	B.	the temperature a pocket of air must reach before condensation can take place
3.	chlorofluorocarbon	C.	lines of equal atmospheric pressure
4.	greenhouse gas	D.	the height a pocket of air must reach before condensation can take place/a cloud can form
5.	dew point	E.	units of atmospheric pressure
6.	condensation level	F.	the layer of the atmosphere in which the temperature decreases with altitude
7.	hectopascals	G.	a layer of the atmosphere in which temperature increases with altitude.
8.	isobars	H.	freon

[8]

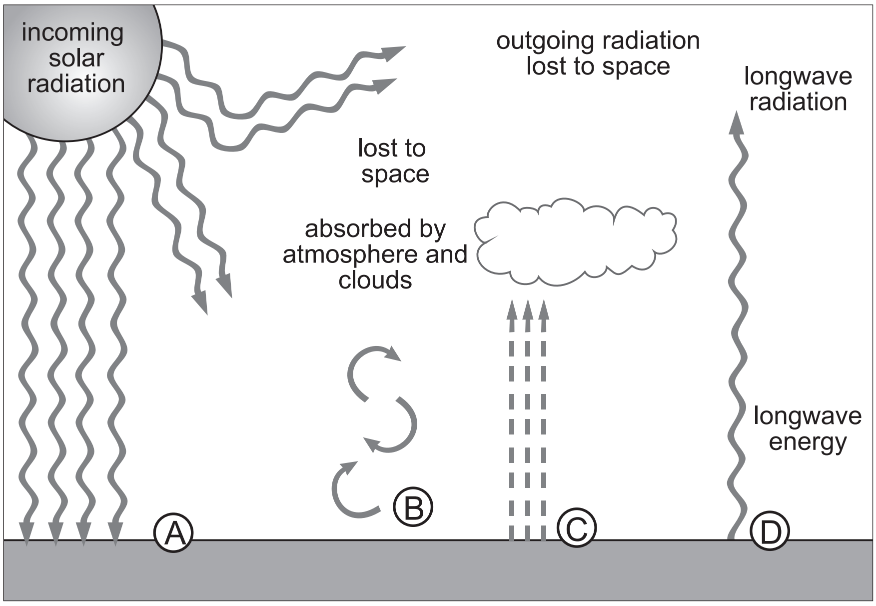
2. Refer to the cartoon.



a) What does CFCs stand for? (1)
b) Give one source of CFCs. (1)
c) Explain why CFCs are a problem. (2)
d) How were CFCs phased out? (1)
e) When did the phase-out begin? (1)
f) Why is the last sentence funny? Give your interpretation. (2)

[8]

3. Refer to the diagram below that shows heating of the Earth and the atmosphere.



a) Incoming sunlight is scattered, reflected and absorbed.
   i) Which process is shown in A? (1)
   ii) If a surface has a low albedo, will it take up more heat or less heat? (1)

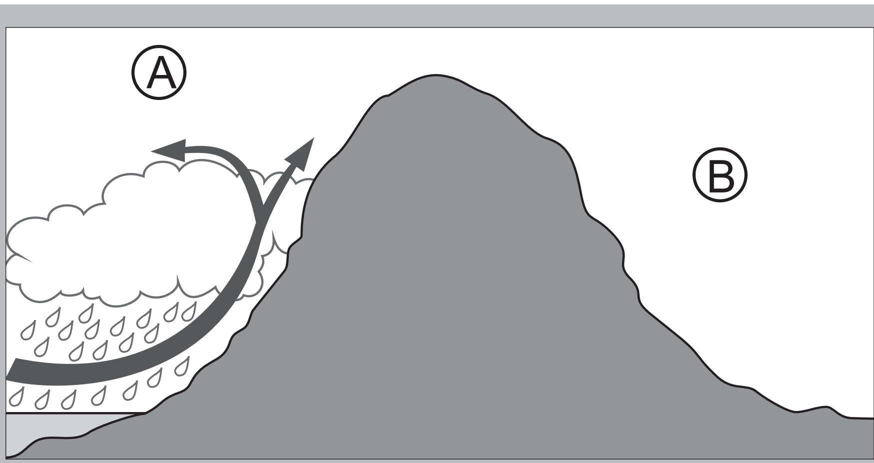
b) The atmosphere is heated by outgoing heat from the Earth rather than by incoming sunlight. Why is this? (2)

c) The Earth heats up the atmosphere in four ways: by radiation, conduction, convection and evaporation (as a store of latent heat).
   i) Identify which of these processes is shown in B, C and D. (3)
   ii) Give the term that explains in a nutshell how the atmosphere keeps the Earth warm or prevents it from losing all its heat. (1)

[8]

4. Read the extract and refer to the diagrams.

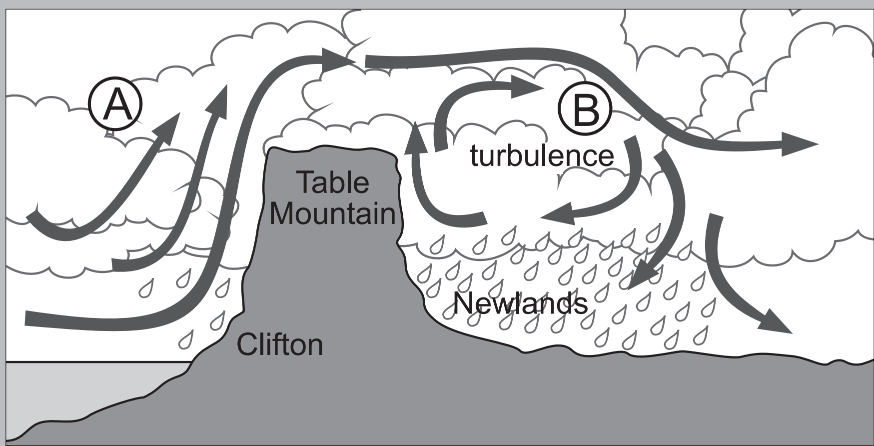
> Rainfall around the Cape Peninsula varies a lot. Newlands is one of the wettest suburbs with an annual rainfall of more than 2 000 mm, while only 30 km away on the Cape Flats, the airport receives only about 550 mm.
>
> The mountains play a very significant part in the distribution of rain. Often, mountains create their own weather.
>
> Usual geographic theory tells us that when an onshore wind that carries moisture meets a mountain, it will rise. The moisture will condense and it will rain on the windward side. The leeward side remains dry because the moisture can't rise up and over the mountain, which acts as a barrier. This is typical of the George-Oudtshoorn area.



Typical mountain rainfall – for example, George-Oudtshoorn area

Now let us look at the unusual scenario in Cape Town in winter, when a fresh to strong north-westerly wind is blowing. As Table Mountain is not too high, the airflow is able to go up and over the mountain. As it is forced up, the moisture condenses and most of the rain falls over Newlands, where the air rises highest. As the air mass moves away from the mountain, the upward push is no longer there and the rainfall decreases further away from the mountain.

Also, the mountain causes great wind turbulence on this side.

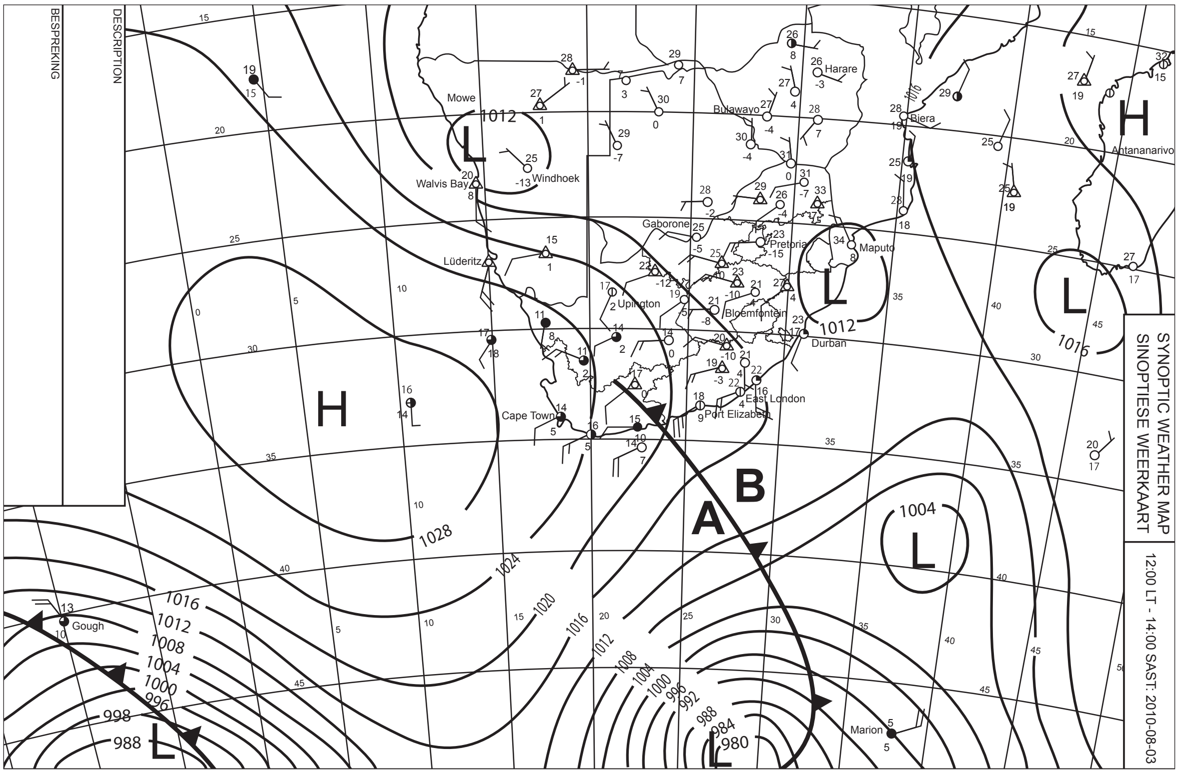


Unusual Table Mountain rainfall

Source: www.1st weather.com/regional/education/winterain.shtml

a) Identify the type of rainfall mechanism for:
   i) the George-Oudtshoorn area (1)
   ii) Table Mountain (1)
b) Why does moisture in the air condense as the air rises? (1)
c) For the labels A and B on the diagrams, which is:
   i) the windward side? (1)
   ii) the leeward side? (1)
d) Which is the rainshadow in the George-Oudtshoorn diagram – A or B? (1)
e) Which wind brings winter rain in Cape Town? (1)
f) Why does Cape Town/Western Cape get winter rain? (1) [8]

5. Refer to the synoptic map.



a) Match A and B to the warm and cold air masses shown for the cold front. (2)

b) Is this statement True or False: Another term for a cold front is a mid-latitude cyclone. (1)

c) For the temperatures for Upington:
   i) What is the 17 °C? (1)
   ii) What is the –2 °C? (1)

d) Compare the set of temperatures for Upington with the set of temperatures for Mossel Bay or Springbok. Complete this statement by choosing the correct option:
   - The closer the two temperatures, the <u>more</u>/<u>less</u> cloud cover there is. (1)

e) Give the wind speed and direction for Port Elizabeth. (2)

[8]

Time: 45 minutes	Test 2 — The atmosphere
	TOTAL MARKS: 60

Answer all the questions.

1. Choose the correct definition in Column B to match the term in Column A. Write down only the numbers and letters.

	Term		Definition
1.1	Relative humidity	a)	The temperature at which condensation takes place.
1.2	Dew point	b)	When water vapour cools and changes into tiny droplets.
1.3	Condensation	c)	The amount of water vapour in the air compared to how much water vapour the air can hold at a specific temperature.
1.4	Saturated air	d)	The amount of water vapour in the air.
1.5	Humidity	e)	When the amount of water vapour entering by evaporation equals the amount leaving by condensation.

[5]

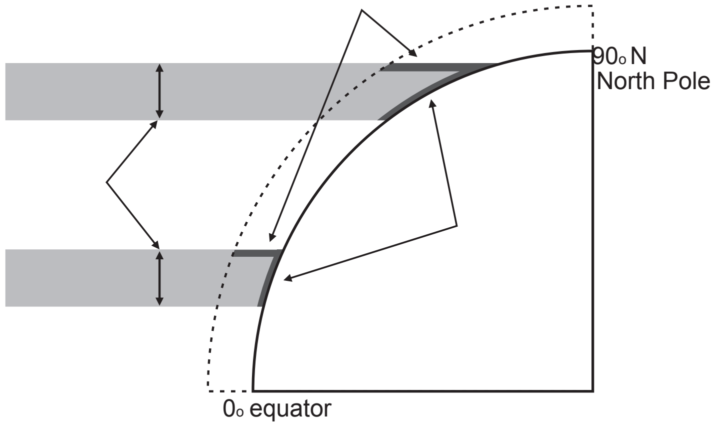
2. Draw a diagram of the structure of the atmosphere and fill in the following labels:
   2.1 the seven different layers of the atmosphere (7)
   2.2 a line showing the changes in temperature (2)
   2.3 the layer in which ozone is found (1)
   [10]

3. Name the layer of the atmosphere that relates to the following:
   3.1 the auroras or northern lights form here
   3.2 stretches 80–90 km above the Earth's surface
   3.3 this layer is the source of Earth's weather
   3.4 the reaction between sunlight and the ozone takes place here [4]

4.
   4.1 What is ozone and why is it important? (4)
   4.2 Name two effects of ozone depletion. (2)
   [6]

5. List four ways in which the Earth heats up the atmosphere. [4]

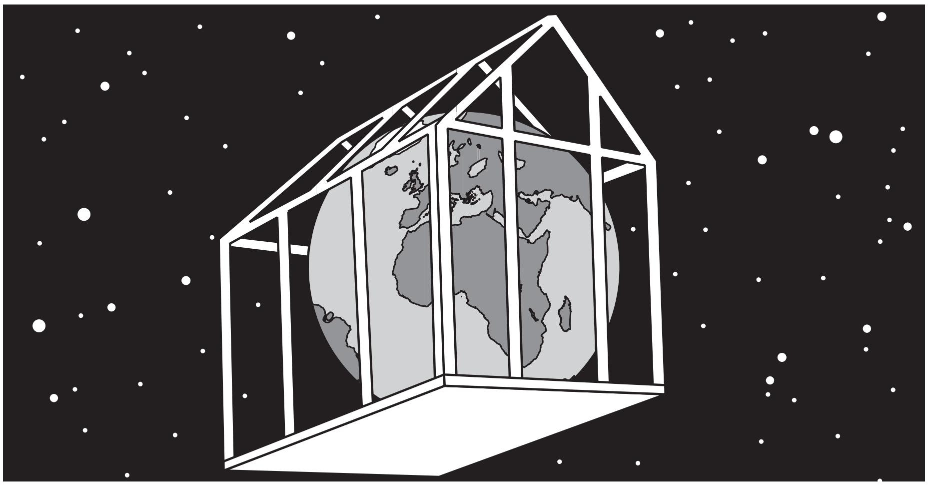
6. Use the diagram below to write a description on the effect of latitude on temperature. [4]



7. What is the 'temperature lapse rate'? [2]

8. How does the Benguela Ocean Current affect temperatures in Cape Town? [2]

9.
   9.1 Define the greenhouse effect. (4)
   9.2 Look at the Greenpeace cartoon below. Why is it a good cartoon about greenhouse gases? (4)



   9.3 Name three causes of greenhouse gases. (3)
[11]

10. Write a paragraph on the impact of climate change in Africa. [8]

11.
   11.1 Which two countries are the largest carbon emitters? (2)
   11.2 Discuss why the carbon emissions in developed countries differ from those in developing countries? (2)
[4]

Assessment Task 1 — The atmosphere

TOTAL MARKS: 40

Activity 1: Constructing a synoptic weather map

Use a blank piece of A4 paper and an atlas to construct a basic synoptic weather map.

1. Draw a sketch map of the outline of South Africa. (2)
2. Use an atlas to locate and label the position of Johannesburg, Durban and Cape Town on your sketch map. (3)
3. Indicate the atmospheric conditions for each of these cities by means of a weather station model. Use the data given in the table. (18)

	Maximum Temperature	Dew Point Temperature	Cold cover	Precipitation	Wind Direction	Wind speed
Johannesburg	21 ºC	4 ºC	0/8	none	northerly	10 knots
Cape Town	16 ºC	11 ºC	8/8	thunderstorms	south-westerly	35 knots
Durban	22 ºC	16 ºC	0/8	none	North-easterly	20 knots

4. On your map, with the use of isobars, draw a high pressure cell off the east coast of South Africa. (2)
5. On your map, use the correct symbol to show a cold front passing over Cape Town. (2)

[27]

Activity 2: Synoptic weather map interpretation

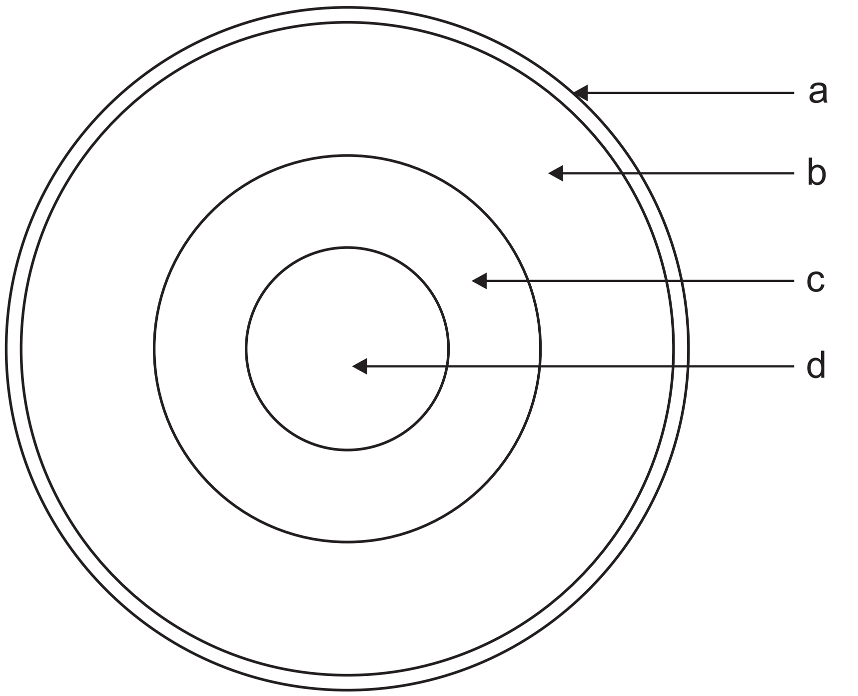
Use the synoptic weather map that you have constructed to answer the following questions:

1. Calculate the temperature ranges for Durban and Johannesburg. (2)
2. What factor caused the difference between the temperature ranges of these two cities? (1)
3. Which season is represented by your synoptic weather map? Give a reason for your answer. (4)
4. Which two ocean currents affect the temperatures in Durban and Cape Town respectively? (2)
5. How has the cold front affected weather in Cape Town? (4)

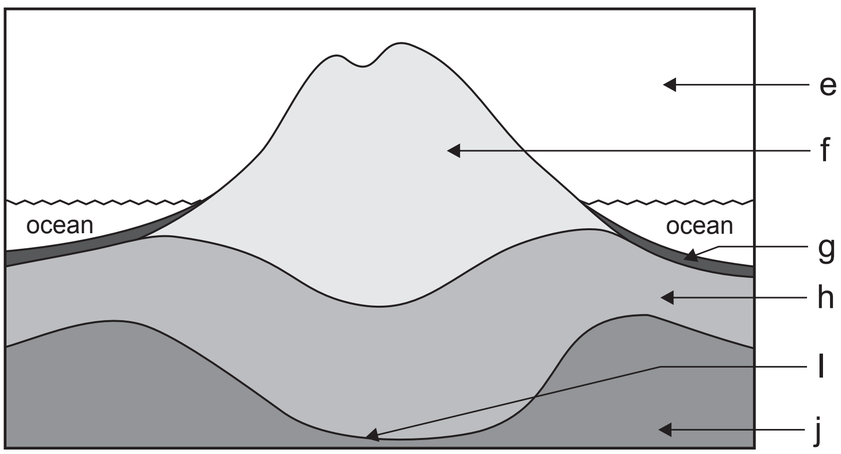
[13]

Activity 1: Labeling the internal structure of the Earth and the Earth's crust

1. This diagram is a cross-section of the internal structure of the Earth. Supply labels (a) to (d). (4)



2. This diagram represents the outer layer of the Earth. Supply labels (e) to (j). (6)



[10]

Activity 2: Interpretation of earthquakes and tsunamis

1. Read the newspaper article below and answer the questions that follow.

> Japan is counting the cost today after its worst recorded earthquake triggered a devastating tsunami. At least 450 people have died, with 300 bodies found on the north-eastern coast, and hundreds still missing. A state of emergency was declared at a nuclear plant after cooling systems failed. Entire towns have been destroyed and massive fires have spread out of control. Ten-metre waves slammed into the north-eastern coast of Japan. A cruise liner packed with passengers has disappeared, while one of the country's legendary bullet trains was swept away. After the 8.9 magnitude quake struck, South Africans living in Yokohama described how they had been battered by tremors and shocks.
>
> *Source*: *Cape Argus*, 12 March 2011

a) What caused the earthquake in Japan? (2)
b) What was the magnitude of the earthquake? (2)
c) Why did a tsunami develop? (2)
d) With the aid of a diagram describe how a tsunami, like the one off the east coast of Japan, is formed. (8)
e) Describe the consequences of the earthquake for the people of Japan. (6)

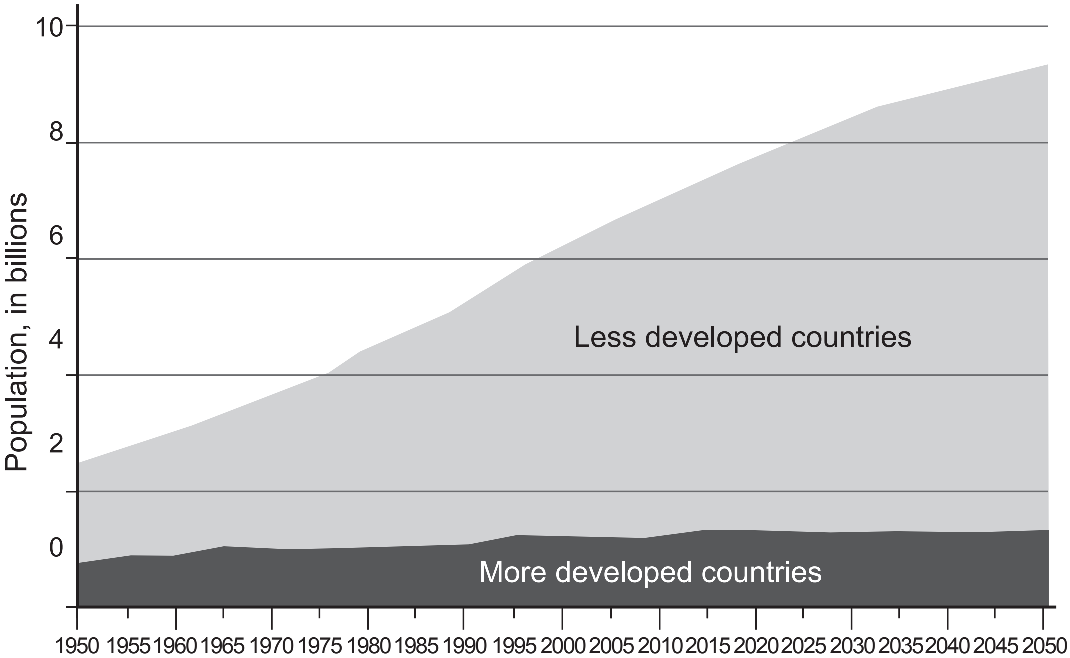
[20]

Time: 45 minutes	Test 1	Population
	TOTAL MARKS: 40	

Answer all the questions.

Question 1

World Population Growth 1950–2005



1. In 2010, what was the approximate number of people living in the world, in billions? (2)
2. Are most of these people living in the developed North or the lesser developed South? (2)
3. In the developed countries of the world, has growth been (a) steep, (b) steady, or (c) declining? (2)
4. In 1950 approximately how many billions lived in the developed nations of the world? (2)
5. By 2050, how many billions will be living in the more developed nations? (2)
6. What dissimilarity between the North-South do you notice in the line graph for the lesser-developed countries of the world? (2)
7. In your opinion, is it likely that the trend line for the lesser-developed countries will flatten or drop? (4)
8. a) What stage of the demographic transition model are: (i) the developing countries of the world, and (ii) the developed countries? (4)
   b) Explain your answer for (i) and (ii). (4)
9. Summarise the social and economic problems that will be facing the world in 2020 because of the difference between the population growth rates found in both areas. (6)

[30]

Question 2

Correctly match the types of migration in Column A to the examples in Column B. Write down only numbers and letters.

	Migration		Examples
1.	forced	a)	Lesotho workers on South African mines
2.	emigration	b)	policy favoured by Australian government
3.	economic labour	c)	flow of people from Zimbabwe into South Africa
4.	rural-urban	d)	movement of French Huguenots away from France
5.	migrant labour	e)	seasonal movement of fruit pickers
6.	immigration	f)	temporary use of foreigners for skilled work projects
7.	refugees	g)	division of India into Hindu and Muslim areas, 1947
8.	political	h)	'brain drain' from South Africa prior to 1994
9.	religious	i)	movement of people to job opportunities in towns
10.	regional	j)	movement of the Jewish people from Europe, 1939

[10]

Time: 45 minutes	**Test 2**	**Population**
	TOTAL MARKS: 60	

Answer all the questions.

1. Define the following terms:
   a) Population distribution
   b) Population density
   c) Non-ecumene areas
   d) The natural increase in population
   e) Fertility rate [10]

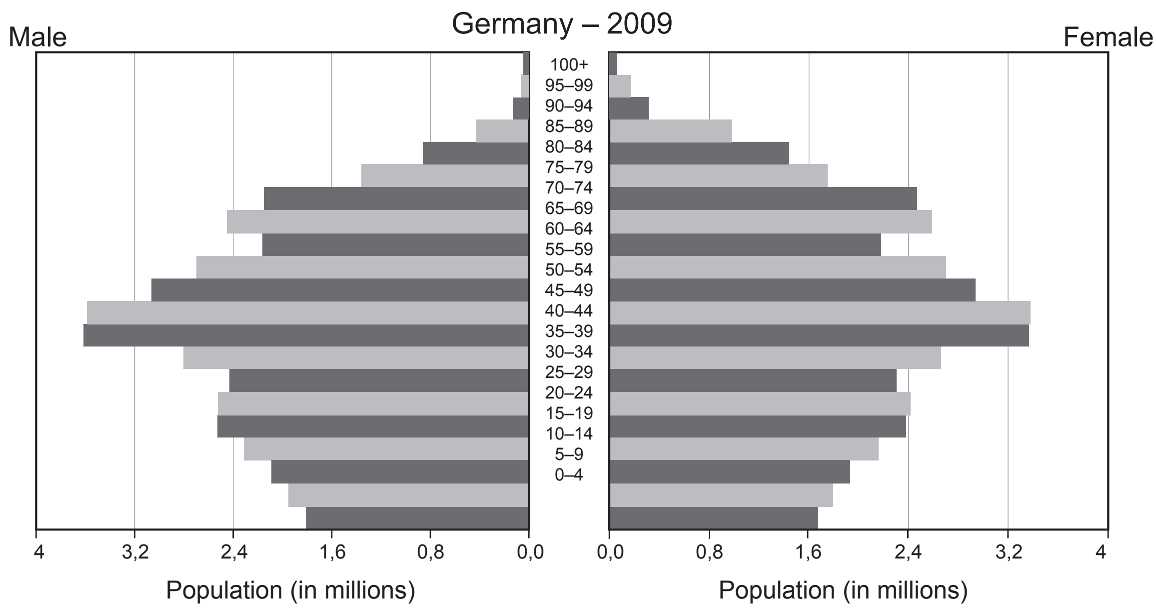
2. How is population density measured? [2]

3. Study the table below and answer the questions.

Province	Population in millions	Area in square kilometres
Gauteng	7,35	17 010
Northern Cape	0,84	361 830

   a) Calculate the population density of each province. Show all your workings and round off your answers to one decimal place. (4)
   b) Which province has the highest population density? (2)
   c) Give two reasons for the differences in population density in each province. (4)
   [10]

4. Study the population pyramid of Germany below and answer the questions.



a) Describe the current age structure of Germany's population. (2)

b) Does this population pyramid indicate a developed or a developing country? Give a reason for your answer. (2)

c) Calculate the dependency ratio for Germany. (4)

d) How is Germany's population going to change in the future? In your answer, refer to the recent development of Germany's birth rate. (2)

e) What economic problems might result from this development? (2)

f) How would a population pyramid of India compare to Germany's? (2)

[14]

5. Study the table.

Year	World Population Growth
1850	1 100 000 000
1900	1 500 000 000
1950	2 500 000 000
2000	6 200 000 000
2050	8 500 000 000

a) Draw a line graph to illustrate the information in the table. Place 'World Population Growth' on the vertical axis using a vertical scale of 1 cm = 1 000 million people. Place the 'year' on the horizontal axis. (6)

b) Using your line graph and information provided in the table, identify three distinct phases in world population growth from the past to the present, giving possible reasons for each. (12)

c) Name three government schemes used to curb population growth. (6)

[24]

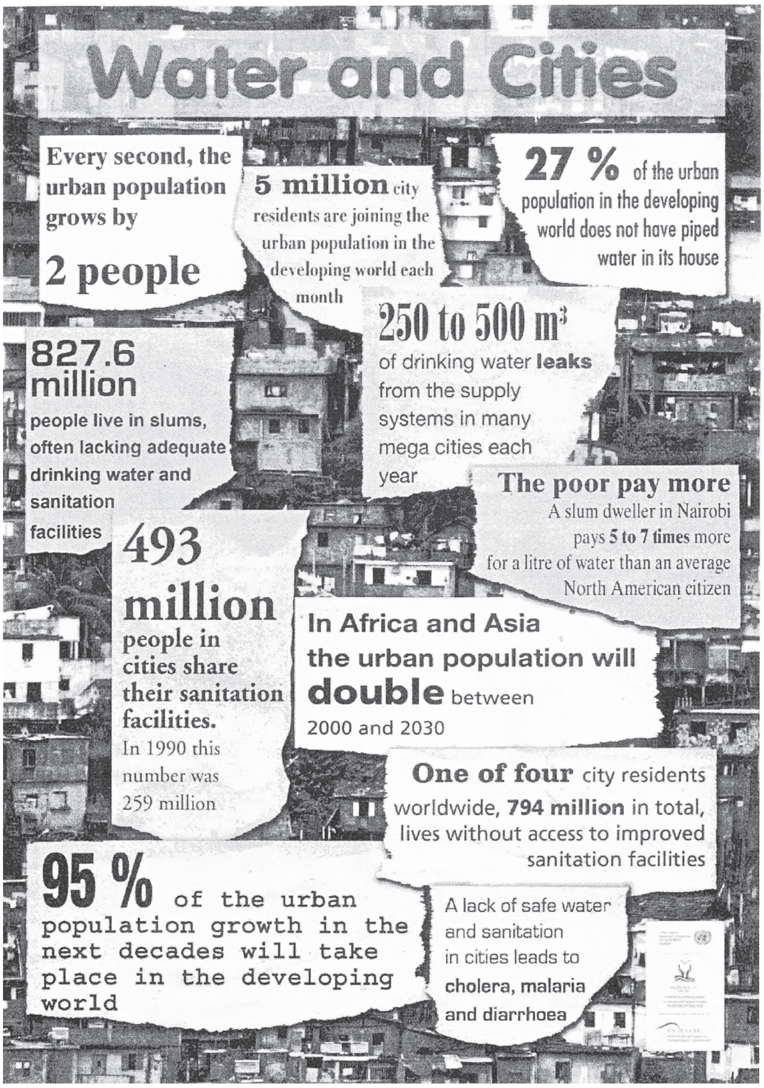
TOTAL MARKS: 30

Activity 1: Draw a flood hydrograph

1. What is a hydrograph? (2)
2. What does a flood hydrograph show and what is it used for? (2)
3. Draw a diagram of a flood hydrograph and include the following labels:
   a) precipitation
   b) rainfall peak
   c) lag time
   d) discharge peak
   e) normal flow
   f) discharge
   g) time (7)
4. What is meant by discharge? (2)
5. What unit is used to measure discharge? (2)

[15]

Activity 2: Write an essay



Use the information in the poster alongside and your knowledge to write a 200–300 word essay entitled, The plight of the poor in urban areas and their access to safe drinking water.

[15]

Time:
1½ hours

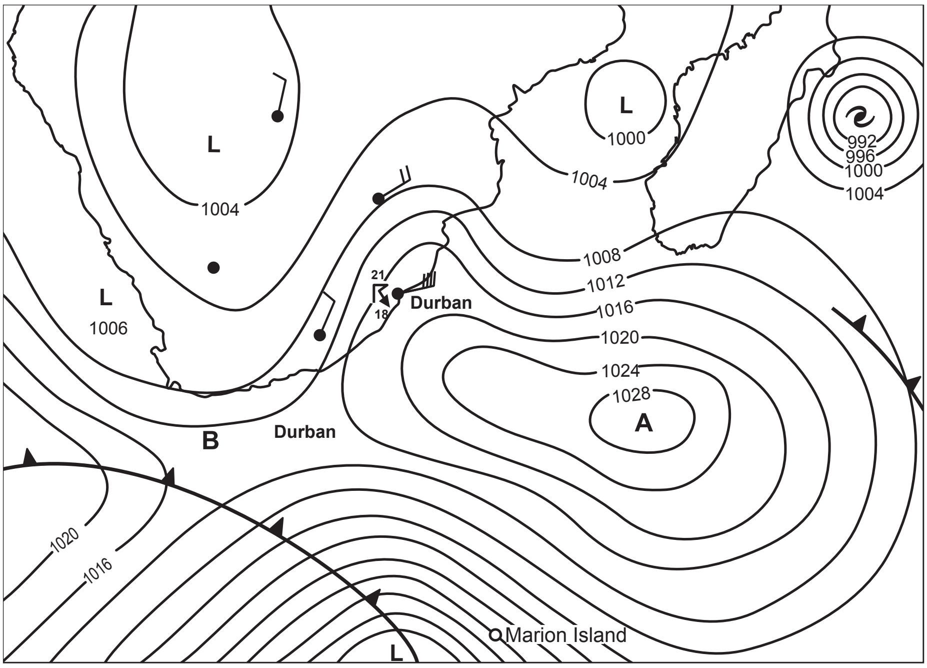
Mid-year examination: Paper 1 (Geographical knowledge)

TOTAL MARKS: 120

Answer all questions in Section A and B.

Section A: The atmosphere and synoptic weather maps (60 marks)

1. Refer to the diagram below and answer the questions that follow.



1.1 What are isobars and what are they used for? (4)
1.2 On the synoptic weather map identify the features marked A and B. (4)
1.3 Give the atmospheric conditions for Durban. (4)
1.4 Calculate the temperature range for Durban. (4)
1.5 How will B influence the atmospheric conditions in Cape Town as it passes over? (2)
1.6 Draw a diagram of a weather station model to represent these conditions in Cape Town. (6)
1.7 Which ocean current flows past Durban? (2)
1.8 How will this ocean current affect the temperatures in Durban? (2)
1.9 Explain why temperature decreases with latitude. (6)

2. Name the permanent gases in the atmosphere and give the percentage of each one. (6)

3. Name the different layers in the atmosphere and give one characteristic of each one. (8)

4. Draw a labeled diagram to illustrate the greenhouse effect. (6)

5. Name two consequences of global warming for Africa. (2)

6. What is the difference between ‘relative humidity’ and ‘saturated air’? (4)

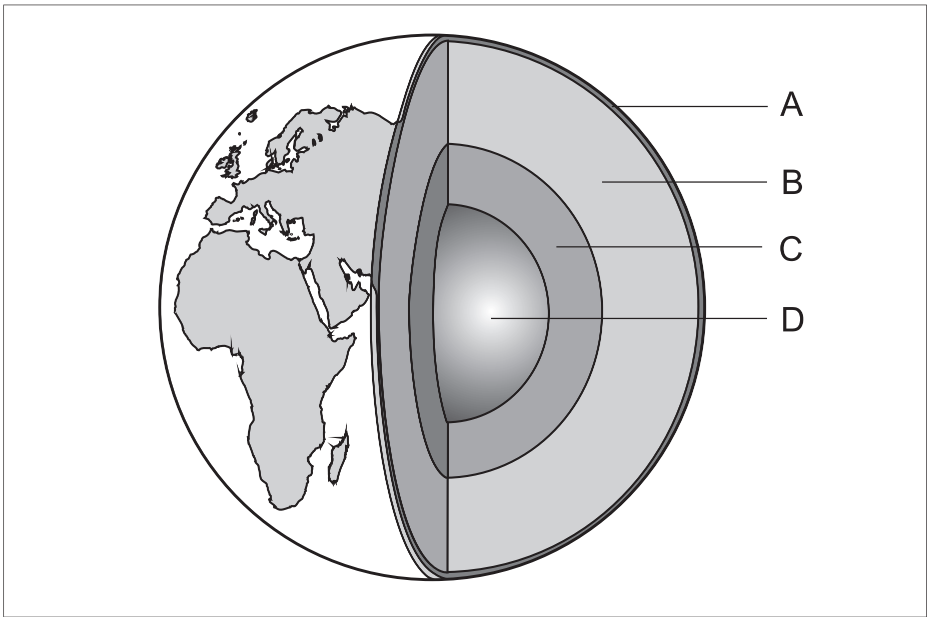
[64]

Section B: Geomorphology (60 marks)

1. Copy the following table.

Layer	Thickness (in km)	State (e.g. liquid)
A	E	F
B	2 900	plastic
C	2 220	G
D	1 255	H

1.1 Using the diagram below, provide names for the layers labeled A–D. Write these names onto the table you copied. (4)



Internal structure of the Earth

1.2 Complete the table by providing the thickness at E and the state of the layers at F to H. (4)

2. What is the difference between destructive and constructive plate boundaries? (4)

3. How are the following formed:
   3.1 fold mountains (2)
   3.2 mid-oceanic ridges (2)

4. Give one example of each of the following:
   4.1 fold mountain (2)
   4.2 mid-oceanic ridge (2)

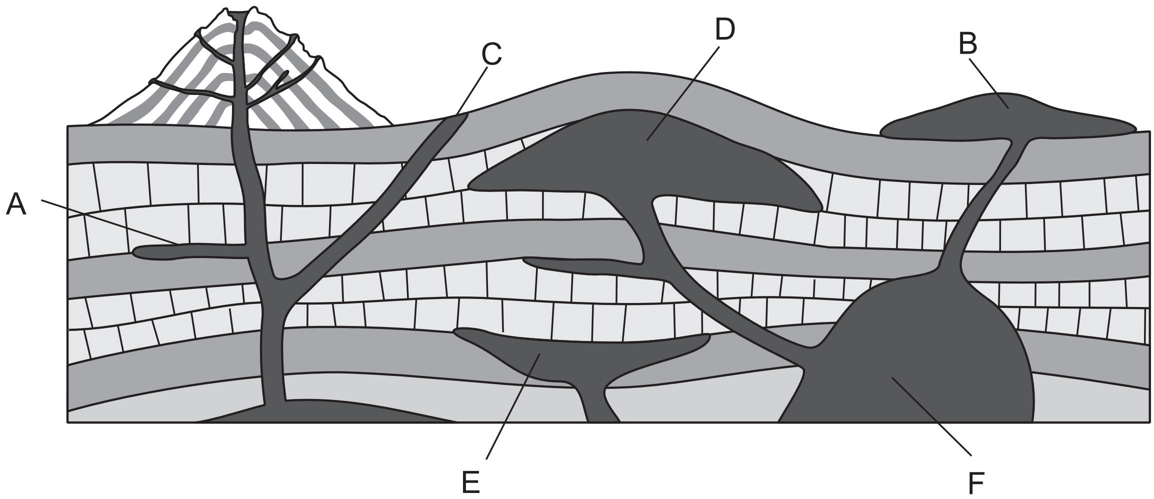
5. How do we know that continental drift has occurred? Give four pieces of evidence. (8)

6. Distinguish between the focus and epicenter of an earthquake. (2)

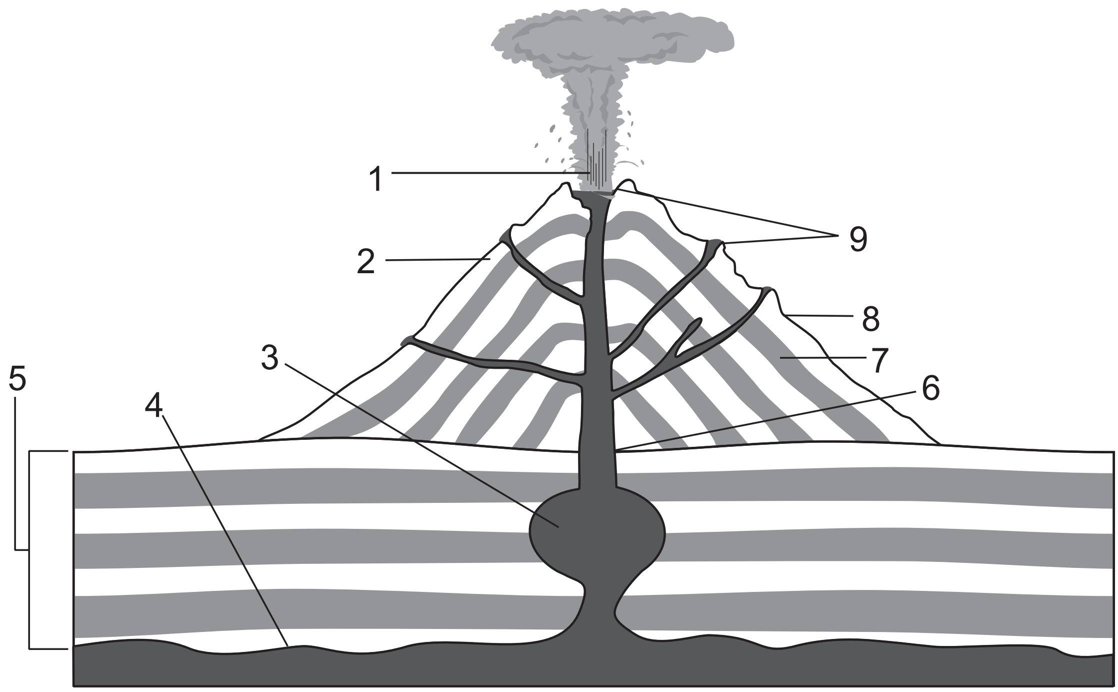
7. What is the scale used to measure the intensity of an earthquake? (2)

8. What is the difference between:
   8.1 intrusive and extrusive volcanism (4)
   8.2 magma and lava? (4)

9. On the diagram below, identify the intrusive volcanic landforms A, C, D, E and F. (5)



10. Provide labels for 1 to 9 in the diagram below. (9)



11. Define the following terms:
   11.1 caldera (2)
   11.2 lava plateau (2)
   11.3 extinct volcano (2)

[60]

Time:
1½ hours

Memorandum
Mid-year examination: Paper 1 (Geographical knowledge)
TOTAL MARKS: 120

Learners should answer all questions.

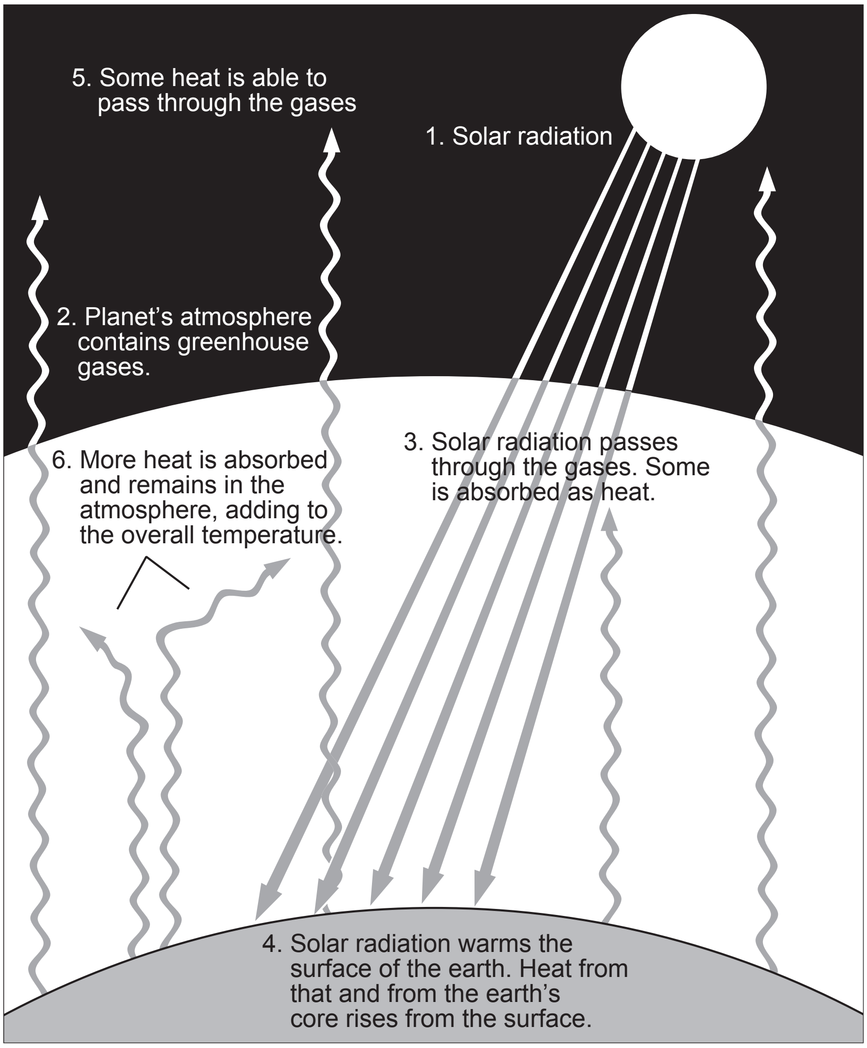
Section A: The atmosphere and synoptic weather maps (60 marks)

1. 1.1 Isobars are lines (1) on synoptic weather maps (1) that join places of equal atmospheric pressure (1). They are used to illustrate atmospheric pressure distribution (1). (4)
   1.2 A. a high pressure cell (2)
   B. a cold front (2) (4)
   1.3 Maximum temperature is 21 ˚C (1) and dew point temperature is 18 ˚C (1); overcast conditions/thunderstorms (1); easterly wind of 40 knots (1). (4)
   1.4 21 – 18 (2) = 3 (2) (4)
   1.5 temperatures will decrease and cloud cover will increase (1), south-westerly winds (1) (2)
   1.6 The weather station model (1) should show:
   overcast conditions (1)
   thunderstorms (1)
   low temperatures (1)
   south-westerly wind (1). (6)
   1.7 Warm (1) Mozambique current (1). (2)
   1.8 It will cause temperatures to be warmer. (2)
   1.9 At the equator the Sun’s rays strike the Earth at right angles (1), further away from the equator the Sun’s rays strike the Earth at oblique angles (1). This means that at the equator the same amount of solar radiation (1) heats up a smaller surface area (1) and passes through less atmosphere (1) – so less radiation is lost through absorption, scattering and reflection (1). (6)

2. Oxygen 21% (2), Nitogen 78% (2), Argon 1% (2) (6)

3. troposphere – where all our weather takes place (2)
   stratosphere – where ozone is located (2)
   mesosphere – stretches 80 to 90 kilometres above the Earth’s surface (2)
   thermosphere – The auroras or northern lights form here (2) (8)

4. Any greenhouse effect diagram that shows the following: (6)



5. Any two of the following: expanding deserts; floods; rising sea levels; sinking tropical glaciers (2)

6. Relative humidity is the actual amount of water vapour in the air (1) relative to the amount of water vapour the air could hold if it were saturated (1). It is expressed as a percentage. Saturated air is when the relative humidity is 100% (1) and it cannot hold any more water vapour at the present temperature (1). (4)

[60]

Section B: Geomorphology **(60 marks)**

1. 1.1 A. Earth's crust
   B. mantle
   C. outer core
   D. inner core (4)

   1.2 E. 5–50 km
   F. solid
   G. liquid
   H. solid (4)

2. Destructive plate boundaries are when two plates move towards each other (1) and part of the Earth's crust is destroyed (1). Constructive plate boundaries are when two plates move apart (1) and a new ocean floor is formed from solidified magma (1). (4)

3. 3.1 When a plate with a continent moves toward a plate with a continent (1), the crust buckles up to form fold mountains (1). (2)
   3.2 When a plate with an ocean floor moves away/apart from a plate with an ocean floor (1), magma wells up from the mantle and solidifies to form a new ocean floor – mid-oceanic ridge (1). (2)

4. 4.1 Any one example: Himalayas/Cape fold mountains (2)
   4.2 Any one example: Mid-Atlantic Ridge (2)

5. Africa and South America fit together like a jigsaw puzzle (2).
   The same fossils have been found in Africa and South America (2).
   Glacier evidence found in the Karoo (2).
   South America and Africa share the same rock formations (2). (8)

6. Focus – deep below the surface where the slip on the fault occurs (1). Epicenter – the place directly above the focus at the surface of the Earth (1). (2)

7. Richter scale or the moment scale (2)

8. 8.1 Intrusive volcanism is when magma solidifies (1) below the surface of the Earth (1). Extrusive volcanism is when magma flows out the surface of the Earth (1) in the form of lava (1). (4)
   8.2 Magma is molten material (1) found in the mantle (1). Lava is molten magma material (1) which flows out the surface of the Earth (1). (4)

9. A. sill
   C: dyke
   D. laccolith
   E. lopolith
   F. batholith (5)

10. 1. crater
    2. conelet
    3. magma chamber
    4. mantle
    5. Earth's crust
    6. volcanic pipe
    7. ash layer
    8. lava layer
    9. vent (9)

11. 1. When a volcano has not erupted for a long time, lava builds up and solidifies in the crater (1). When an eruption does occur again there is a huge explosion as the lava plug is pushed out and the whole top of the volcano is blown off to form a caldera (1). (2)
    2. An elevated tableland that is several hundreds to several thousands of square kilometers in area (1) underlain by a thick succession of lava flows (1). (2)
    3. Volcanoes, that scientists consider (1) unlikely to erupt ever again (1). (2)

[60]

[Total marks: 120]

Time:
1 hour

Mid-year examination: Paper 2 (Geographical skills and techniques)

TOTAL MARKS: 60

Answer all the questions.

Section A: Topographical maps **(30 marks)**

Refer to the topographical map of Tafelberg 3125CA and answer the questions.

1. Give the map code of the map to the west of 3125CA. (2)
2. What is the scale of the topographical map? (2)
3. Calculate the length in kilometers of the power line running from Block A3 to E6. (2)
4. Give the direction and true bearing from:
   4.1 spot height 1159 in Block D5 to spot height 1225 in Block E2 (2)
   4.2 Oskop in Block B3 to Volminskop in Block A2 (2)
5. Give the co-ordinates of:
   5.1 Gryskop (2)
   5.2 Oskop (2)
6. Draw a cross-section from spot height 1205 in Block F2 to spot height 1190 in F4. Use a vertical scale of 1cm to represent 100 m. (6)
7. Identify the landform in the cross-section you have drawn. (2)
8. Name the map convention sign located at 31°34'15''S and 25°08'45''E. (2)
9. Using evidence from the map, give three reasons to suggest that Tafelberg receives a low average annual rainfall. (6)

Section B: Geographical Information Systems **(16 marks)**

1. What is a Geographical Information System? (4)
2. Describe how remote sensing works. (6)
3. Name six components of remote sensing. (6)

Section C: Graphs **(14 marks)**

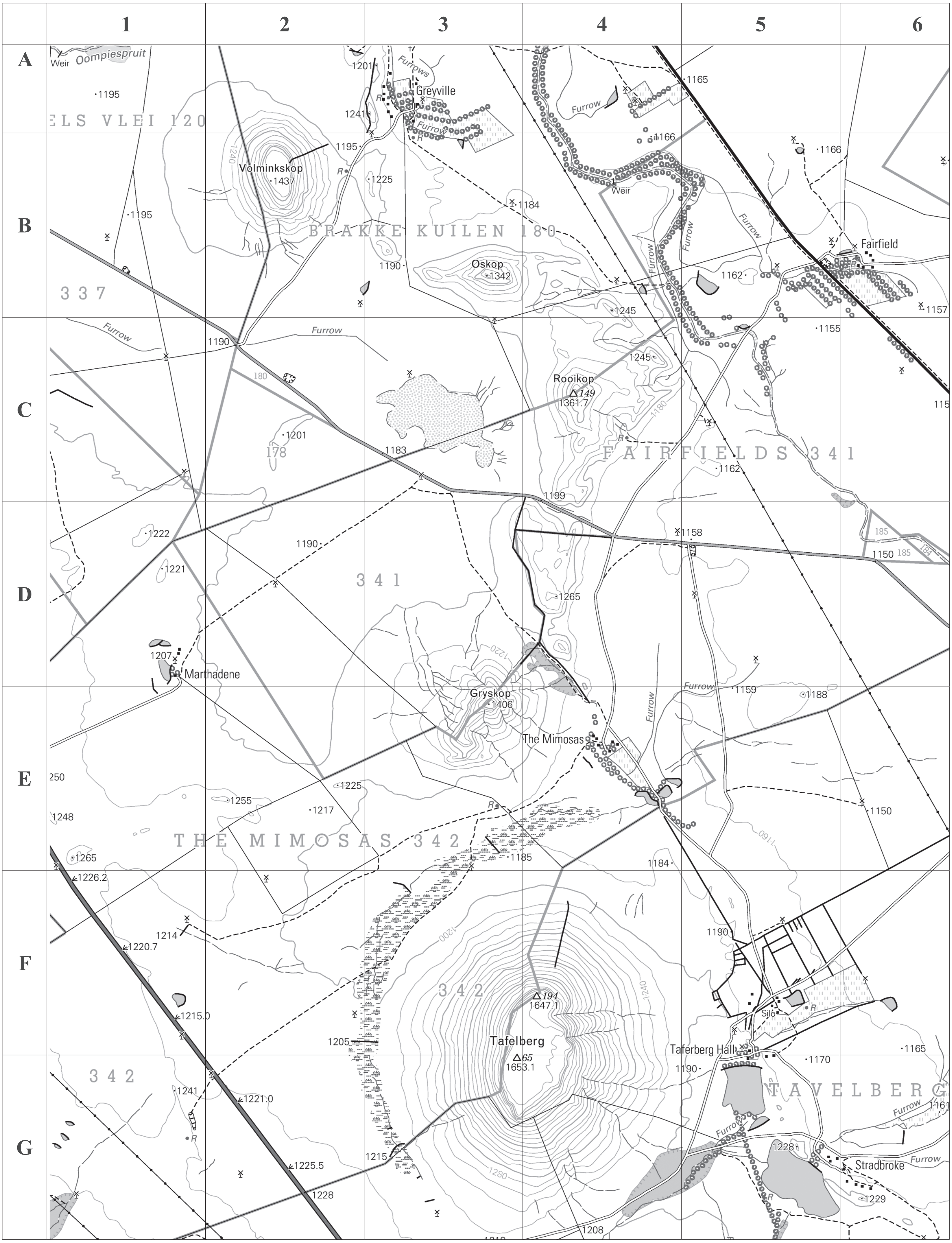
Use the data of temperature and rainfall below to construct a:

1. line graph representing temperature (7)
2. bar graph representing rainfall (7)

Month	Temperature in C	Rainfall in mm
January	20 °C	243 mm
February	20 °C	212 mm
March	19 °C	186 mm
April	17 °C	71 mm
May	15 °C	34 mm
June	12 °C	19 mm
July	12 °C	23 mm
August	14°C	28 mm
September	16 °C	62 mm
October	18 °C	128 mm
November	19 °C	169 mm
December	20 °C	213 mm

[Total marks: 60]

3125CA TAFELBERG



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Memorandum Mid-year examination: Paper 2 (Geographical skills and techniques)

TOTAL MARKS: 60

Learners must answer all questions.

Section A: Topographical maps **(30 marks)**

1. 3124 DB (2)

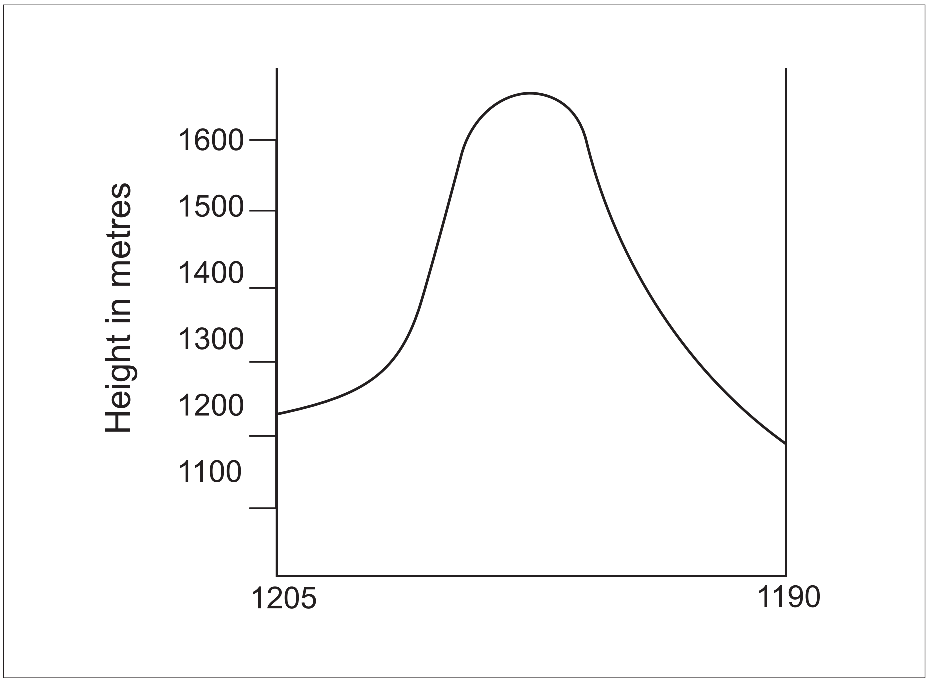
2. 1:50 000 (2)

3. 17 cm [×] 0,5 (1) = 8,5 km (1) (2)

4. 4.1 246 °SW (2)
   4.2 294 °NW (2)

5. 5.1 31°36°40°S (1) and 25°09°35°E (1) (2)
   5.2 31°34°30°S (1) and 25°09°30°E (1) (2)

6.



(6)

7. a mountain (2)

8. windmill/wind pump (2)

9. Any three of the following: absence of cultivated land (2); windmills/wind pumps (2); furrows (2); non-perennial streams (2) (6)

[30]

Section B: Geographical Information Systems **(16 marks)**

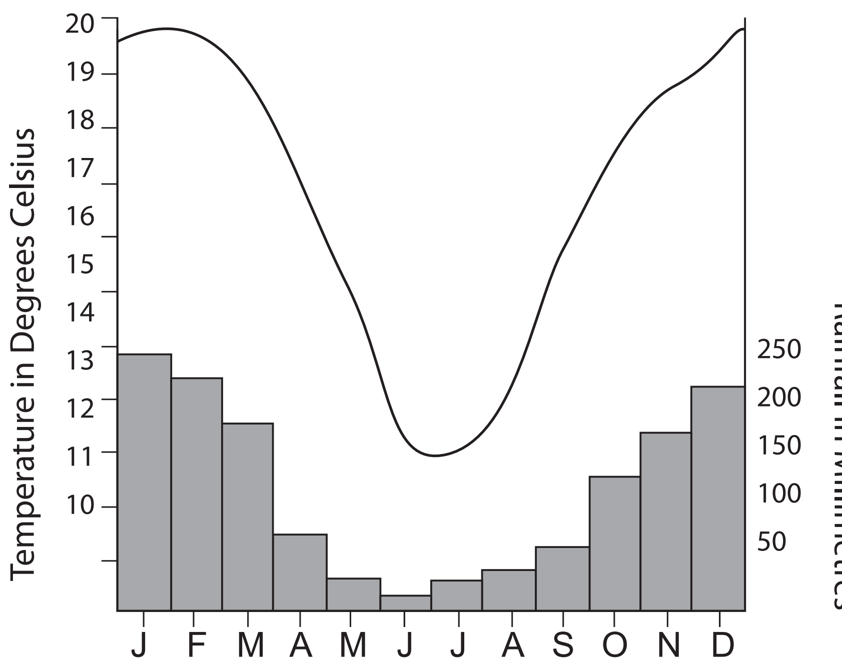
1. A Geographical Information System is a computer programme (1) that collects data (1), stores data (1) and displays captured information (1). (4)
2. Remote sensing uses Electromagnetic Radiation or EMR (1). The energy emitted in the process of EMR (1) reflects responses from natural source or objects (1), creating a picture of the object (1). The difference in the amount of energy reflected, absorbed and transmitted by features/objects (1) helps us to distinguish the different features on an image (1). (6)

3. an energy source (1); platforms for the sensor (1); sensors (1); detectors for handling data (1); processing done by photographic or digital means (1); institutions for their application of interpretative skills to the data (1). (6)

Section C: Graphs **(14 marks)**

1. line graph representing temperature (7)

2. a bar graph representing rainfall (7)



Time:
2½ hours

End-of-year examination: Paper 1 (Geographical knowledge)

TOTAL MARKS: 225

Answer three questions:

- one from Section A
- one from Section B
- one from either Section A or B

Section A

Answer at least one question from this section.

[**75 marks**]

Question 1

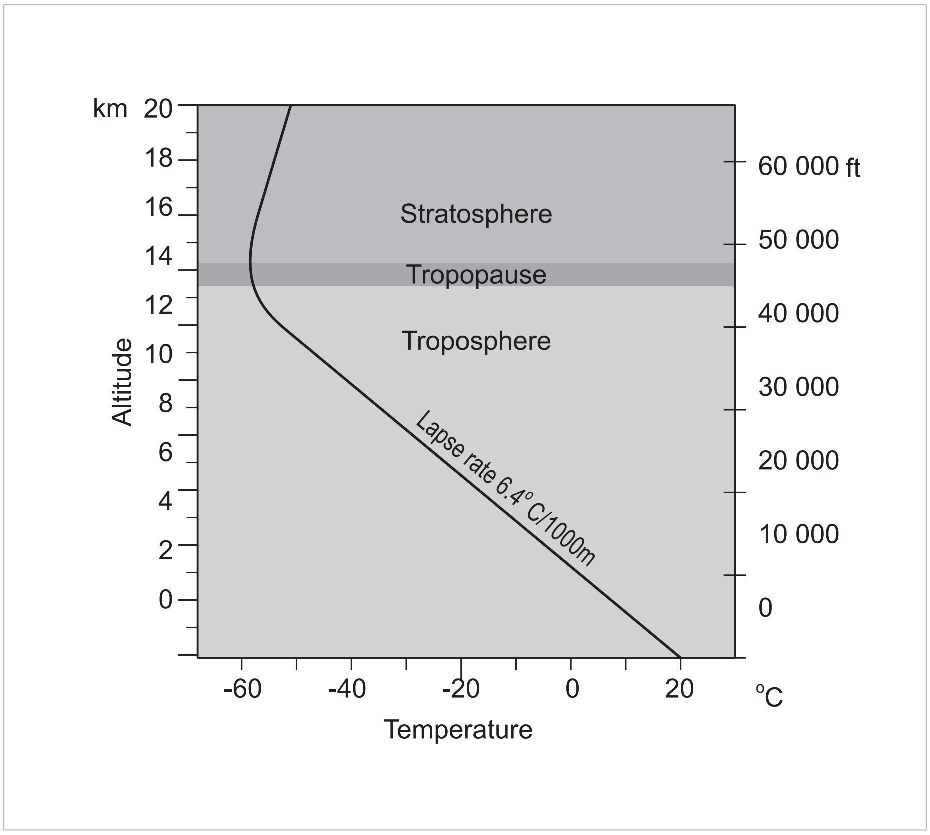
1.1 Match the term with the correct description. Write only the number and matching letter.

Term		Description	
1.1.1	stratosphere	A.	the process whereby gas is turned to liquid
1.1.2	mesosphere	B.	the hot dense inner portion of the Earth consisting of iron and nickel
1.1.3	core	C.	a region between 50 and 80 kilometres above the Earth's surface
1.1.4	igneous rock	D.	the outer layer of the atmosphere
1.1.5	humidity	E.	when air can hold the maximum amount of water vapour
1.1.6	lapse rate	F.	the granitic rocks of the continental crust
1.1.7	tors	G.	an igneous rock landform
1.1.8	cuesta	H.	transfer of heat from one molecule to adjacent molecules by contact
1.1.9	sedimentary rock	I.	rock formed by a chemical reaction
1.1.10	condensation	J.	the water sphere of the planet
1.1.11	conduction	K.	forms the ocean floors
1.1.12	sima	L.	when heat is transferred through the mass movement of particles
1.1.13	sial	M.	rock consisting of particles laid down in layers
1.1.14	heterosphere	N.	the change of temperature with increasing height
1.1.15	convection	O.	the outer most layer of the Earth
		P.	a rock formed from molten magma material
		Q.	the layer of the atmosphere where ozone is found
		R.	the amount of water vapour in the air
		S.	a sedimentary rock landform

[15]

1.2. Refer to the diagram below and answer the questions that follow.

The temperature lapse rate under typical conditions



1.2.1 What is a temperature lapse rate? (2)

1.2.2 What is the temperature lapse rate in Celsius under typical conditions? (2)

1.2.3 Under typical conditions what would be the temperature in Celsius at 10 km above the Earth? (2)

1.2.4 Calculate the temperature under typical conditions at 10 metres above the Earth's surface if the temperature at the surface was 20 °C. (2)

1.2.5 Describe what happens to the temperature in the stratosphere. (4)

1.2.6 What is this process called? (2)

1.2.7 Why does this process occur in the stratosphere? (4)

1.2.8 In which other layer of the atmosphere does this process occur? (2)

1.2.9 Why is the troposphere so important to humans? (2)

1.2.10 Discuss how ocean currents and latitude have an effect on temperature. (8)

[30]

1.3 Answer the questions.

1.3.1 How do we know that continental drift has occurred? Provide four pieces of evidence to support this theory. (8)

1.3.2 What causes continental drift? (4)

1.3.3 Refer to the diagram below and answer the questions.

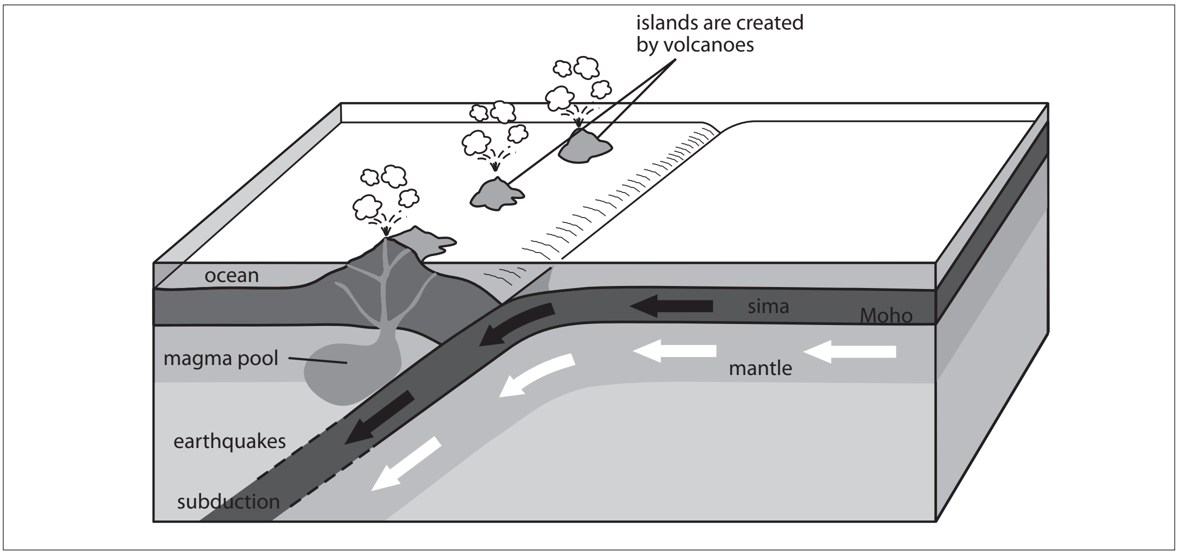


Figure 1.3.3 Subduction zones

i) What is a subduction zone? (2)

ii) What causes earthquakes in this type of subduction zone? (2)

iii) Explain why volcanoes are often found in this type of area. (2)

1.3.4 Refer to the map showing the crustal plates. Is there a subduction zone at 1, 2, 3 or 4 on the map? Give a reason for your answer. (4)

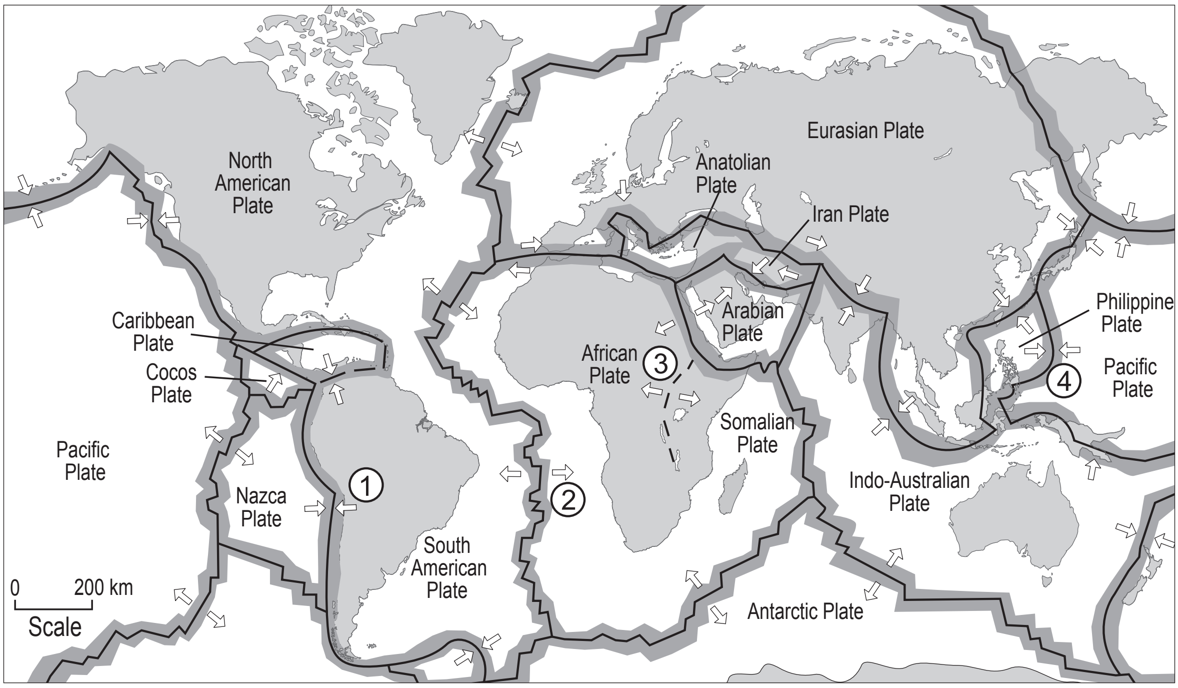


Figure 1.3.4 Crustal plates

1.3.5 What is the difference between the focus and epicenter of an earthquake? (2)

1.3.6 What instrument is used to measure earthquakes? (1)

1.3.7 Refer to the table below and answer the questions.

	Largest Earthquakes				Deadliest Earthquakes			
Year	Date	Magnitude	Fatalities	Region	Date	Magnitude	Fatalities	Region
2010	02/27	8.8	507	Offshore Maule, Chile	01/12	7.0	222,570	Haiti
2009	09/29	8.1	192	Samoa Islands region	09/30	7.5	1,117	Southern Sumatra, Indonesia
2008	05/12	7.9	87,587	Eastern Sichuan, China	05/12	7.9	87,587	Eastern Sichuan, China
2007	09/12	8.5	25	Southern Sumatera, Indonesia	08/15	8.0	514	Near the Coast of Central Peru
2006	11/15	8.3	0	Kuril Islands	05/26	6.3	5,749	Java, Indonesia
2005	03/28	8.6	1,313	Northern Sumatra, Indonesia	10/08	7.6	80,361	Pakistan
2004	12/26	9.1	227,898	Off West Coast of Northern Sumatra	12/26	9.1	227,898	Off West Coast of Northern Sumatra
2003	09/25	8.3	0	Hokkaido, Japan Region	12/26	6.6	31,000	Southeastern Iran
2002	11/03	7.9	0	Central Alaska	03/25	6.1	1,000	Hindu Kush Region, Afghanistan
2001	06/23	8.4	138	Near Coast of Peru	01/26	7.7	20,023	India

i) Which countries appear more than once in the table? (3)

ii) The 2003 earthquake in Japan measured 6.6 and caused the death of 31 000 people. The 2002 earthquake in Alaska measured 6.1 and killed 1 000 people. Explain why fewer people were killed in Alaska. (2)

(30)

[75 marks]

Question 2

2.1 Choose the most correct answer from the four options given. Write down only the number and the letter of the correct answer.

2.1.1 A cloud that grows to a height of 10 km and causes heavy rain is…

a) cumulus
b) stratus
c) cumulonimbus
d) cirrus

2.1.2 Orographic rain is caused by…

a) convection currents
b) mountain barriers
c) cold fronts
d) tropical cyclones

2.1.3 The Mohorovicic discontinuity is the contact zone between…

a) the crust and the mantle
b) the mantle and the core
c) the crust and the core
d) the crust and the lithosphere

2.1.4 When two plates collide with a continent…

a) peripheral fold mountains are formed
b) a rift valley is formed
c) a mid-oceanic ridge is formed
d) intercratonic fold mountains are formed

2.1.5 Stratification is usually found in…
a) sedimentary rocks
b) metamorphic rocks
c) igneous rocks
d) mixture of igneous and metamorphic rocks

2.1.6 The instrument used to measure humidity is called…
a) an anemometer
b) hygrometer
c) a rain gauge
d) a barometer

2.1.7 A synoptic weather map indicates…
a) wind patterns
b) pressure patterns
c) temperatures
d) all of the above

2.1.8 The following is not a greenhouse gas:
a) carbon dioxide
b) oxygen
c) methane
d) water vapour

2.1.9 The following is not found in granite:
a) quartz
b) feldspar
c) mica
d) breccias

2.1.10 Hogsbacks are formed from…
a) tilted sedimentary rocks
b) horizontal sedimentary rocks
c) tilted igneous rocks
d) horizontal igneous rocks

2.1.11 Sea floor spreading occurs when a plate with…
a) a continent moves away from a plate with an ocean floor
b) a continent moves away from a plate with a continent
c) an ocean floor moves away from a plate with an ocean floor
d) an ocean floor moves towards a plate with an ocean floor

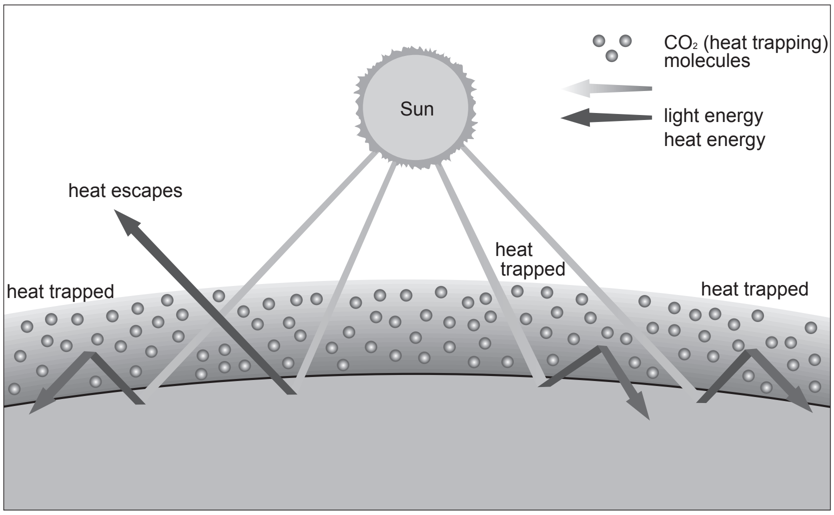
2.1.12 The instrument that is most accurate in the measurement of earthquakes is the…
a) moment scale
b) Richter scale
c) seismograph
d) seismometer

2.1.13 A very tall volcano with steep slopes is called a...
a) stratovolcano
b) cinder cone
c) shield volcano
d) caldera

2.1.14 Mount St Helens which erupted after 123 years is in…
a) North America
b) Italy
c) Spain
d) South America

2.1.15 A fault that forms due to rock under tension is called a…
a) normal fault
b) reverse fault
c) strike-slip fault
d) thrust fault [15]

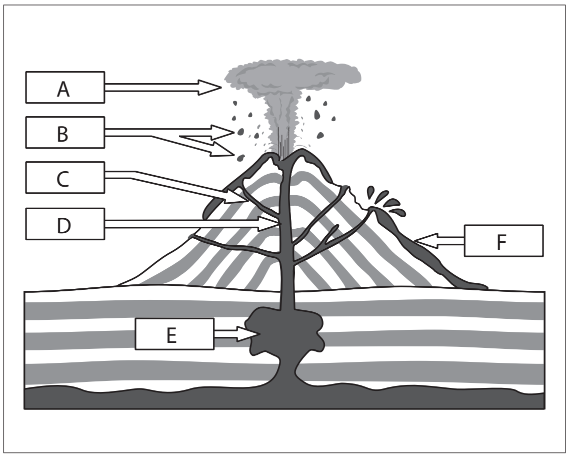
2.2 Refer to the diagram and answer the questions.



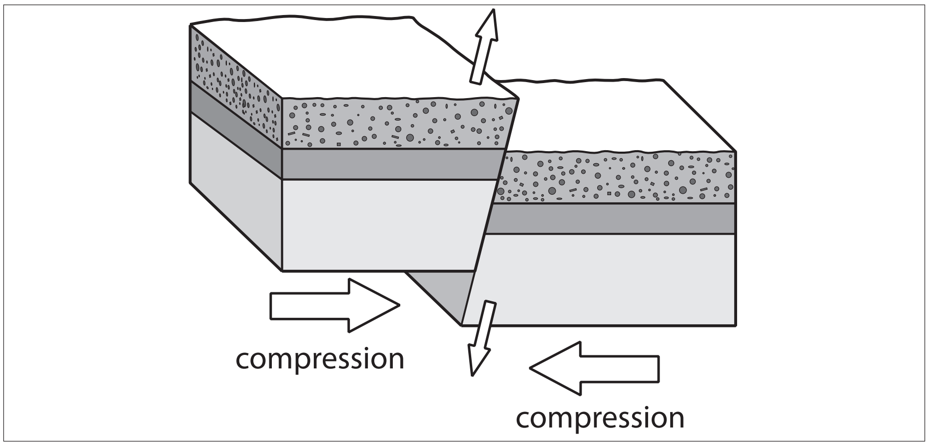
2.2.1 Name three ways that solar radiation is depleted in the atmosphere. (3)
2.2.2 What percent of solar radiation eventually reaches the Earth's surface? (1)
2.2.3 What is another name for the Earth's radiation? (1)
2.2.4 What traps the ultra-violet radiation from the Sun? (1)
2.2.5 Describe the greenhouse effect. (6)
2.2.6 Name two greenhouse gases. (2)
2.2.7 Is the greenhouse effect essential for life on Earth? Substantiate your answer. (4)
2.2.8 Suggest three solutions to reduce greenhouse gases? (6)
2.2.9 Name three consequences of global warming? (6)
[30]

2.3 Answer the questions.
2.3.1 Supply labels for A to F in the diagram below. (6)

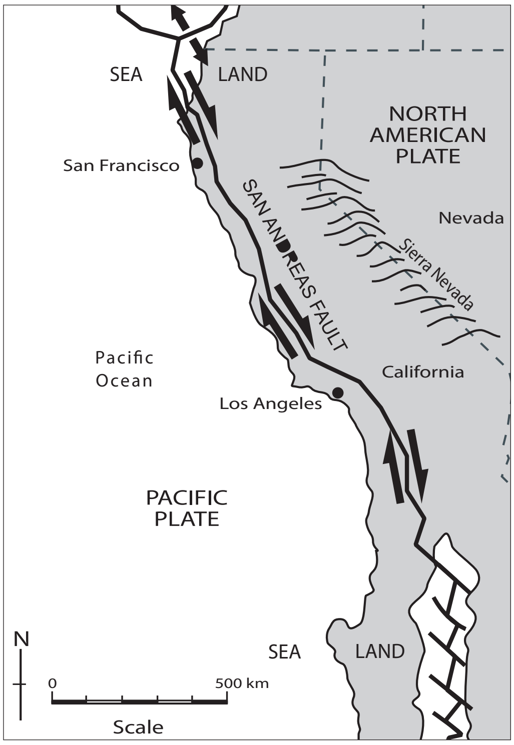
A typical volcano



2.3.2 What is the difference between magma and lava? (2)
2.3.3 How does a caldera form? (4)
2.3.4 What is the difference between a dormant and an extinct volcano? (4)
2.3.5 What is a cinder cone? (2)
2.3.6 Identify the type of fault in the diagram below. (2)



2.3.7 Look at the map of the famous San Andreas Fault below.



i) What type of fault is it? (2)
ii) Which two tectonic plates are responsible for this movement? (4)
iii) What could be the consequences for the people of Los Angeles? (2)

2.3.8 Draw a simple sketch of a fold that illustrates a syncline and an anticline. (2)

[30]

Section B

Answer at least one question from this section

[75 marks]

Question 3

3.1 Select the correct word or term for each of these statements.

3.1.1 Areas where there is little sign of humans are called ecumene/non-ecumene areas.

3.1.2 The difference between the number of births per 1 000 people and the number of deaths per 1 000 people is called growth rate/natural increase.

3.1.3 People who are forced to flee their country and are unable to return for fear of persecution are called refugees/migrants.

3.1.4 The process whereby more and more of the population move from rural areas to live in cities is called urban growth/urbanisation.

3.1.5 A positive reason for leaving your country of birth such as increased job opportunities in another country is called a push factor/pull factor.

3.1.6 The country with the highest population numbers is China/India.

3.1.7 The country with the highest population density is Monaco/Macao.

3.1.8 When plants lose water from their leaves it is called evaporation/transpiration.

3.1.9 Water that slides over the surface towards lower ground is called infiltration/runoff.

3.1.10 Fossil fuels are a renewable/non-renewable source of energy.

3.1.11 The Brazil Ocean Current is a cold/warm ocean current.

3.1.12 The Limpopo River flows into the Indian/Atlantic Ocean.

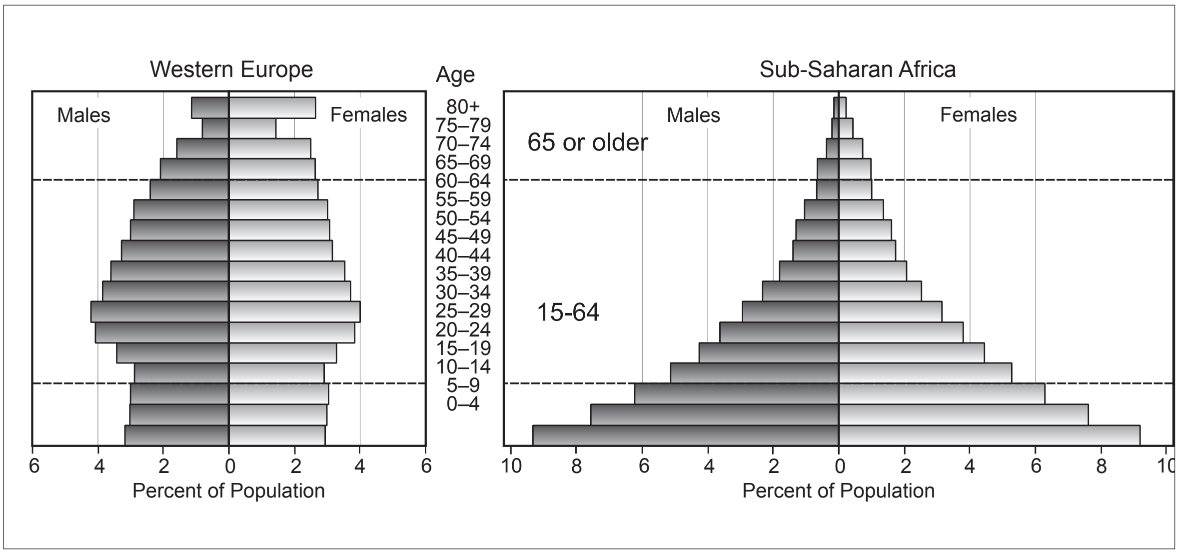
3.1.13 The province in South Africa with the lowest rainfall is the Eastern Cape/Northern Cape.

3.1.14 The time between the peak rainfall and the peak discharge is called flood peak time/lag time.

3.1.15 Forty percent (40%) of the world's floods take place in Asia/South America because of the heavy monsoon rains.

[15]

3.2 Study the two population pyramids below and answer the questions.



3.2.1 Describe the shape of each of the population pyramids for Western Europe and Sub-Saharan Africa. (4)
3.2.2 Calculate the percentage of the population below the age of 15 in Western Europe. (2)
3.2.3 Which of the two pyramids displays a high birth rate and a high death rate? (2)
3.2.4 Give two factors which could attribute to a high birth rate. (4)
3.2.5 Which of the two pyramids shows a decline in birth rate? (2)
3.2.6 What could be the economic consequences of this decline? (2)
3.2.7 What is the dependency ratio? (2)
3.2.8 List three government schemes used to control an increase in population. (6)
3.2.9 What have the governments in Australia, Sweden and Singapore done to encourage the birth of children? (6)
[30]

3.3 Answer the questions
3.3.1 Which fishing bank is found off the coast of South Africa? (2)
3.3.2 Where are fishing banks found? (2)
3.3.3 Why are they found in these areas? (4)
3.3.4 What is meant by the term 'upwelling'? (2)
3.3.5 Name one other famous fishing bank. (2)
3.3.6 What is the difference between commercial and subsistence fishing? (2)
3.3.7 What are pelagic fish? (2)
3.3.8 Explain what is meant by the 'sardine run'. (6)
3.3.9 What would happen to the ocean food chain if there was a decrease in phytoplankton? (4)
3.3.10 Suggest two sources of sea pollution and their effects on marine life and the environment. (4)
[30]
[75 marks]

Question 4

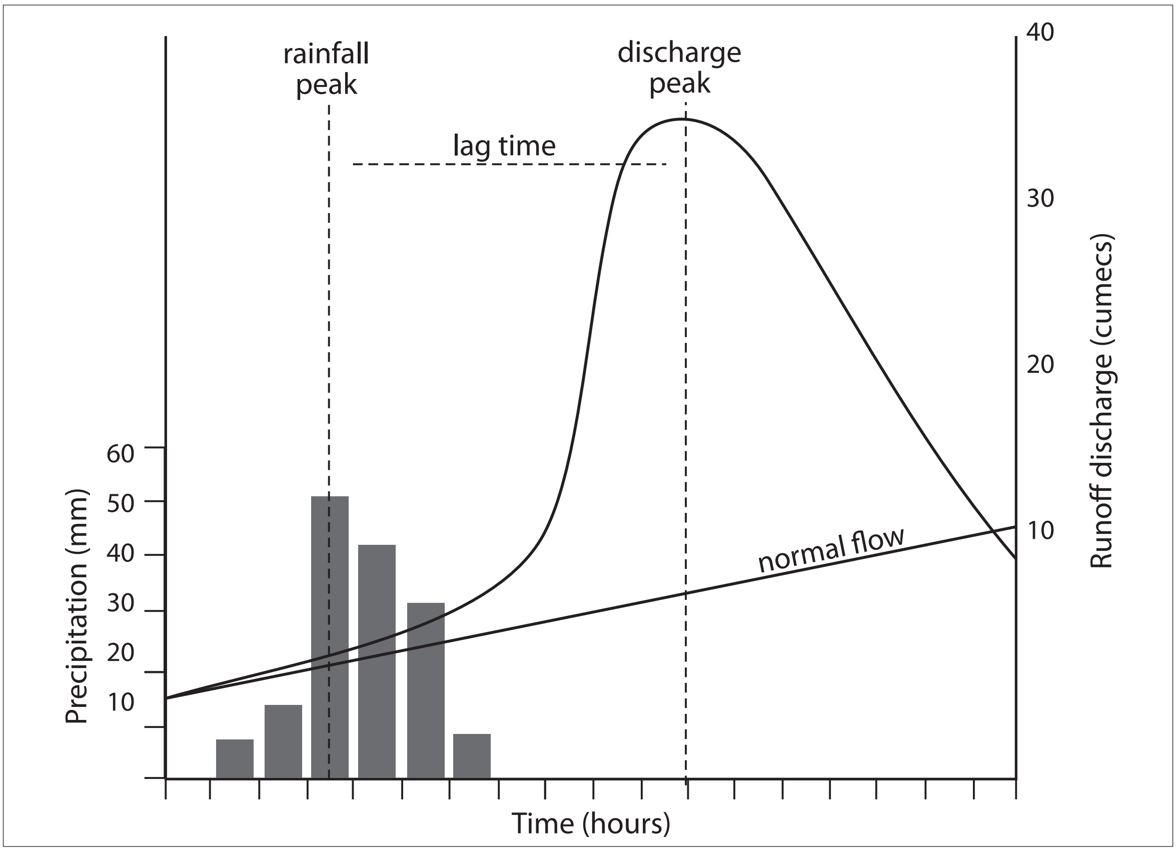
4.1 Indicate whether the following statements are true or false.
4.1.1 Population distribution is the number of people per square kilometre.
4.1.2 In South Africa, population density is the highest in the Northern Cape.
4.1.3 The death rate is calculated by the number of deaths divided by the total population.
4.1.4 The fertility rate is the average number of children a woman will have during the reproductive period of her life.
4.1.5 A population pyramid is a graphical way of showing the population structure in a country.
4.1.6 The demographic transition model is a theory of how the change from low to high birth and death rates happens over time.
4.1.7 A developing country will show a high birth rate and a high death rate.
4.1.8 Only the Antarctic and Greenland are covered with ice sheets.
4.1.9 The Orange River has its source in Lesotho.
4.1.10 Tidal energy converts the force of waves into electricity.
4.1.11 Warm ocean currents move from the poles towards the equator.
4.1.12 The Benguela Current is a warm ocean current.

4.1.13 Blue flags are awarded to recreational beaches that are well managed and have high environmental standards.
4.1.14 The largest lake in South Africa is found in KwaZulu-Natal.
4.1.15 A flash flood is a flood that strikes a couple of hours after rainfall.
[15]

4.2 Complete the following.
4.2.1 Define the terms:
i) urbanisation
ii) voluntary migration
iii) involuntary migration
iv) economic migrant
v) political migrant
vi) asylum seeker (12)
4.2.2 Name two push factors and two pull factors that would cause people to move from rural areas to the cities. (4)
4.2.3 Give one example in history where involuntary migration took place. (2)
4.2.4 Name two positive effects and two negative effects of voluntary migration. (4)
4.2.5 What is the difference between an economic migrant and migrant labour. Use examples in your explanation. (4)
4.2.6 What is xenophobia? (2)
4.2.7 Give two reasons that might cause people to become xenophobic. (2)
[30]

4.3 Refer to the diagram below and answer the questions.

A flood hydrograph



4.3.1 What is a hydrograph used for? (2)
4.3.2 Why is there a lag time between the time the rain stops and the discharge peak? (2)
4.3.3 Which rivers are more likely to flood? Use the terms 'time lag' and 'discharge peak' in your answer. (2)
4.3.4 What is meant by discharge? (2)
4.3.5 What effects can a flood have on the economy of a region? (6)
4.3.6 Name three ways in which good flood management can reduce the effects of floods. (6)
4.3.7 Why are people in rural areas and informal settlements often the hardest hit by floods? (4)
4.3.8 What is a storm surge? (2)
4.3.9 Name two positive effects of floods. (4)

[30]

[75 marks]

[Total marks: 225]

Learner's Book page 322

Memorandum
End-of-year examination: Paper 1 (Geographical knowledge)
TOTAL MARKS: 225

Learners should answer three questions: one from Section A, one from Section B and the third, from either Section A or B.

Section A
Question 1 **(75 marks)**

1.1

1.1.1	Q	
1.1.2	C	
1.1.3	B	
1.1.4	P	
1.1.5	R	
1.1.6	N	
1.1.7	G	
1.1.8	S	
1.1.9	M	
1.1.10	A	
1.1.11	H	
1.1.12	K	
1.1.13	F	
1.1.14	D	
1.1.15	L	[15]

1.2

1.2.1	The rate at which temperature decreases (1) with altitude (1).	(2)
1.2.2	6,4 °C/1 000 m	(2)
1.2.3	Approximately –45 °C	(2)
1.2.4	0,64 × 10 metres = 6,4 (1) 20°C –6,4 = 13,6 °C (1)	(2)
1.2.5	The temperature starts to increase with altitude	(4)
1.2.6	Temperature inversion	(2)
1.2.7	This is the layer where ozone (1) is found which absorbs (1) the ultra violet radiation (1) increasing heat (1).	(4)
1.2.8	The thermosphere	(2)
1.2.9	This is where all our weather takes place.	(2)
1.2.10	Latitude: The further one moves away from the equator the colder it gets (1). This is because at the equator, the Sun's rays strike the Earth at 90º angle (1) and so they move through less atmosphere (1) and have a smaller area on the surface to heat up (1). Ocean currents: Warm ocean currents (1) cause temperatures on the coast to increase (1) whereas cold ocean currents (1) cause temperatures on the coast to decrease (1).	(8)
		[30]

1.3

1.3.1	Any four of the following: The same fossils have been found in Antarctica, India and Australia (2). South America and Africa fit together like pieces of a jigsaw (2). Similar kinds of plants and animals are found in Africa and South America (2). Layers in rock in the Karoo are the same as rock layers in South America (2). Mesosaurus fossils have been found in Africa and South America (2).	(8)

1.3.2 The movements (1) of plates (1) that make up the Earth's crust (2). (4)

1.3.3 i) A region where one plate plunges beneath another plate (1) into the mantle (1). (2)

ii) One plate grinding (1) over another plate (1). (2)

iii) Magma rises up from the mantle (1) through the cracks and ridges between the plates (1). (2)

1.3.4 At 4 (2). Two plates with oceans floors moving towards each other (2). (4)

1.3.5 Focus – the place deep beneath the Earth where the slip on a fault occurs (1). Epicentre – the place directly above the focus at the surface of the Earth (1). (2)

1.3.6 Richter scale or the moment scale (1)

1.3.7 i) Indonesia, China and Peru (3)

ii) Japan is far more densely populated than Alaska. (2)

(30)

[75 marks]

Question 2 **(75 marks)**

2.1

2.1.1 c

2.1.2 b

2.1.3 a

2.1.4 d

2.1.5 a

2.1.6 b

2.1.7 d

2.1.8 b

2.1.9 d

2.1.10 a

2.1.11 c

2.1.12 q

2.1.13 a

2.1.14 a

2.1.15 a [15]

2.2

2.2.1 absorption, reflection and scattering (3)

2.2.2 50% (1)

2.2.3 terrestrial radiation (1)

2.2.4 ozone (1)

2.2.5 The atmosphere allows solar radiation to pass through (1). The heat absorbed by the Earth (1) is radiated into the atmosphere (1) where greenhouse gases (1) prevent it from escaping out into space (1) and the heat is trapped in the atmosphere (1). (6)

2.2.6 carbon dioxide and methane (2)

2.2.7 Yes (2) because without it, it would be too cold for us to survive on Earth (2). (4)

2.2.8 Any three of the following × 2 marks each: plant more trees; cut down on carbon emissions; car pools; cut down on the CFCs (6)

2.2.9 Any three of the following × 2 marks each: melting of the polar icecaps; rising sea levels; climate change; more extreme weather; threat to ecosystems (6)

[30]

2.3

2.3.1 A. volcanic ash and steam; B. lava bomb; C. layers of ash and lava; D. central pipe; E. magma chamber; F. lava flow (6)

2.3.2 Magma is molten material beneath the Earth's crust (1). Lava is molten material above the Earth's crust (1). (2)

2.3.3 It forms when a lava plug (1) blasts off the top of a volcano (1) or when the top collapses (2). (4)

2.3.4 Extinct volcano – no longer erupts (2). Dormant volcano – has not erupted in a long time (2). (4)

2.3.5 Small volcanoes (1) that pour out rock fragments and ash and not much lava (1). (2)

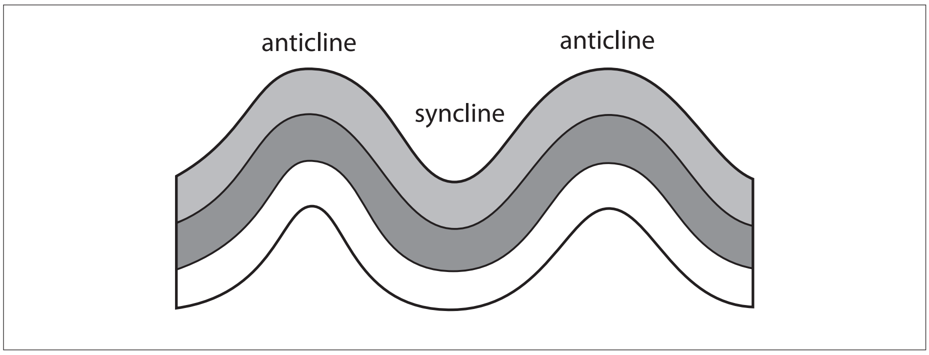
2.3.6 reverse fault (2)

2.3.7 i) strike-slip fault (2)

ii) North American Plate (2); Pacific Plate (2) (4)

iii) A catastrophic earthquake (2)

2.3 8



(2)

(30)

[75 marks]

Section B: Question 3 **(75 marks)**

3.1 One mark for each correct answer.

3.1.1 non-ecumene
3.1.2 natural increase
3.1.3 refugees
3.1.4 urbanisation
3.1.5 pull factor
3.1.6 China
3.1.7 Monaco
3.1.8 transpiration
3.1.9 runoff
3.1.10 non-renewable
3.1.11 warm
3.1.12 Indian
3.1.13 Northern Cape
3.1.14 lag time
3.1.15 Asia (15)

3.2

3.2.1 Western Europe: bell shaped (2); Sub-Saharan Africa: triangular (2) (4)

3.2.2 18% (2)

3.2.3 Sub-Saharan Africa (2)

3.2.4 Any two of the following × 2 marks each: tradition; poverty; no access to contraceptives (4)

3.2.5 Western Europe (2)
3.2.6 not enough workforce to sustain the country economically (2)
3.2.7 [children (0–14) + old people (above 65)] ÷ [working age people (15–64) × 100] OR the relationship between the size of the economically non-active and the economically active people (2)
3.2.8 Any three of the following × 2 marks each: families paying tax penalties if they have more than one child; the government investing in education to encourage women to delay falling pregnant and to raise economic standards; investing in family planning and making contraceptives accessible to all; greater focus on the role of women in society to make their own decisions; investing more money in fighting infant mortality rate leads to smaller families; greater control over immigration (6)
3.2.9 Australia: bonus for each baby plus welfare payments and free immunisation (2) Sweden: 16 months maternity and paternity leave paid to parents for each child (2) Singapore: $3 000 to first child, $9 000 dollars to second child, $18 000 to third child (2) (6)
(30)

3.3
3.3.1 Agulhas Bank (2)
3.3.2 on continental shelves (2)
3.3.3 There is upwelling (1) of cold nutrient-rich ocean water (1) which encourages the growth of phytoplankton (1) on which fish feed (1). (4)
3.3.4 Upwelling is the rise of cold nutrient-rich ocean water which replaces surface water (1) which has been pushed away from the coastline by prevailing winds (1). (2)
3.3.5 Any one example: Dogger Bank; Grand Bank (2)
3.3.6 Subsistence fishing: small-scale fishing for food and income (1). Commercial fishing: the farming of fish, shellfish and seaweed in sheltered areas of the sea (1). (2)
3.3.7 Fish that live in the surface layers of the sea (1) known as the pelagic zone (1). (2)
3.3.8 In South Africa (1), sardines are breed at the Agulhas Bank in summer (1). Every year in winter (1), millions of sardines head up the south coast to KwaZulu-Natal (1), attracted by a band of cool water (1) between the south coast and the Agulhas Current (1). (6)
3.3.9 There would be no food for the fish to feed on (1) and so they would decrease in numbers (1) and so there would not be enough food in the next link of the food chain (1). Species would eventually decrease or die out/ there would be a huge disruption in the food chain (1). (4)
3.3.10 Any two of the following × 2 marks each: Agriculture – rapid growth of algae using oxygen in the water, kills fish. Industry – poisons sea animals. Household sewerage – illness, such as diarrhoea and dysentery in people. Oil spills – blocks light from water and suffocates marine birds. Littering – plastics trap sea birds and animals. Acid Rain – kills plants and water animals (4)
(30)
[75 marks]

Question 4 **(75 marks)**

4.1

4.1.1 False
4.1.2 False
4.1.3 False
4.1.4 True
4.1.5 True
4.1.6 False
4.1.7 True
4.1.8 True
4.1.9 True
4.1.10 False
4.1.11 False
4.1.12 False
4.1.13 True
4.1.14 True
4.1.15 False [15]

4.2

4.2.1
i) Ubanisation is the process of more and more people choosing to live in the cities (2).
ii) Voluntary migration is when someone makes a choice to move to another area (2).
iii) Involuntary migration is when the choice is removed from someone because of external factors (2).
iv) An economic migrant is a skilled person whose ultimate intention is to emigrate to a new country (2).
v) Political migrants are people who move from their country of birth for political reasons (2).
vi) Asylum seekers are people who have fled their own country and apply to the government of another country for protection (2). (12)

4.2.2 Any two answers for each × 2 marks each: Push factors: e.g. lack of jobs//lack of security. Pull factors: e.g. job opportunities//higher wages//security (4)

4.2.3 Any correct example: e.g. Germany during World War II; during the war in Darfur in Sudan; during the genocide in Rwanda (2)

4.2.4 Positives: Migrants do the least favoured jobs; work long hours for less pay; add to cultural diversity; bring a variety of skills; strengthen tolerance (2). Negatives: Migrants are exploited; brain drain; may attract hostility and jealousy; lumped together as illegal; cause of racial tension (2) (4)

4.2.5 Economic migrants: people who move permanently to another place because of better economic opportunities (1), e.g. people with higher levels of education might emigrate to a country where their skills are better paid (1). Migrant labourer: someone who moves to another place to work but does not settle there (1). Migrant labourers usually have lower levels of education than economic migrants (1). (4)

4.2.6 Xenophobia is prejudice against foreigners. (2)

4.2.7 Any two of the following × 1 mark each: Fears and jealousy amongst lesser-skilled workers; reduction of job opportunities for locals; decrease in wages – migrants often work for less pay (2)

[30]

4.3

4.3.1 A hydrograph can be used to measure the change in a river's discharge (1) over time (1). (2)

4.3.2 The lag time is the time when the first waters infiltrate the ground, as well as cracks and crevices (1), until they are saturated before the actual runoff takes place (1). (2)

4.3.3 Rivers with a short (1) lag time and high (1) discharge peak are more likely to flood. (2)

4.3.4 Discharge is a measure of the volume and speed (1) of the water flow (1). (2)

4.3.5 Any six of the following × 1 mark each: infrastructure is destroyed; crops are destroyed; businesses are destroyed; food has to be imported; rebuilding infrastructure costs money; people are unable to work so GDP declines; foreigners stop investing in the area; tourism declines (6)

4.3.6 Any three of the following × 2 marks each: early warning systems; a flood disaster action plan; river maintenance; the use of dams for flood water control; effective drainage systems in towns (6)

4.3.7 Informal settlements often located on the banks of rivers below the flood line (1) and informal housing is usually not strong enough to withstand heavy rain (1). People in rural areas often practice traditional farming methods which do not reduce runoff, e.g. not practicing contour ploughing (1), and they are further away from emergency services (1). (4)

4.3.8 a sudden rises in sea level which breaks over walls and banks (2)

4.3.9 Any two of the following × 2 marks each: fertile alluvium deposits in the floodplain; natural irrigation for crops; deposits build up river banks; groundwater supplies replenished (4)

(30)

[75 marks]

[Total marks: 225]

Time:
1½ hours

End-of-year examination: Paper 2 (Geographical skills and techniques)

TOTAL MARKS: 75

Answer all the questions.

Refer to the 1:50 000 topographical map of GINGINDLOVU 2931BA and the vertical aerial photograph.

1. Multiple choice questions. Write only the number and the letter.

1.1 The contour interval of the topographical map is…
- A 20 m
- B 100 m
- C 5 m
- D 40 m

1.2 The ocean found closest to Gingindlovu is…
- A Atlantic
- B Pacific
- C Indian
- D Arctic

1.3 Two types of scales shown on the topographical map are…
- A line scale and word scale
- B word scale and ratio scale
- C ratio scale and line scale
- D line Scale and Richter scale

1.4 29 in the map code refers to…
- A longitude
- B latitude
- C seconds
- D minutes

1.5 The map code of the map directly north of 2931BA is ...
- A 2931DC
- B 2831DC
- C 2930DC
- D 2830DC

1.6 The initials PS in Gingindlovu, represent a…
- A Primary School
- B Post Office
- C Police Station
- D Public Service

1.7 The Matigulu River is flowing…
- A south-westerly
- B north-easterly
- C north-westerly
- D south-easterly

1.8 The Matigulu River is a…
   A permanent river
   B periodic river
   C exotic river
   D non-perennial river

1.9 The mean magnetic declination is…
   A 12°36’west
   B 36°22’east
   C 22°36’west
   D 22°36’east

1.10 The scale of the map is…
   A 1:50 000
   B 1:5000
   C 1:10 000
   D 1:1 000 (20)

2. Calculate the distance along the railway line from the station in Gingindlovu to Nyezane siding. (2)
3. Give the direction and bearing from:
   a) trig beacon 14 [Block E2] and trig beacon 90 [Block D5] (4)
   b) trig beacon 139 [Block D5] and the station in Gingindlovu (4)
4. Give the co-ordinates of:
   a) spot height 99 [Block F3] (2)
   b) trig beacon 90 [Block B2] (2)
5. Draw the following conventional map signs and indicate their colour. (5)

Conventional sign		Symbol	Colour
a)	power line		
b)	cultivated land		
c)	national road		
d)	windpump		
e)	orchards and vineyards		

6. Give one piece of evidence from the map that indicates that Gingindlovu receives a high rainfall. (2)
7. Which ocean current flows past Gingindlovu? (2)
8. How does this current affect the temperatures in Gingindlovu? (2)
9. Why would the temperature range at Gingindlovu be smaller than that of Pretoria? (2)
10. Look at the vertical aerial photograph of Gingindlovu and answer these questions.
   10.1 How does this photograph differ from oblique photographs? (2)
   10.2 Name two advantages of having a vertical photograph rather than an oblique photograph. (4)
   10.3 Describe one difference between the farms in the northern half of the photo and farms in the southern half. (2)
   10.4 Do you think commercial farming or subsistence farming is taking place in the northern half of the photo? Give one reason for your answer. (4)
   10.5 On the topographical map [Block B2] why do you think the farmer planted the row of trees? (2)

11. Geographical Information Systems

11.1 What is a Geographical Information System? (2)

11.2 What is remote sensing? (2)

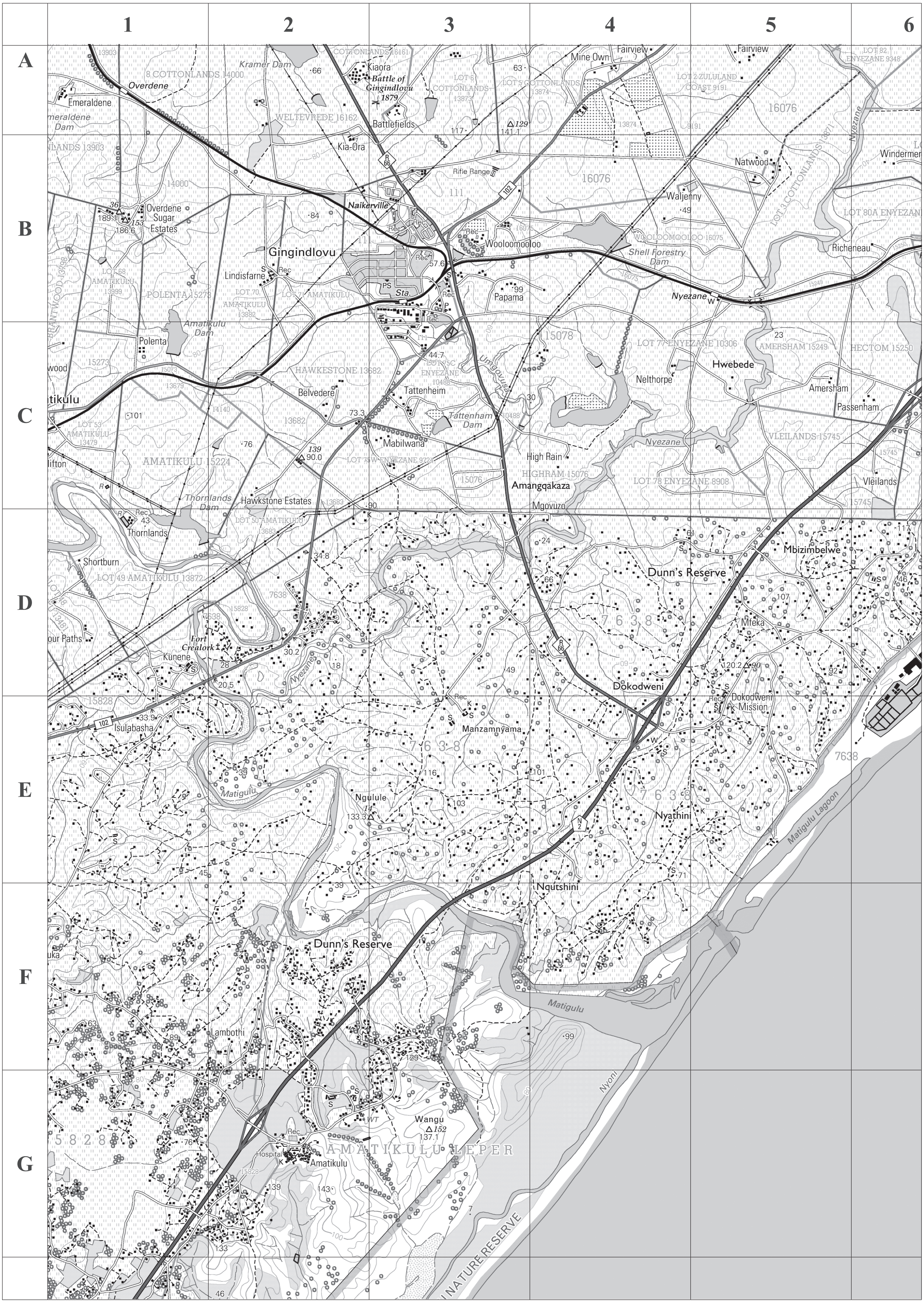
11.3 What is the difference between spatial data and attribute data? (4)

11.4 What is the difference between a Raster and Vector model? (4)

11.5 Suggest two ways in which GIS can be used. (2)

[Total marks: 75]

2931BA GINGINDLOVU



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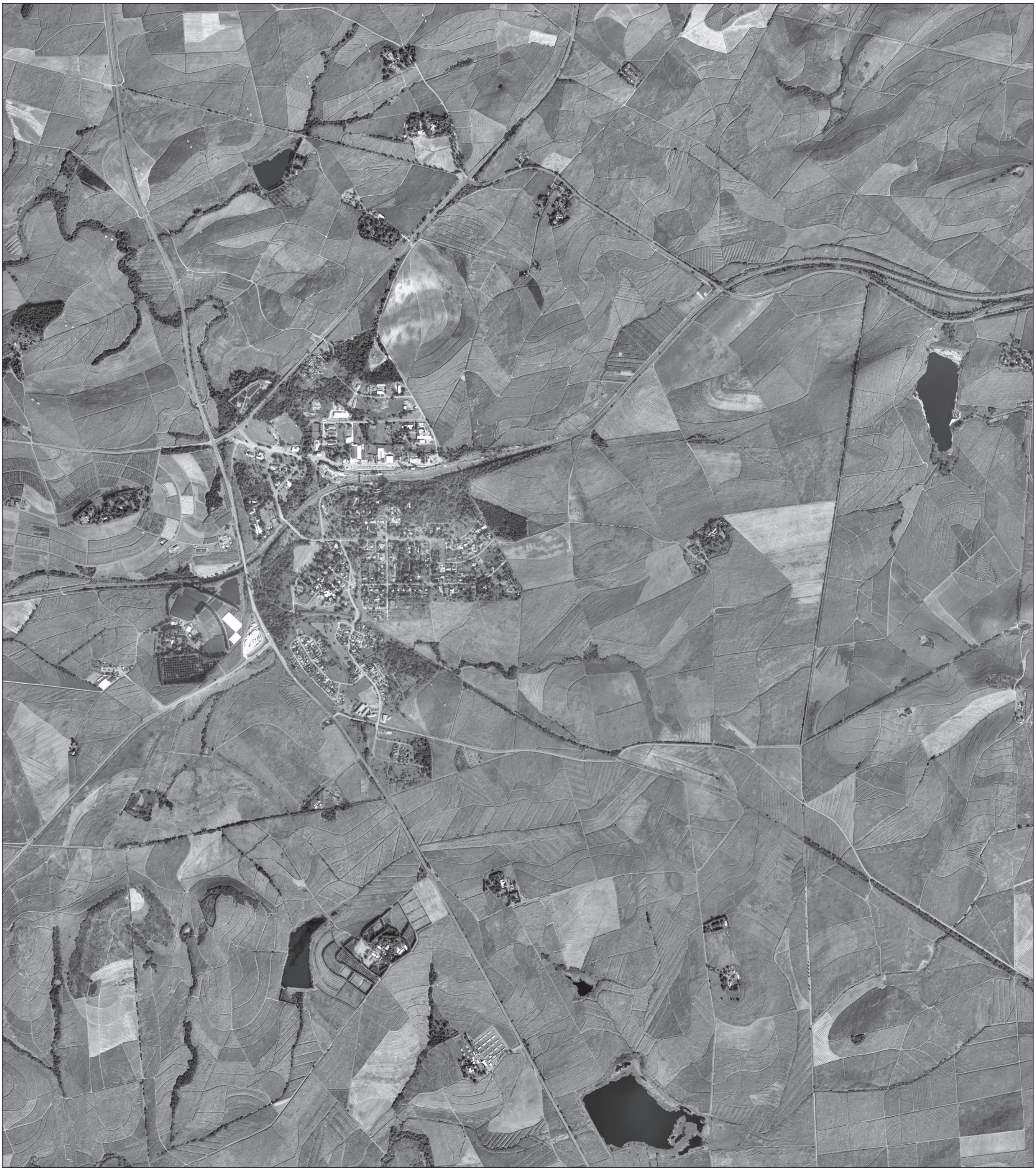
Metres 1 000 0 1 000 2 000 3 000 4 000 5 000



Reproduced under Government Printer's Authorisation No. 11539 dated 29 June 2011

Metres 1 000 0 1 000 2 000 3 000 4 000 5 000

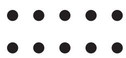
Vertical aerial photograph of Gingindlovu

Memorandum End-of-year examination: Paper 2 (Geographical skills and techniques)

TOTAL MARKS: 75

Learners should answer all the questions.

1. Two marks for each correct answer.
   1.1 A
   1.2 C
   1.3 C
   1.4 B
   1.5 B
   1.6 C
   1.7 D
   1.8 A
   1.9 C
   1.10 A (20)
2. 8,4 cm × 0,5 (1) = 4,2 km (1) (2)
3. a) 68 °NE (4)
   b) 316 °NW (4)
4. a) 29°06’50’’S 31°35’50’’E (2)
   b) 29°02’50’’S 31°34’00’’E (2)
5.

CONVENTIONAL SIGN	SYMBOL	COLOUR
(a) Power line		black
(b) Cultivated land		green
(c) National Road		blue
(d) Windpump		black
(e) Orchards and vineyards		green

(5)

6. Any one of the following × 2 marks: A farm called High Rain on the topographical map; large amounts of cultivated land; plenty of storage dams (2)
7. Mozambique Current (2)
8. It causes the temperatures to increase or to be higher/warmer. (2)
9. Pretoria is landlocked whereas Gingindlovu is situated near the coast (1). The sea has a moderating effect on temperatures at Gingindlovu (1). (2)
10.
   10.1 The position of the camera is directly overhead (above) the area being photographed in the vertical photograph (1); the position of the camera is at an angle to the ground when the photograph is taken in the oblique photograph (1). (2)
   10.2 The scale is the same in all parts of the photograph (2); the shapes of the farms and the town are correct (2). (4)
   10.3 Farms in the north are much bigger than farms in the south. (2)

10.4 Commercial faming (2); because the farms are large in size (1); and the farms show a very structured pattern (1). (4)

10.5 to serve as a windbreak (2)

11.

11.1 A computer programme (1) which allows users to capture, store, manipulate and interpret data which is stored digitally (1). (2)

11.2 The collection of spatial data (1) from a distance using aircraft and satellite (1). (2)

11.3 Spatial data are features on the ground such as buildings, roads, forests, etc (1) and are shown on maps by lines, points, nodes or polygons (1); attribute data are attributes/features/information (1) about the spatial data (1). (4)

11.4 A Raster model uses pixels (1) to store information (1); a Vector model uses points (1), each assigned a co-ordinate (1). (4)

11.5 Any two of the following x 1 mark each: used for scientific investigations; resource management; development planning; or more specific examples could be to decide where to locate a school in an area; to decide the best location for a business to identify a suitable site for a well (2)

[Total marks: 75]

Record sheet for formal assessment: Term 1

Class: ______________________________ Year: ____________________

Learner's names	Test mark (40 or 60 marks) *	Contribution to year mark (10 marks)**	Assessment Task 1 mark (40 marks)	Contribution to year mark (20 marks)***	Term 1 mark (80 or 100 marks)^	Term 1 percentage~	Rating code

Rating codes and descriptors:
7: Outstanding achievement (80%–100%) 6: Meritorious achievement (70%–79%) 5: Substantial achievement (60%–69%) 4: Adequate achievement (50%–59%) 3: Moderate achievement (40%–49%)
2: Elementary achievement (30%–39%) 1: Not achieved (0%–29%)

* This mark will be out of 40 or 60 depending on which test you choose.
** If the test is out of 40 marks: divide the learner's test mark by 4. If the test is out of 60 marks, divide the learner's test mark by 6.
*** Divide the learner's Assessment Task 1 mark by 2.
^ Add the Test mark and the Assessment Task 1 mark. This mark is out of 80 or 100.
~ If the test is out of 40 marks: divide the number in the previous column by 80 and multiply by 100. If the test is out of 60 marks, the percentage will be the same as the Term 1 mark.

Record sheet for formal assessment: Term 2

Class: ______________________ Year: ______________________

Learner's names	Assessment Task 2 mark (30 marks)	Contribution to year mark (20 marks)*	Mid-Year exam: Paper 1 mark (120 marks)	Mid-year exam: Paper 2 mark (60 marks)	Total mark for Mid-Year exam (180 marks)**	Contribution to year mark (20 marks) ***	Term 2 mark (210 marks)^	Term 2 percentage ~	Rating code

Rating codes and descriptors:
7: Outstanding achievement (80%–100%) 6: Meritorious achievement (70%–79%) 5: Substantial achievement (60%–69%) 4: Adequate achievement (50%–59%) 3: Moderate achievement (40%–49%)
2: Elementary achievement (30%–39%) 1: Not achieved (0%–29%)

* Multiply the mark in the previous column by 2 and divide the answer by 3.
** Add the marks in Columns 4 and 5.
*** Divide the learner's total mark for the mid-year exam by 9.
^ Add the marks in Columns 2 and 6.
~ Divide the mark in the previous column by 210 and then multiply the answer by 100.

Record sheet for formal assessment: Term 3

Class: ______________________ Year: ______________________

Learner's names	Test mark (40/60 marks)*	Contribution to year mark (10 marks)**	Term 3 mark (40/60 marks)***	Term 3 percentage^	Rating code

Rating codes and descriptors:
7: Outstanding achievement (80%–100%) 6: Meritorious achievement (70%–79%) 5: Substantial achievement (60%–69%) 4: Adequate achievement (50%–59%) 3: Moderate achievement (40%–49%)
2: Elementary achievement (30%–39%) 1: Not achieved (0%–29%)

* This mark will be out of 40 or 60 depending on which test you choose.

** If the test is out of 40 marks: divide the learner's test mark by 4. If the test is out of 60 marks, divide the learner's test mark by 6.

*** This is the same mark that appears in Column 2.

^ If the test is out of 40 marks: divide the number in the previous column by 40 and multiply by 100. If the test is out of 60 marks: divide the number in the previous column by 60 and multiply by 100.

Record sheet for formal assessment: Term 4

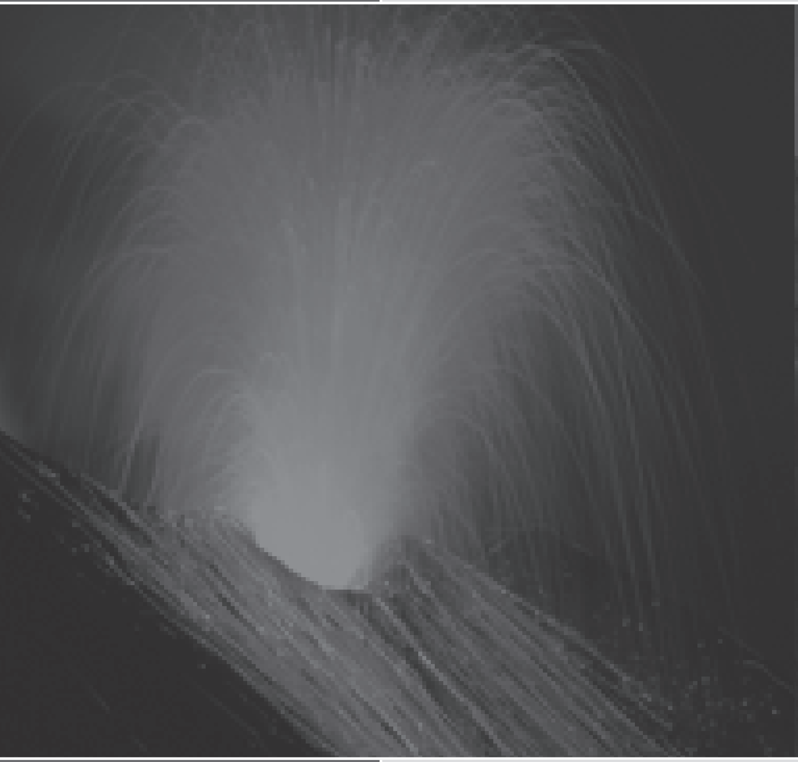
Class: ______________________ Year: ______________________

Learner's names	Assessment Task 3 mark (30 marks)	Contribution to year mark (20 marks)*	Year-end exam: Paper 1 mark (225 marks)	Year-end exam: Paper 2 mark (75 marks)	Total mark for Year-end exam (300 marks)**	Year mark (100 marks)***	Term 4 mark (400 marks) ^	Term 4 percentage~	Rating code

Rating codes and descriptors:
7: Outstanding achievement (80%–100%) 6: Meritorious achievement (70%–79%) 5: Substantial achievement (60%–69%) 4: Adequate achievement (50%–59%) 3: Moderate achievement (40%–49%)
2: Elementary achievement (30%–39%) 1: Not achieved (0%–29%)

* Multiply the mark in the previous column by 2 and divide the answer by 3.
** Add the marks in Columns 4 and 5.
*** To work out the year mark of for each learner add the marks in the columns indicated from this table and the tables for the other terms: Term 1, Column 3 + Term 1, Column 5 + Term 2, Column 3 + Term 2, Column 7 + Term 3, Column 3 + Term 4, Column 3
^ Add the marks in Columns 6 and 7.
~ Divide the mark in Column 8 by 4.

4. RESOURCES



1. USEFUL WEBSITES

The following websites are suggested for both you and the learners to consult. They contain information and features that would be of general use to you as a teaching tool for Grade 10 Geography:

- http://www.dailymail.co.uk/sciencetech/index.html
- http://www.geography4kids.com/index.html
- http://gis.com
- http://www.google.com/earth/index.html
- http://maps.google.co.za
- http://www.nasa.gov/home/index.html
- http://www.nationalgeographic.com
- http://www.un.org/en/development
- http://www.weathersa.co.za

For website information that links specifically with the content of each module and unit, please consult the Resources section of the lessons in the Lesson-by-lesson part of this Teacher's Guide (pages 17–192).

2. RECIPES

Recipe for papier mâché

Materials
- flour
- water
- old newspapers
- bucket
- spoon

Method
1. Mix one part flour to two parts water to make a runny, but sticky glue.
2. If you are using a frame to build your model, tear up strips of newspaper and dip them in the glue. Build up the strips around the frame.
3. If you are using the papier mâché as a sort of modeling clay, then tear up pieces of newspaper and add them to the paste to make a thick mash.

Tip
Allow plenty of drying time for your model before painting it with poster paints. You can apply a coat of varnish on top.

Recipe for play dough

Materials for 1 kg play dough
- 5 cups of flour
- 1 cup of water
- 2 cups of salt
- half a cup of oil
- food colouring

Method
1. Mix the flour, salt and oil, then add the water.
2. Mix and knead well.
3. For different colours, divide up the mixture and add enough drops of food colouring to give a strong colour.

Tips
- Store the play dough in a plastic bag or airtight container to prevent it from drying out and getting hard.
- To extend the life of a play dough model, bake it in a warm oven for about half an hour. Or put it in the hot sun.

3. PHOTOCOPIABLE WORKSHEETS

The following worksheets may be photocopied for use with *Study & Master Geography Grade 10*. Please refer to the Lesson-by-lesson section of this Teacher's Guide for suggestions on when to use these worksheets. The consolidation worksheets can also be used for revision purposes.
Answers for the photocopiable worksheets are provided on pages 306–323 of this section.

Worksheet 1 (consolidation)

Temperature and altitude

The lapse rate is a temperature decrease of 6,5 °C for every 1 000 m in altitude. Using the information already given in the table, calculate the temperature at the top of Mount Everest.

Altitude (m)	Temperature (°C)	Working out
2 000	29,9	
3 000		
4 000		
5 000		
6 000		
7 000		
8 000		
8 800		

Worksheet 2 (consolidation)

The heating of the atmosphere and its effect

1. How is the atmosphere heated?
   1.1 Choose the correct term from those in brackets to complete the sentences.
      a) The Sun's energy is called (terrestrial/solar) radiation.
      b) Short waves of the electromagnetic spectrum are (visible light/infrared heat).
      c) The Sun's radiation is (long-wave/shortwave) radiation.
      d) The atmosphere can only trap (long-wave/shortwave) radiation.
      e) The Earth radiates (long-wave/shortwave) radiation.

   1.2 Name the tri-molecular oxygen molecule that absorbs the ultraviolet radiation from the Sun.

   ____

   1.3 What percentage of incoming solar radiation is absorbed by the Earth?

   ____

   1.4 Name three ways in which the rest is lost to the atmosphere.

   ____
   ____
   ____

   1.5 Describe how latent heat is released into the atmosphere.

   ____
   ____
   ____

   1.6 What is the difference between convection and conduction of heat?

   ____
   ____
   ____

2. Factors which affect differences in temperature
   2.1 Study the table below representing the temperature, latitude and height above sea level of Durban, Johannesburg, Cape Town and Kimberley.

Place	Latitude	Average hottest month	Average coldest month	Annual temperature range	Height above sea level in metres
Johannesburg	26 °S	20,0 °C	10,0 °C	10,0	1 665
Cape Town	34 °S	21,7 °C	12,8 °C	8,9	12
Durban	30 °S	23,9 °C	16,7 °C	7,2	5
Kimberley	29 °S	25,0 °C	10,0 °C	15,0	1 197

a) Explain why Kimberley's temperature range is higher than that of Durban.

b) Use the data from the table to explain how altitude above sea level affects temperature.

c) Which factor is responsible for Durban having the highest average hottest month?

d) What causes the average temperatures in Cape Town to be lower than in Durban?

3. With the aid of a fully labeled diagram, explain how latitude influences temperature.

4. What is meant by albedo?

5. How does albedo affect differences in temperature?

Worksheet 3 (extension)

The effect of distance from the ocean on temperature

Task

To demonstrate the 'distance from the oceans' effect and show that water is slower to cool than land or air.

Materials

- 2 identical or equal-sized plastic lunchboxes
- 2 weather or 1–100 °C thermometers, or 2 teaspoons

Method

1. Put a thermometer in each plastic lunchbox. (If you do not have 2 weather thermometers or 0–100 °C thermometers put a teaspoon in each box and then feel which one is colder.)
2. Fill 1 lunchbox with water.
3. Place both lunchboxes in the fridge or freezer.
4. Check the thermometers after 15 minutes.

Results

Can you predict which box will have cooled more quickly – the one filled with air or the one filled with water?

Predicted result: ______________________________

Actual result: ______________________________

Record or describe the difference in temperature:

____

____

Depletion of ozone in the atmosphere

1. Read the newspaper article below and then answer the questions.

Hole in Arctic ozone layer is ‘growing at record rate’

Geneva, 5 April 2011 GENEVA 5 APRIL 2011

The ozone layer protects us from the Sun’s harmful rays. However, according to scientists, 2011 saw the highest recorded levels of ozone depletion over the Arctic. The World Meteorological Organization (WMO) warned that ozone column loss reached 40 per cent in the spring of 2011. They blame this on a combination of a long, cold winter and lingering CFCs and halons in the atmosphere.

The Montreal Protocol on Substances That Deplete the Ozone Layer came into force on January 1 1989 as an international treaty aimed at phasing out the production of ozone-depleting chemicals, such as CFCs and halons. CFCs were once used in refrigerators, spray cans and fire extinguishers, but have now been phased out. However CFCs and halons have a long lifetime in the atmosphere and the ozone layer is only expected to recover by 2050, if everyone adheres to the Protocol.

Scientists know that levels of ozone at the poles do change with the seasons. Every year there is a large ozone loss over the Antarctica. However this is not the case in the Arctic stratosphere, where meteorological conditions vary much more each year. Over the past 15 years, the highest ozone loss recorded over the Arctic was about 30 per cent. Now in 2011, with a 40 per cent loss of ozone, we can expect more harmful UV light to be able to reach the Earth’s surface. This increases our risk of sunburn, skin cancer, eye damage and damage to the human immune system. Crops and marine life may also be harmed.

A spokesperson from WMO stated: “Depletion of the ozone… has reached an unprecedented level over the Arctic this spring because of the continuing presence of ozone-depleting substances in the atmosphere and a very cold winter in the stratosphere. If the ozone depleted area moves away from the pole and towards lower latitudes one can expect increased ultraviolet (UV) radiation as compared to the normal season. Some crops and forms of marine life can also suffer adverse effects.”

The areas of low ozone have shifted towards Greenland and Scandinavia. Scientists have warned that as the lower ozone areas move away from the Arctic, other parts of the world could face increased UV ray exposure. Everyone is urged to check their national UV forecasts and to take the appropriate measures to protect themselves.

Source: **Adopted from http://www.wmo.int/pages/mediacentre/press_releases/pr_912_en.html**

a) Where is the Arctic?

b) What has caused the depletion of ozone over the Arctic?

c) What is ozone?

d) In which layer of the atmosphere is ozone found?

e) Why is the presence of ozone in the atmosphere essential to human life?

f) What is the WMO?

g) What are the functions of the WMO?

h) What have UV-B rays been linked to?

i) What was the aim of the Montreal Protocol?

j) Has this had any effect on the loss of ozone?

2. Imagine that you are a member of WMO and have been asked to write an article for a magazine on the causes, effects and possible solutions of ozone depletion. Write the article which must:
   - be at least 150 words long
   - have an interesting heading.

Worksheet 5 (consolidation)

Temperature difference and relative humidity

1. Use the dry bulb and wet bulb temperature readings on the table to work out:
   a) the temperature difference
   b) the relative humidity.

Tips
- Temperature difference = dry bulb temperature – wet bulb temperature.
- To work out the relative humidity, refer to Table 1.3.2 on page 43 of the Learner's Book.

Dry bulb temperature	Wet bulb temperature	Temperature difference	Relative humidity
30 °C	28 °C		
30 °C	23 °C		
24 °C	21 °C		
24 °C	17 °C		
20 °C	19 °C		
20 °C	15 °C		
20 °C	13 °C		

2. Complete the sentence by underlining the correct word:
   a) When the temperature difference between the wet and dry bulbs is small, the relative humidity is low/high.
   b) When the temperature difference between the wet and dry bulbs is big, the relative humidity is low/high.

Worksheet 6 (extension)

Water cycle model

Make a simple model of the water cycle that shows how the Earth's water cycle takes place in a closed system.

Materials

- jar with a lid
- water
- teaspoon of salt
- marker pen/ tape

Method

1. Half fill a jar with water and stir in a teaspoon of salt until it is dissolved (this represents sea water).
2. Close the jar with a lid, mark the level of the water with a marker pen or tape; and place it in a warm place.
3. Notice how much water evaporates.
4. Taste the condensed water droplets under the lid of the jar (which represent fresh water precipitation). Do the droplets taste salty?
   Why or why not?

   ____

   ____

   ____

5. If a lot of water droplets collect, see how their weight pulls them down the sides of the jar and they run back into the water in the bottom (this represents the water runoff that returns to the sea).

Worksheet 7 (extension)

Make a wind vane

Make a wind vane by following the instructions.

Materials
- strip of thick paper/ thin cardboard
- drinking straw
- glue
- dowel stick/ broom stick/ other similar stick
- nail
- hammer

Method
1. Bend a strip of paper in half.
2. Put the top end of the drinking straw in the bend of the paper, making sure that the straw does not stick out.
3. Glue the two sides of the paper together.
4. Put the stick into the ground where you want to measure the wind direction.
5. Hammer a nail into the top end of the stick.
6. Place the straw over the nail so that it can move freely. When the wind blows, the straw and paper (the wind vane) will swivel on the nail and indicate the direction of the wind.

Worksheet 8 (consolidation)

Metamorphic rock landforms

Read the case study, 'The Golden Gates' on page 101 of the Learner's Book and complete the questions below.

1. Which famous Free State and Lesotho mountains are the Golden Gate buttresses part of? ______

2. What is a buttress?

______

3. Refer to Figure 3.1.25 on page 101 in the Learner's Book.
   a) Complete this table.

Rock layer	Colour	How long ago it formed (millions of years ago)	Type of rock
Eliot mudstone			
Clarens sandstone			
Calcified sandstone			
Quartzite			
Drakensberg basalt			

   b) Which rock layer is the oldest? ______

   c) Which rock layer is the newest? ______

   d) Explain how sedimentary rock forms.

   ______

   ______

   e) Of the sedimentary rock layers, which one is made up of the finest particles? ______

   f) Part of which rock layer turned to quartzite?

   ______

   g) Why is the quartzite layer right next to the basalt? Explain, using the term 'contact metamorphism'.

   ______

   ______

   h) What is basalt formed from?

   ______

   i) Classify basalt as intrusive or extrusive.

   ______

Worksheet 9 (extension)

Types of rocks and their formation

1. Explain how the following groups of rocks form.
   a) Igneous rocks:

   b) Metamorphic rocks:

   c) Sedimentary rocks:

2. What is the difference between an igneous extrusion and an igneous intrusion?

3. Draw a labelled diagram to illustrate three different igneous intrusions.

4. Which rock group contains crystals?

5. Which rock group is usually layered?

6. Which sedimentary rock is formed from pebbles cemented together?

7. Which sedimentary rock is formed from organic matter such as plants?

8. What type of metamorphic rock forms from limestone?

9. From which type of rock did the metamorphic rock slate form?

10. What type of rock forms the top half of Table Mountain?

11. Name a place in the Western Cape where granite can be observed easily.

12. What type of rock is granite?

13. How is granite formed?

14. There are three minerals found in granite. Name the three minerals and explain how you would be able to identify them.

15. In the diagram below, identify the igneous rock landforms **A**, **B** and **C**. Explain the process of how landform C developed from landform A.

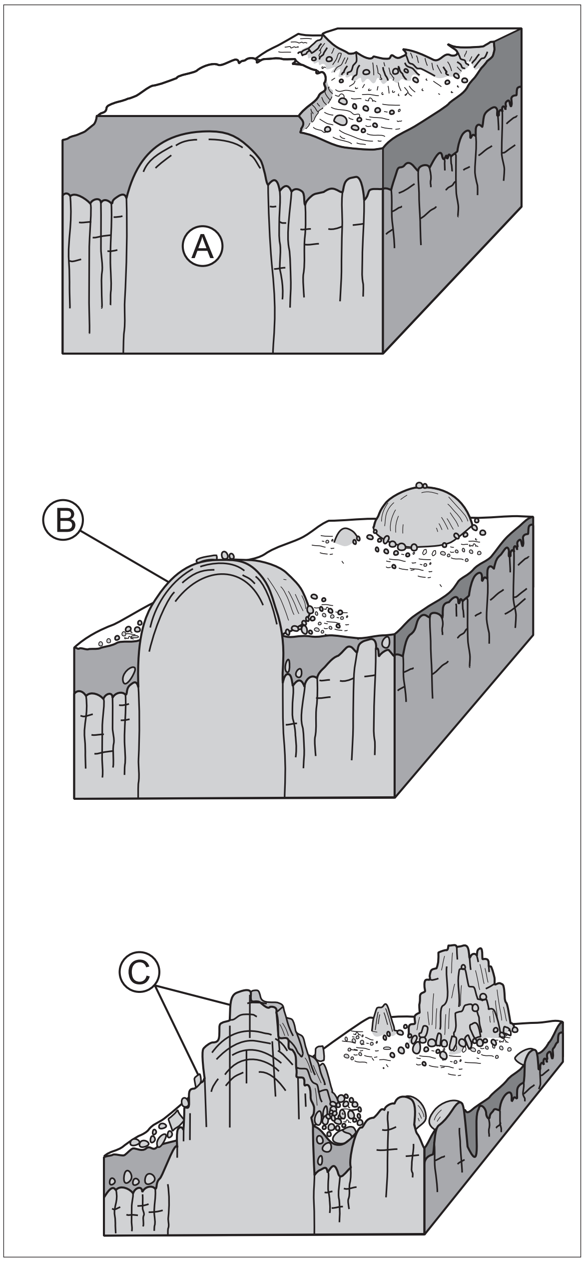


Plate boundaries and the movement of plates

Refer to Figure 3.2.13 on pages 108 and 109 of the Learner's Book and complete the table below.

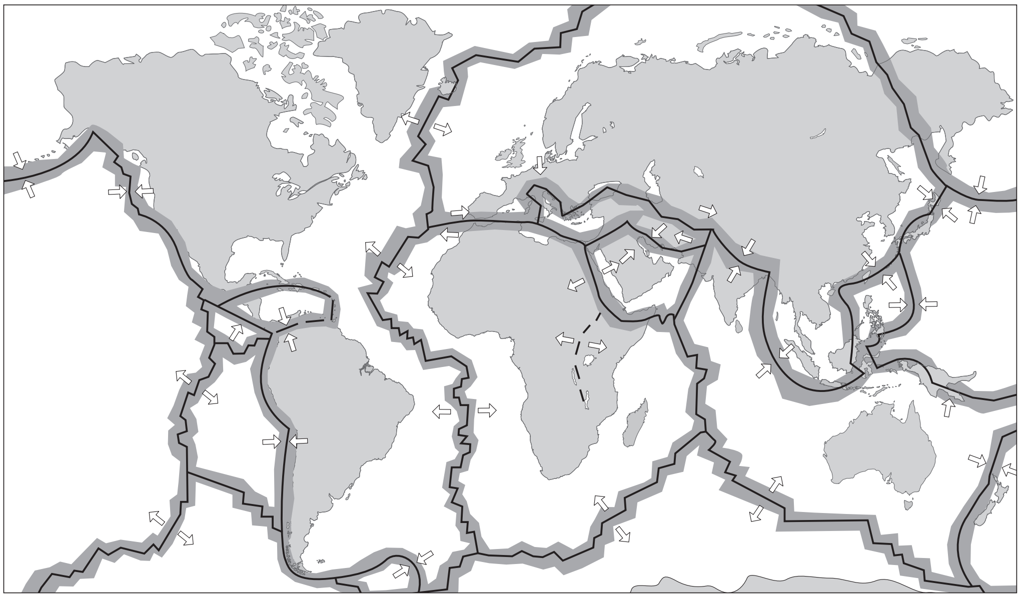
Plate boundary	Direction of movement	Constructive or destructive*	Features or landforms
Diverging			
Ocean–ocean			
Continent–continent			
Converging			
Ocean–ocean			
Ocean–continent			
Continent–continent			

*Constructive forms new crust, destructive breaks down crust

Worksheet 11 (consolidation)

Plate tectonics

1. Label the eight tectonic plates on the map below.



2. Fill in the missing word/s in the information on plate tectonics.
   Ocean floors can be divided into a number of ___________________ each bordered by a ___________________. Convection currents in the ___________________ cause plates to constantly move. When plates move apart, ___________________ plate boundaries are formed. When plates move towards each other ___________________ plate boundaries are formed. When plates move past each other a ___________________ boundary is formed.

   When plates push together, the heavier plate sinks into the mantle. This is called ___________________. The melted material from the sunken plate then pushes up through the weakened edge of the lighter plate to form ___________________.

   When a plate with an ocean floor and a plate with a continent push together the two resultant landforms are a ___________________ and ___________________ mountains.

   When a plate with a continent and a plate with a continent move towards each other, it produces ___________________.

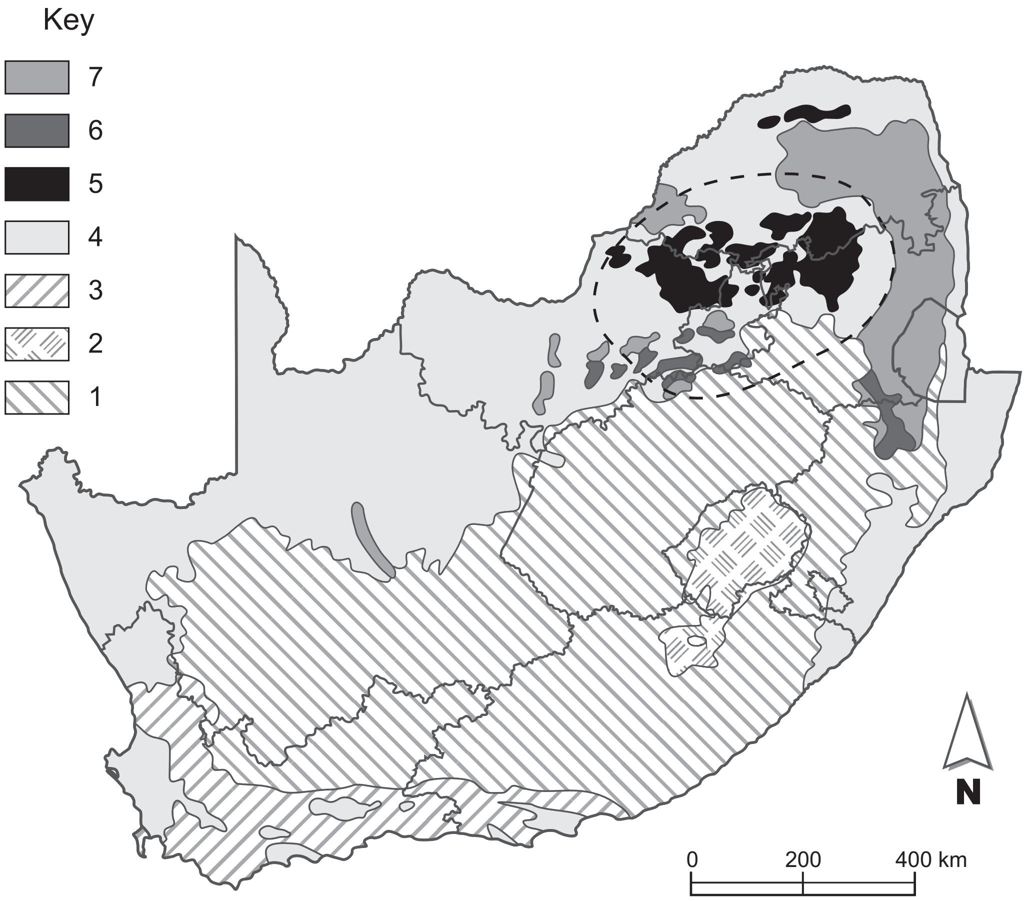
   When two plates move past each other, they catch or stick. The strain produces a crack called a ___________________ . These can result in an ___________________.

   When a plate with an ocean floor moves apart from a plate with an ocean floor a ___________________ is formed. This process is called ___________________.

Worksheet 12 (extension)

Geological time and different rock types

The map below shows a simplified version of South Africa's geology. The southern African region has had six main periods of tectonic activity: the first gave rise to the greenstone belts – metamorphosed volcanic belts; the sixth and last gave rise to the Cape Fold Mountains.



Explanation of map key

1. The Barberton and other greenstone belts (more than 3 000 mya)
2. Witwatersrand gold-bearing conglomerate reefs (2 900–2 800 mya)
3. Transvaal dolomites (2 600–2 400 mya)
4. Sedimentary and volcanic rocks
5. Cape Fold Mountains, including Table Mountain (250 mya)
6. Karoo sediments covered by Karoo dolerite intrusions and Drakensberg basalt extrusions (183 mya)
7. Karoo sediments

mya stands for 'million years ago'

1. Refer to the map and its key.
   a) Which are South Africa's oldest rocks?

____

____

b) Identify the type of rock and give a brief description:
   i) conglomerate

   ii) dolomite

   iii) dolerite

   iv) basalt

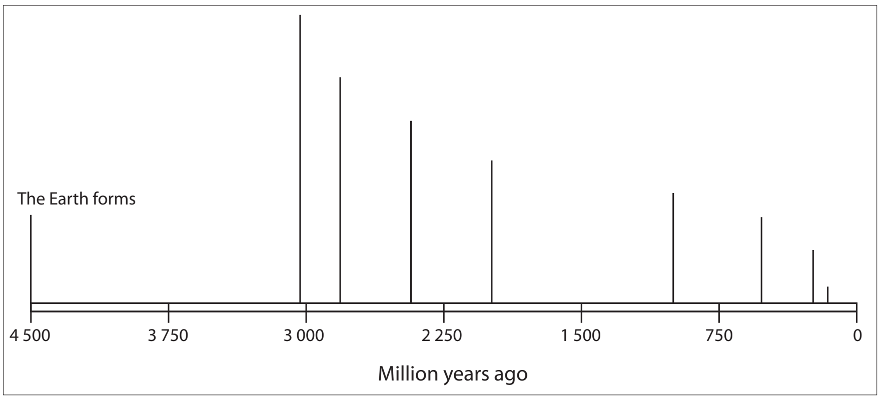
c) The Cape Fold Mountains were formed by the continents of Pangea coming together.
   i) Which continents made up Pangea?

   ii) What type of boundary is formed when tectonic plates come together?

   iii) When did Pangea begin to break up?

2. Which is older, Table Mountain or the Drakensberg?

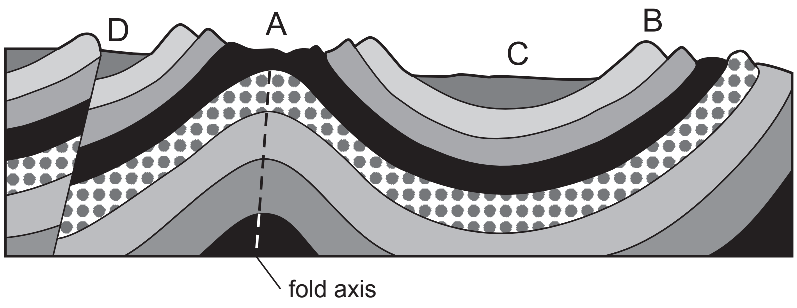
3. Complete the timeline below by filling in the geological events above the vertical lines. Use the information in the map above and also include these three geological events:
   - 2 000 mya: Igneous intrusions in Bushveld complex, which are rich in platinum and other metals
   - 1 100–1 000 mya: Namaqualand Mountains formed from sedimentary and igneous rock/volcanic intrusions
   - 540 mya Intrusion of Cape granites



Worksheet 13 (consolidation)

Folding and faulting

1. Refer to the diagram.



a) Identify the type of fold in the rock layers.

____

b) If the fold axis were inclined (at an angle), what type of fold would it be?

____

c) If the folds were sharp peaks, instead of rounded, what type of fold would it be?

____

d) Match these parts to A, B and C: syncline, anticline, limb.

____

e) Identify the type of fault at D.

____

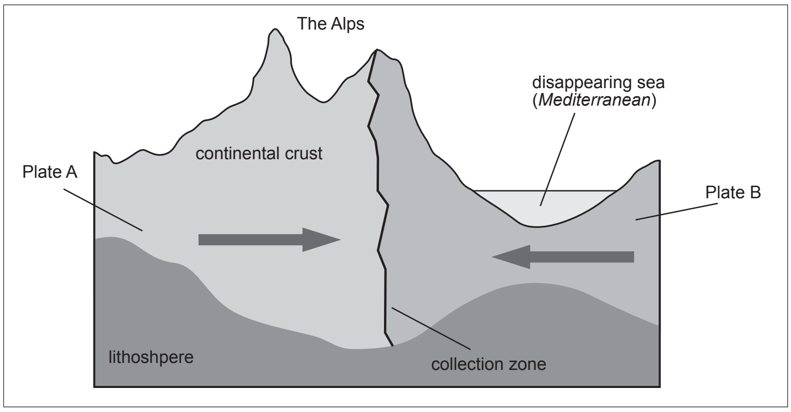
f) Explain what caused the folding and the fault.

____

____

____

2. Refer to the diagram.



a) The Alps span seven countries. Name three of these.

b) Name one of the Alps' highest peaks.

c) What type of mountains are the Alps?

d) Are they young or old mountains?

e) Identify Plate A and Plate B.

f) The lithosphere is broken up into tectonic plates. Which parts of the Earth does the lithosphere consist of?

g) Lithos is an ancient Greek word. What does it mean?

h) Name the plate boundary at the collision zone.

i) Explain why, over time, the Mediterranean Sea will disappear.

Worksheet 14 (consolidation)

Volcanoes

Refer to pages 132–136 in the Learner's Book. Complete the table by filling in examples.

Feature	Type	Examples covered in the Learner's Book	Other examples
Volcanic islands	island arcs		
	ocean rift islands		
	hot spot islands		
Volcanic mountains	stratovolcanoes		
	shield volcanoes		
	cinder cones		

Worksheet 15 (consolidation)

Mapwork: scale, co-ordinates, direction, magnetic bearing, conventional symbols

Refer to the map of Paarl on the next page and answer the following questions.

1. The map code of Paarl is 3318DB. What do the numbers 33 and 18 represent?

2. Give the map codes of the maps:
   a) Directly south of 3318DB
   b) North-east of 3318D

3. What is the scale of the map?

4. Write the map scale in words.

5. Give the co-ordinates of the following:
   a) Trig Beacon 352 [Block C5]
   b) Trig Beacon 170 [Block B5]
   c) Trig Beacon 179 [Block C1]

6. Give the direction and bearing from:
   a) Trig Beacon 352 to Trig Beacon 170
   b) Trig Beacon 179 to Trig Beacon 352
   c) Trig Beacon 352 to Trig Beacon 179

7. What is the magnetic declination of the map for July 2002?

8. Calculate the magnetic bearing from Trig Beacon 179 to Trig Beacon 352.

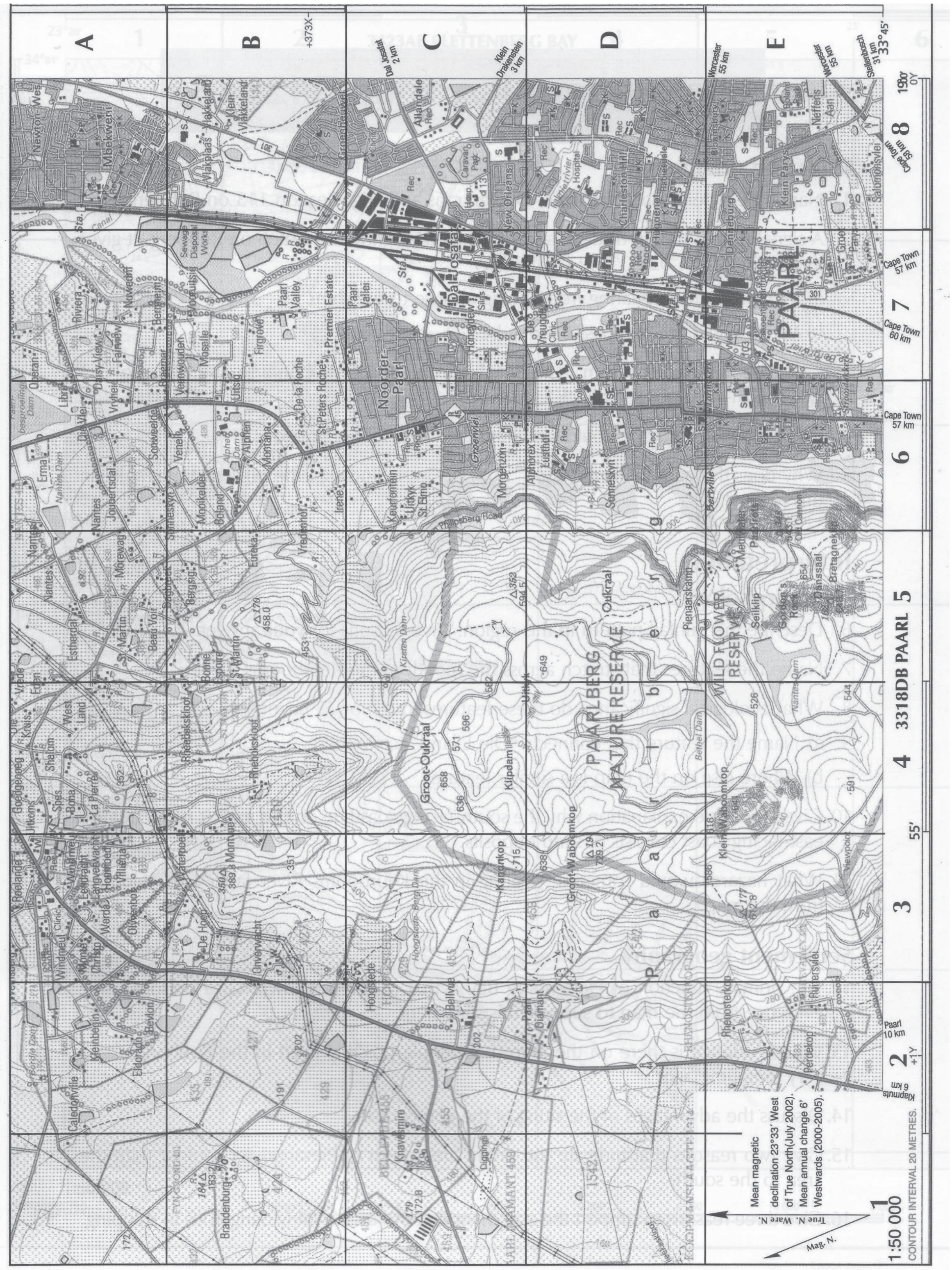
9. What is the mean annual change of the magnetic declination?

10. Draw the map symbols for the following:
    a) Power lines
    b) Wind pump

c) Police station

d) Cemetery

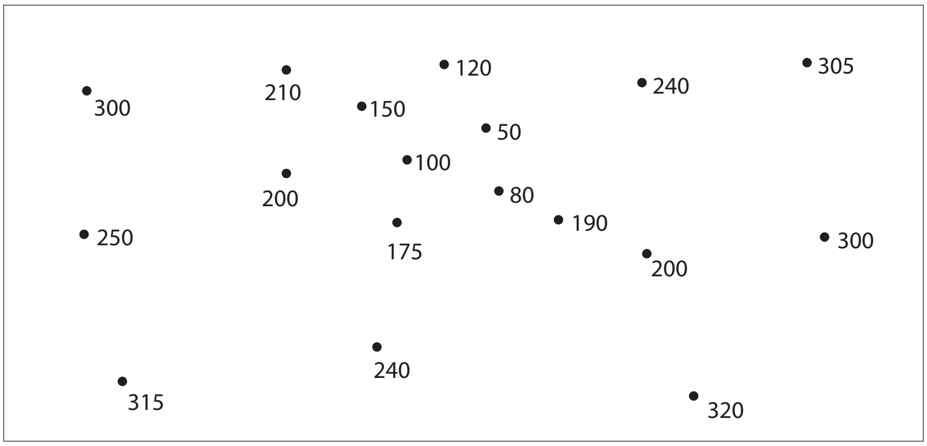
11. What type of farming takes place in the Paarl area?
(Use your knowledge of conventional signs.)



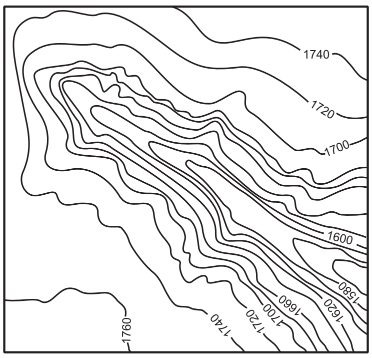
Worksheet 16 (extension)

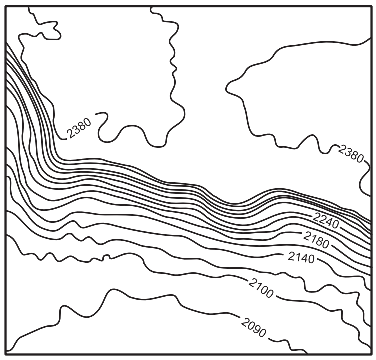
Mapwork: contours

1. On the map below:
   a) fill in the contour lines using a contour interval of 100 m
   b) shade the area of height below 100 m in (green)
   c) shade the area of height between 100 m and 200 m in (yellow)
   d) shade the area of height above 200 m in (brown).

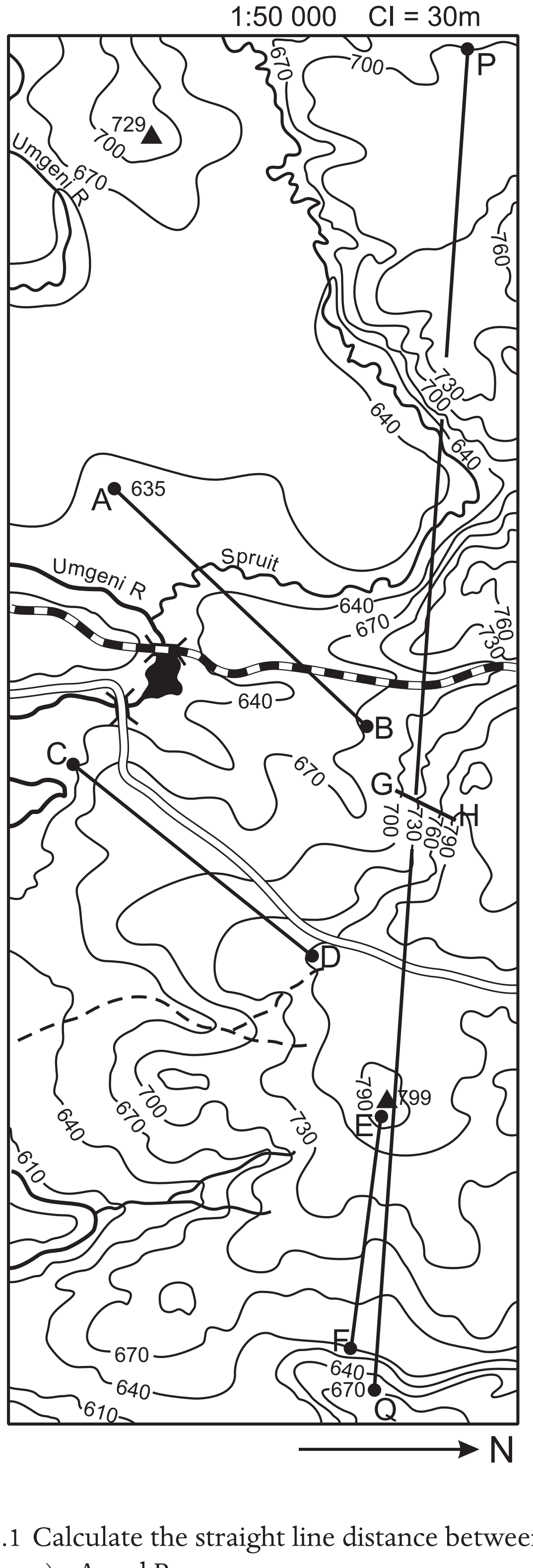


2. On the maps below indicate the following features:
   a) a valley
   b) a spur
   c) a potential waterfall
   d) a possible river
   e) a cliff
   f) a gentle slope
   g) a steep slope





3. Refer to Map F and complete the following:



3.1 Calculate the straight line distance between:

a) A and B

____

b) P and Q

____

3.2 Calculate the length of the railway line.

____

3.3 Draw a cross-section from P to Q.
- Use a vertical scale of 1 cm represents 30 m.
- Indicate the railway, road and river on your cross-section.

3.4 Give direction and bearing from:
a) A to B ________________
b) D to C ________________

4. Draw two contour diagrams, one illustrating a convex slope and one illustrating a concave slope.

Worksheet 17 (consolidation)

Population distribution and density

1. Match the definition in Column B with the population concept in Column A.

Column A		Column B	
1.	population distribution	a)	where both abiotic and biotic factors combine to attract large numbers of people to settle in one area
2.	non-ecumene areas	b)	the number of people living on each square kilometre of land
3.	population density	c)	where there is little sign of human or animal life
4.	ecumene areas	d)	where people live in the world

2. Name eight factors which could be responsible for the differences in population density around the world.

3. Give one reason for the high population density in each of the following places:
   a) Gauteng Province

   b) Nile River

c) City of Durban

d) North-eastern USA

4. Name four areas in the world which have low population densities and suggest one reason for each of these low densities.

5. a) Use the information in the table to calculate the population densities of each of the countries.

Country	Population size in thousands	Area in square kilometres in thousands
India	1 171 000	3 288
South Africa	50 700	1 220
Australia	12 900	7 687
China	1 331 400	9 597
Namibia	2 200	825
United Kingdom	61 000	243,3

b) Which country has the highest population density?

c) Which country has the lowest population density?

6. Describe the impact on the natural resources of a country that has a high population density.

7. Suggest one solution to try to curb high population densities in an area.

Worksheet 18 (extension)

Population data and interpretation

1. Study the world population data represented in the table below and answer the questions that follow.

Country	Botswana	United Kingdom	India
Population size in millions	2	13	171
Births per 1 000 population	25	9	23
Deaths per 1 000 population	12	0,4	7
Percent urban	60	80	29
Percent of population with HIV/AIDS	23,9	0,2	0,3
Projected percent of population change 2009–2050	39	24	49
Population per square kilometre	3	255	356

a) Which country has the highest birth rate?

____

b) Give two reasons for this high birth rate.

____

____

c) Which country has the highest death rate?

____

d) Why do you think the death rate is so high in this country?

____

____

e) Which country has the highest population density?

____

f) Describe the effects of a high population density on the natural resources of a country.

____

g) Which country is the most urbanised?

h) What does urbanisation mean?

i) Why do people move from rural to urban areas?

j) Which country shows the highest percentage of the population living with HIV / AIDS?

k) What does the acronym AIDS stand for?

l) Why do you think the prevalence of this disease is prominent in this particular country?

m) What do you think could be done to decrease the prevalence of AIDS?

n) Calculate the estimated population size for each of the three countries for the year 2050.

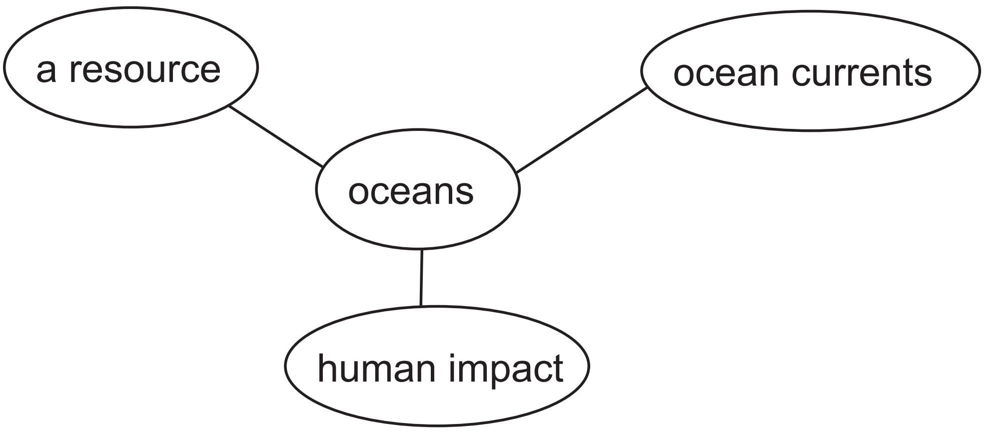
2. On a separate sheet of paper, write a 300 word essay describing the difference between developed and developing countries in terms of:
   - birth rate
   - death rate
   - urbanisation
   - HIV/AIDS prevalence.

Give reasons for the differences. You may use the data above as examples in your essay. Give your essay a suitable heading and make sure that it has a clear introduction and conclusion.

Worksheet 19 (extension)

The oceans

Summarise Unit 2 of Module 7, 'The world's oceans' by using the *Study & Master Geography Grade 10* Learner's Book to complete the mind-map.



Calculating percentages

The tables below show the March 2011 figures for free basic water delivery at a national level. Calculate and fill in the percentages in each one.

Summary view

Households	Total	Poor
Total	13 106 206	5 839 848
Served	11 284 325	5 054 454
%		

Service level view

Total Households Served					
Service Level	Above RDP	at RDP	Below RDP	No Infrastructure	Total
Total	9 630 980	2 405 502	604 960	464 764	13 106 206
Served	8 497 275	2 200 909	557 230	28 912	11 284 325
%					

Service level view

Total Poor Households Served					
Service Level	Above RDP	at RDP	Below RDP	No Infrastructure	Total
Total	3 814 885	1 363 852	350 201	310 910	5 839 848
Served	3 504 919	1 210 947	324 957	13 632	5 054 454
%					

[*Source*: Department of Water Affairs, www.dwaf.gov.za/dir_ws/fbw/]

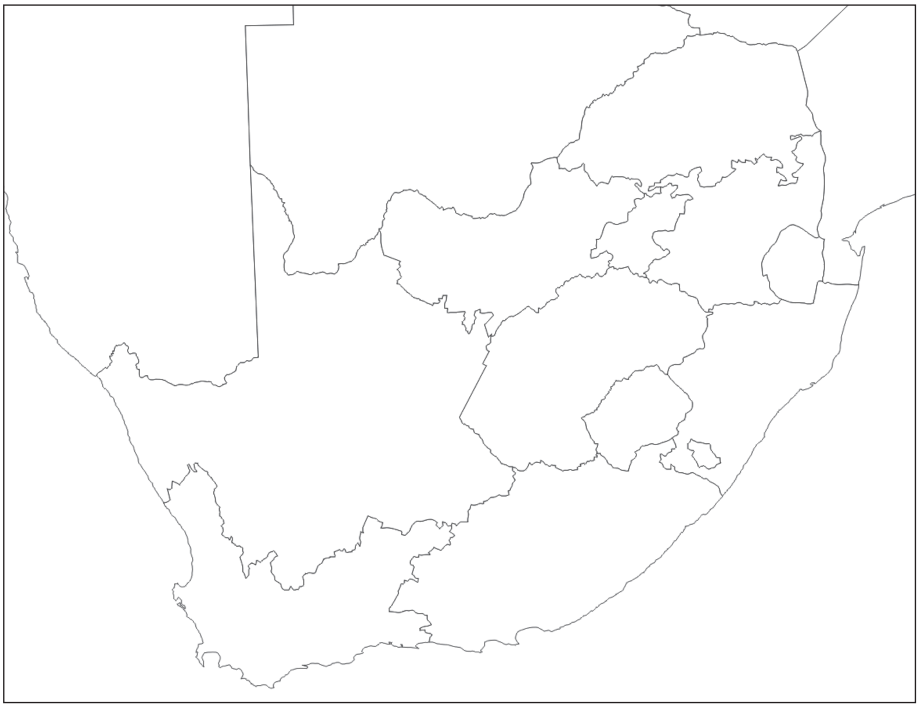
Water resources

1. List five factors that influence the availability of water in South Africa.

2. On the map of South Africa below, draw in and label the following water resources (use your atlas to help you):

a) Orange River	g) Vaal Dam
b) Gariep Dam	h) Sundays River
c) Limpopo River	i) Sterkfontein Dam
d) Tugela River	j) Steenbras Dam
e) Vaal River	k) Vanderkloof Dam
f) Fish River	l) Palmiet River

3. On the same map use four different symbols to indicate the four main inter-basin water transfer schemes. Give the map a key.



KEY:

4. Name two South African dams where hydroelectricity is generated.

5. Why do you think Gauteng needs so much water?

6. Why do you think storage of water in Cape Town dams is necessary?

7. What is the role of each of the following in providing water to South Africans:
   a) Department of Water Affairs

   b) Local government

   c) Municipalities

8. What is meant by 'free basic water'?

9. List five problems with 'free basic water'.

10. List three ways in which we can use water sustainably.

Worksheet 22 (extension)

Fracking for gas in the Karoo

1. Read the article below and answer the questions that follow.

Proposed fracking for gas in the Karoo by Shell

Fracking (hydraulic fracturing) is a process of drilling 1 to 5 km under the surface of the Earth to a layer of shale where natural gas is trapped. Using millions of litres of water, sand and an array of chemicals (many of which are carcinogenic, endocrine-disrupting or just plain toxic), the rock is repeatedly fractured by high pressure explosions underground, allowing the gas to be collected. Tens of thousands of wells have been dug in 32 American States and many other parts of the world, and a groundswell of popular protest has started. This is because groundwater has frequently been contaminated as a result of fracking, either with methane or the chemicals used.

People have complained that water coming out of their taps is undrinkable and becomes flammable when contaminated with methane and oil. They suffer from lesions, cancers and tumours. Their livestock is poisoned, sometimes with radioactive substances brought up from underground as waste material. Arsenic and other substances poison their vegetables and crops.

Shell was asked if it could give an assurance that groundwater and therefore the health, livelihoods, communities and towns in the Karoo, would not be affected. The response was that Shell had never had any incident of contamination while doing exploratory fracking. They also said that the only ones to benefit would be Shell and the government (which owns all underground minerals, gas and oil).

One man who has property and roots in the Karoo said: "We are not against responsible exploration or extraction; we are against Russian roulette."

Shell still has no idea where the millions of litres of water needed for fracking will come from. Possibilities at this stage include treated surface water, deep saline aquifers and seawater trucked in by train.

The president of Agri-Eastern Cape who farms in the affected district emphasised the importance of groundwater. The recent crippling drought in the Somerset East Region was just a reminder. He said, "I spent all my time trying to pump up more groundwater to keep going. So we want to know with certainty what the effects will be on the underground water supply."

When asked if there was any kind of possibility that contamination could happen, Dodson from Shell pursed his lips and looked down.

Source: www.greenpeace.org

a) Explain what 'fracking' is.

____

____

____

____

____

b) Where in South Africa does Shell want to do fracking for gas?

c) How much water is needed for the process of fracking?

d) Where does Shell propose to get this water from?

e) Besides water, which other substances are used in the fracking process?

f) What effect could these substances have on the groundwater?

g) Why do you think farmers and residents in the area are so reliant on groundwater?

h) What are the consequences for residents if the groundwater becomes contaminated?

i) Who owns the rights to underground minerals, oil and gas in South Africa?

j) Who will stand to make money from this venture?

k) What is meant by one resident saying: "We are not against responsible exploration or extraction; we are against Russian roulette"?

2. Imagine you are a resident of Somerset East, in the Karoo. Write a letter to the company, Shell, explaining the potential damage that fracking could have on the water in your area and urging them to reconsider their proposal of fracking in the Karoo. Remember to use the correct format for a formal letter.

Worksheet 23 (consolidation)

Hydrographs

Refer to the flood hydrograph in Figure 7.4.5 on page 288 of the Learner's Book and answer the questions below.

1. Give the peak rainfall in mm.

2. Give:
   a) the units for cumecs

   b) the normal discharge of the river in cumecs

   c) the size of the discharge peak in cumecs

3. a) Give the lag time in hours.

   b) Explain why there is a lag time.

4. ANSWERS FOR PHOTOCOPIABLE WORKSHEETS

Worksheet 1 (consolidation) Answers

Temperature and altitude

Altitude (m)	Temperature (°C)	Working out
2 000	29,9	
3 000	23,4	29,9 – 6,5
4 000	16,9	23,4 – 6,5
5 000	10,4	16,9 – 6,5
6 000	3,9	10,4 – 6,5
7 000	–2,6	3,9 – 6,5
8 000	–9,1	–2,6 – 6,5
8 800	–15	–9,1 – (8000/8800 × 6,5)

Worksheet 2 (consolidation) Answers

The heating of the atmosphere and its effect

1.1 a) The Sun's energy is called terrestrial radiation.
b) Short waves of the electromagnetic spectrum are visible light.
c) The Sun's radiation is shortwave radiation.
d) The atmosphere can only trap long-wave radiation.
e) The Earth radiates long-wave radiation.

1.2 Ozone

1.3 50%

1.4 reflection by clouds 30%; absorption by dust particles 20%; scattering by dust particles

1.5 Heat is used to evaporate water on the Earth's surface. This evaporated heat is stored in water vapour as latent heat. When the water vapour condenses, the latent heat is released into the atmosphere.

1.6 Convection is the transfer of heat by the circulation of warm and cold air. Conduction is the transfer of heat between substances that are in direct contact with each other.

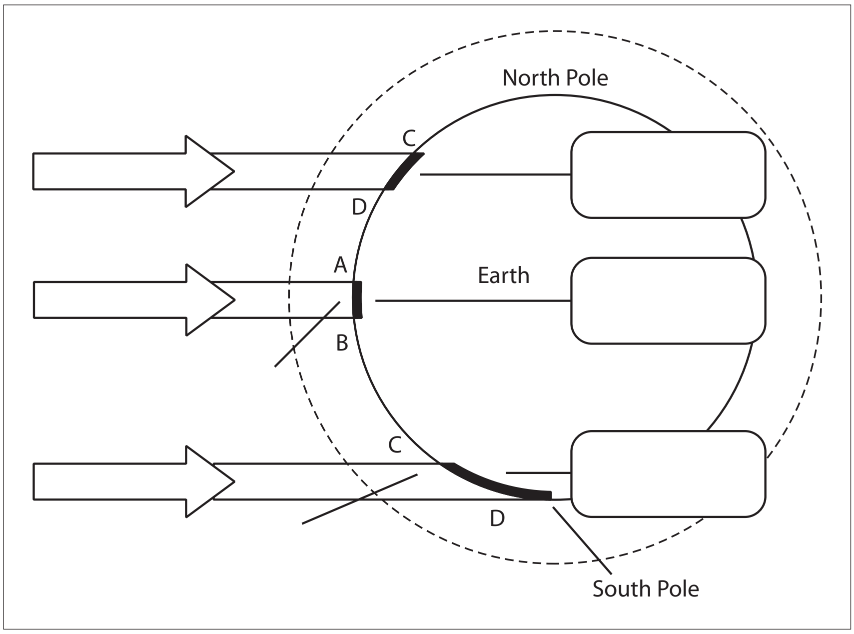
2.1 a) Kimberley is landlocked, whereas Durban is on the coast. The sea has a moderating affect on temperatures in Durban.

b) As altitude increases temperature decreases. Johannesburg is 1 665 m above sea level and the average coldest month is 10 °C.

c) The warm Mozambique Current off the coast of Durban causes temperatures to be higher.

d) Cape Town's temperatures are influenced by the cold Benguela Current which flows past the West Coast of South Africa – thus causing temperatures in Cape Town to be lower than in Durban.

3.



At A-B, the Sun's rays strike the Earth's surface at a 90°angle. More heat is spread over a smaller surface area at the equator than towards the Poles C-D where the Sun's rays strike the Earth at a more oblique angle. The solar radiation at the equator also passes through less atmosphere and so less heat is lost through absorption, reflection and scattering. So ultimately the surface of the Earth at the equator will be warmer than those areas further north and south of the equator.

4. Albedo is measure of a surface's reflectivity.

5. Dark colours absorb heat increasing temperature, while light colours reflect heat causing temperatures to decrease.

Worksheet 3 (consolidation) Answers

The effect of distance from the ocean on temperature

The lunchbox filled with air (the empty one) should be colder. This demonstrates that water is slower to cool than air.

Worksheet 4 (extension) Answers

Depletion of ozone in the atmosphere

1. a) The North Pole
   b) long cold winters and lingering CFCs in the atmosphere
   c) a tri-atomic oxygen molecule O_3; a blue gas
   d) in the stratosphere
   e) It protects us from ultra-violet radiation from the Sun.
   f) World Meteorological Organisation
   g) • to record the amount of ozone and other meteorological findings in the atmosphere
      • to reveal their findings to people and warn people of any dangers
   h) UV-B rays have been linked to skin cancer, cataracts and damage to the human immune system
   i) to stop CFC production; all CFCs were to be replaced with HFCs by 1996
   j) no
2. The article should have a catchy/interesting title and should include the following points:
   - Causes: CFCs, which are chlorine-containing chemicals, in the atmosphere caused by propellants in aerosol sprays and coolants in refrigerators and air conditioning systems
   - Effects: damage DNA and cause skin cancers; cataracts; kill phytoplankton and disrupt the marine food web; disrupt photosynthesis and reduce growth and yield of food crops
   - Solutions: Replace CFCs with HFCs – a non-ozone depleting chemical; safe disposal of old refrigerators and cooling systems

Worksheet 5 (consolidation) Answers

Temperature difference and relative humidity

1.

Dry bulb temperature	Wet bulb temperature	Temperature difference (dry bulb temperature – wet bulb temperature)	Relative humidity
30 °C	28 °C	2 °C	86%
30 °C	23 °C	7 °C	55%
24 °C	21 °C	3 °C	77%
24 °C	17 °C	7 °C	57%
20 °C	19 °C	1 °C	91%
20 °C	15 °C	5 °C	59%
20 °C	13 °C	7 °C	44%

2. a) When the temperature difference between the wet and dry bulbs is small, the relative humidity is high.
   b) When the temperature difference between the wet and dry bulbs is big, the relative humidity is low.

Worksheet 6 (extension) Answers

Water cycle model

4. No, because when the water evaporated, the salt was left behind.

Worksheet 8 (consolidation) Answers

Metamorphic rock landforms

1. Drakensberg
2. A smaller ridge or slope that seems to prop up or support a main peak.
3. a)

Rock layer	Colour	How long ago it formed (millions of years ago)	Type of rock
Eliot mudstone	red	200	sedimentary
Clarens sandstone	yellow	196	sedimentary
Calcified sandstone	yellow	Later than 196*	sedimentary
Quartzite	yellow	190–160**	metamorphic
Drakensberg basalt	grey/black	190–160	igneous

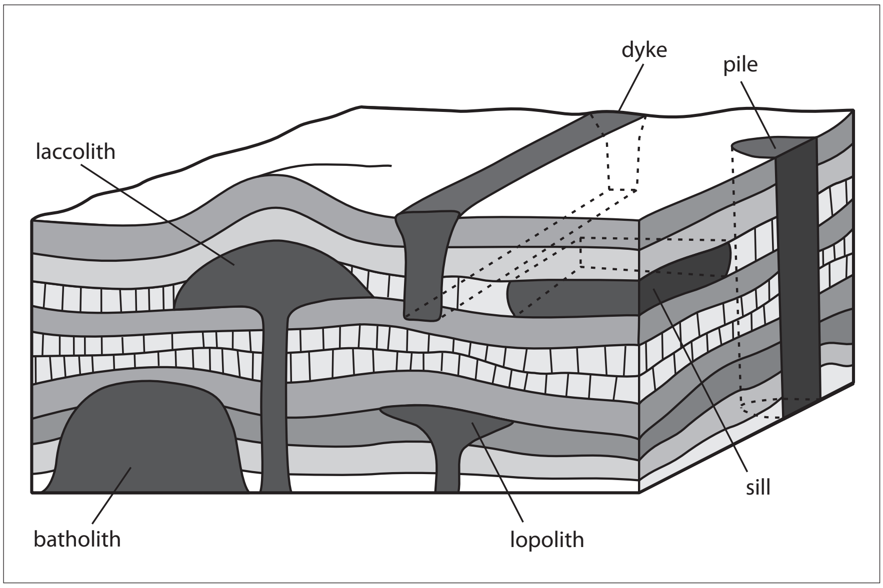
In 'The Golden Gates' case study extract, no dates are given for the formation of the calcified limestone and quartzite, but learners can work out that:
* The calcified sandstone layer formed after the formation of the Clarens sandstone.
** The quartzite layer formed during the Drakensberg basalt outpourings, i.e. this is when metamorphism of the top sandstone layer took place.

b) Eliot mudstone (it is at the bottom; it formed 200 million years ago)
c) Drakensberg basalt (it is on the top; it formed 190–160 million years ago)
d) Layers of sediment (made up of particles or rock debris or dead living matter) accumulate and are squashed together. Over time, these layers are deeply buried and the particles become cemented together.
e) Eliot mudstone
f) Clarens sandstone
g) As the hot basalt flowed out on top of the sandstone layer, the part that was in contact with the hot basalt was turned to quartzite/ metamorphic rock by the heat. This process is called contact metamorphism.
h) magma/ lava/ molten rock
i) extrusive

Types of rocks and their formation

1. a) Igneous rocks are formed by the solidification of magma material.
   b) Metamorphic rocks are formed by a process in which already consolidated rock undergoes a change in texture, composition or chemical and physical structure. These changes are brought about through heat and pressure.
   c) Sedimentary rock is formed from the deposition of sediments and particles laid down in layers and cemented together.

2. Igneous extrusion is when magma solidifies below the ground. Igneous extrusion is when magma erupts to the surface as lava.

3. 

4. igneous

5. sedimentary

6. conglomerate

7. coal

8. marble

9. shale

10. Table Mountain sandstone

11. Paarl Rock

12. igneous

13. Magma solidifies beneath the Earth's surface to form granite.

14. quartz – crystals, mica – black, feldspar – white

15. Stage 1: Magma welled up beneath the Earth's surface and solidified to form a massive batholith, shown in diagram A.
Stage 2: Over millions of years the overlying layers of earth were eroded away to expose the dome-shaped top of the batholith now known as a monolith in diagram B.
Stage 3: Over time the cracks and joints in the monolith create corestones which are rounded and the landform is called a tor in diagram C.

Worksheet 10 (consolidation) Answers

Plate boundaries and the movement of plates

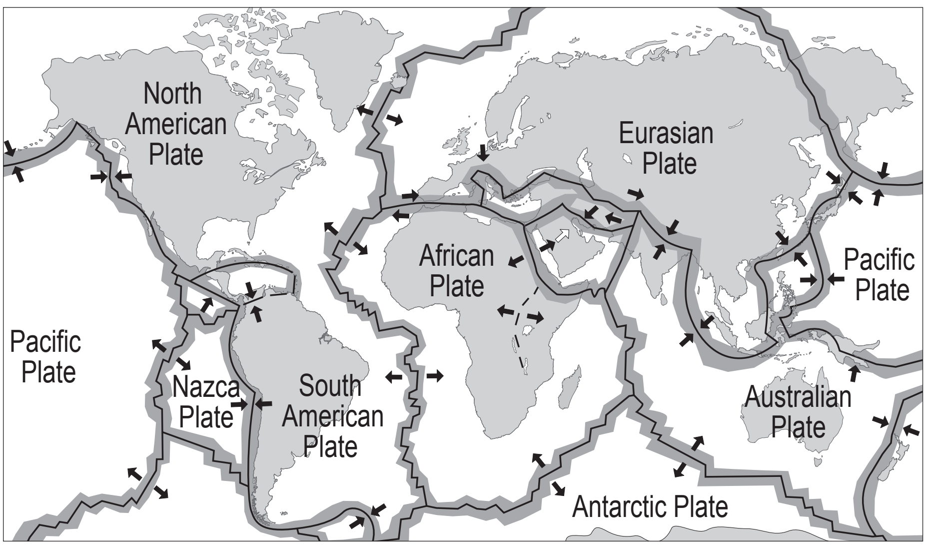
Plate boundary	Direction of movement	Constructive or destructive*	Features or landforms
Diverging			
Ocean–ocean	away from each other	Constructive	mid-ocean ridges/ seafloor spreading
Continent–continent			rift valleys
Converging			
Ocean–ocean	towards each other	Destructive	volcanic arc islands
Ocean–continent			ocean trenches
Continent–continent			fold mountains

*Constructive forms new crust, destructive breaks down crust

Worksheet 11 (consolidation) Answers

Plate tectonics

1.



2. Ocean floors can be divided into a number of **plates**, each bordered by a **plate boundary**. Convection currents in the **mantle** cause plates to constantly move. When plates move apart, **constructive** plate boundaries are formed. When plates move towards each other **destructive** plate boundaries are formed. When plates move past each other a **transform fault** boundary is formed.

   When plates push together, the heavier plate sinks into the mantle. This is called **subduction**. The melted material from the sunken plate then pushes up through the weakened edge of the lighter plate to form **volcanoes**.

   When a plate with an ocean floor and a plate with a continent push together the two resultant landforms are **a trench** and **peripheral fold** mountains.

   When a plate with a continent and a plate with a continent move towards each other, it produces **fold mountains**.

   When two plates move past each other, they catch or stick. The strain produces a crack called a **fault line**. These can result in an **earthquake**.

   When a plate with an ocean floor moves apart from a plate with an ocean floor a **mid-oceanic ridge** is formed. This process is called **seafloor spreading**.

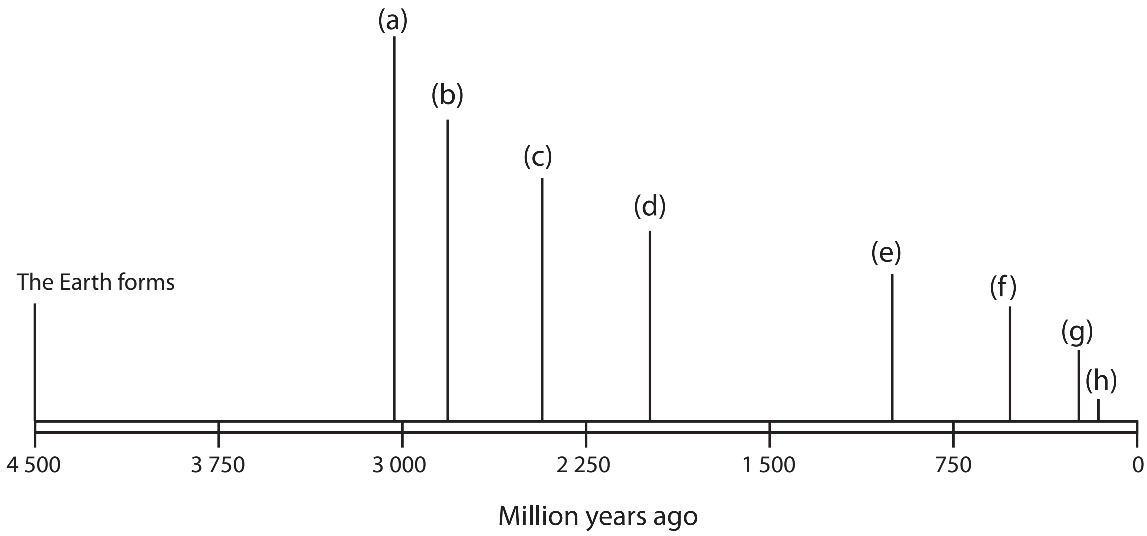
Worksheet 12 (extension) Answers

Geological time and different rock types

1. a) the greenstone belts
   b) i) sedimentary rock; formed from pebble sediments
      ii) sedimentary rock; a type of limestone formed from calcium magnesium carbonate (limestone is formed from calcium carbonate)
      iii) igneous rock, intrusive; it has a finer grain structure than granite or gabbro because it forms nearer the surface and cools more quickly
      iv) igneous rock, extrusive; it is grey/dark-coloured and has a fine grain structure
   c) The Cape Fold Mountains were formed by the continents of Pangea coming together.
      i) all the continents
      ii) convergent
      iii) about 180 mya

2. Table Mountain

3.



a) the Barberton and other greenstone belts
b) Witwatersrand gold-bearing conglomerate reefs
c) Transvaal dolomites
d) igneous intrusions in Bushveld complex
e) Namaqualand Mountains
f) intrusion of Cape granites
g) Cape Fold Mountains, including Table Mountain
h) Karoo dolerite intrusions and Drakensberg basalt extrusions

Worksheet 13 (consolidation) Answers

Folding and faulting

1. a) symmetrical folds
   b) overturned fold/ recumbent fold
   c) chevron fold
   d) A syncline; B limb; C anticline
   e) reverse/ thrust
   f) Compression forces made the rock layers bend (fold). Where the stress in the rock was highest, when the rock could bend no more, it cracked (faulted).

2. a) Any three of the following: Austria, Slovenia, Italy, Switzerland, Liechtenstein, Germany, France
   b) Mont Blanc, Matterhorn (any one)
   c) fold mountains
   d) young
   e) A Eurasian; B African
   f) the crust and the upper part of the mantle
   g) rocky or rock/ stone
   h) convergent; continent to continent
   i) As the two plates push together, the African Plate will continue to rise/ uplift near the plate boundary until it is above sea level.

Volcanoes

Feature	Type	Examples covered in the Learner's Book	Other examples
Volcanic islands	island arcs	Philippines, Japan	Mariana, Tonga, Aleutian
	ocean rift islands	Iceland	Jan Mayen
	hot spot islands	Hawaiian Islands	Tuamoto Archipelago, Tristan da Cunha, Réunion
Volcanic mountains	stratovolcanoes	Mount Fuji, Kilimanjaro, Mount St Helens, Eyjafjallajökull, Mount Nyiragongo (DRC)	Mount Etna and Mount Vesuvius (Italy), Mount Kenya
	shield volcanoes	Mauna Loa, Kilauea	Fernandina (Galapagos), Nyamuragira (DRC), Erta Ale (Ethiopia)
	cinder cones	Paricutin	Cerro Negro (Nicaragua)

Worksheet 15 (consolidation) Answers

Mapwork: scale, co-ordinates, direction, magnetic bearing, conventional symbols

1 33 represents latitude; 18 represents longitude

2. a) 3318DD
   b) 3319AC

3. 1:50 000

4. One centimetre on the map represents fifty thousand centimetres in reality.

5. a) 33° 42'58''S 18° 56'50''E
   b) 33° 41'30''S 8° 56'30''E
   c) 33° 42'25''S 18° 52'30''E

6. a) 355° NNW
   b) 100° ESE
   c) 280° WNW

7. 23° 33' west

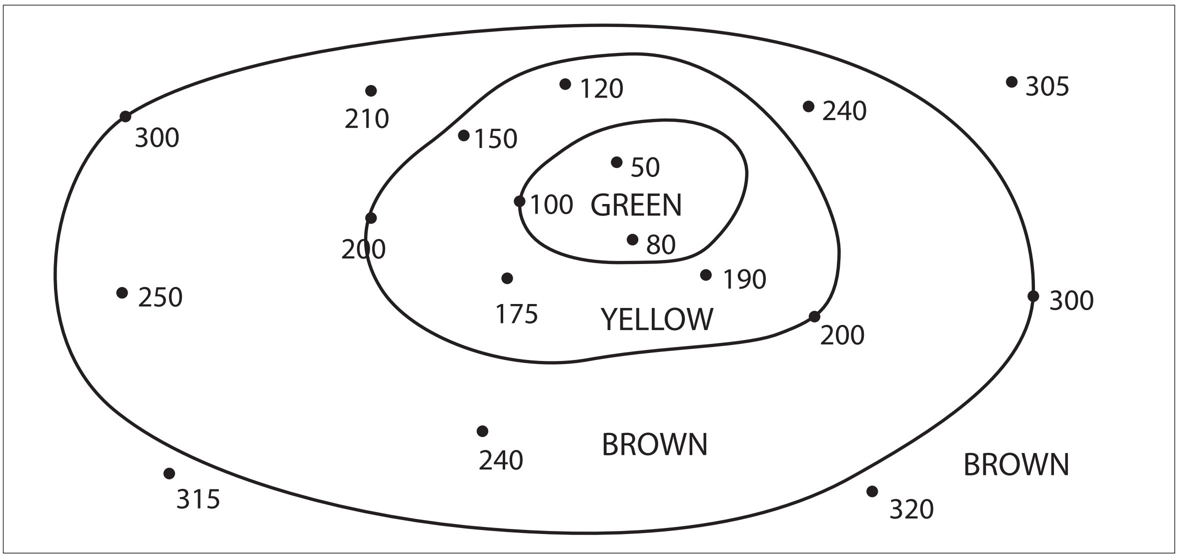
8. 100° + 23° 33' = 123° 33'

9. Mean annual change is 6' westwards

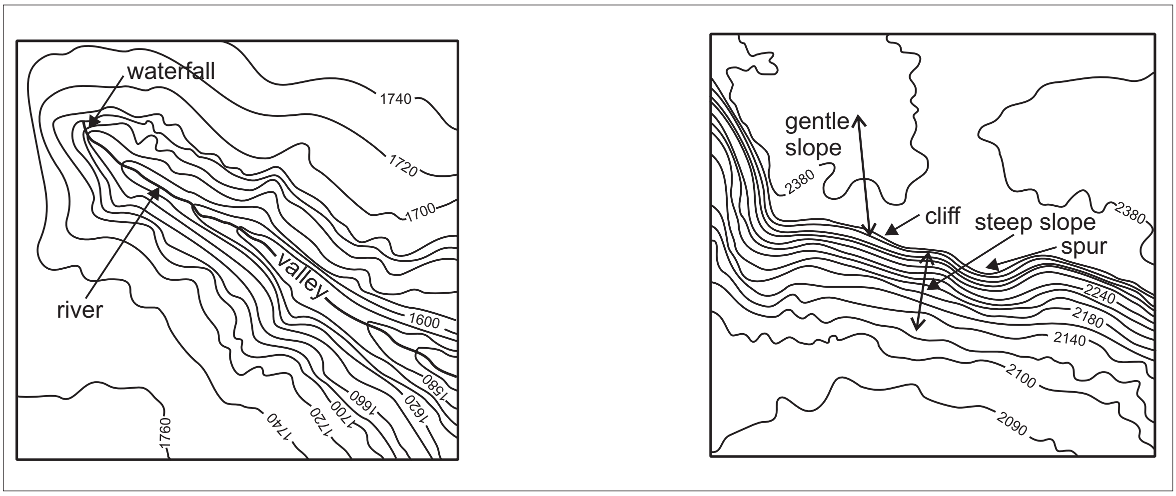
10. a)
    b) 
    c) ■PS
    d) ††††

11. Vineyards and orchards

1.



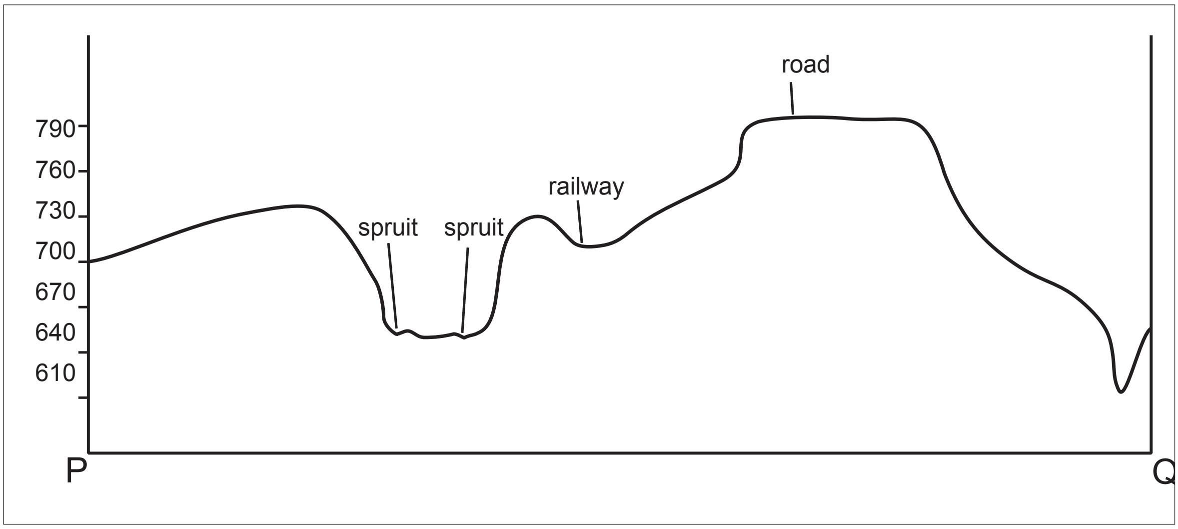
2.



3.

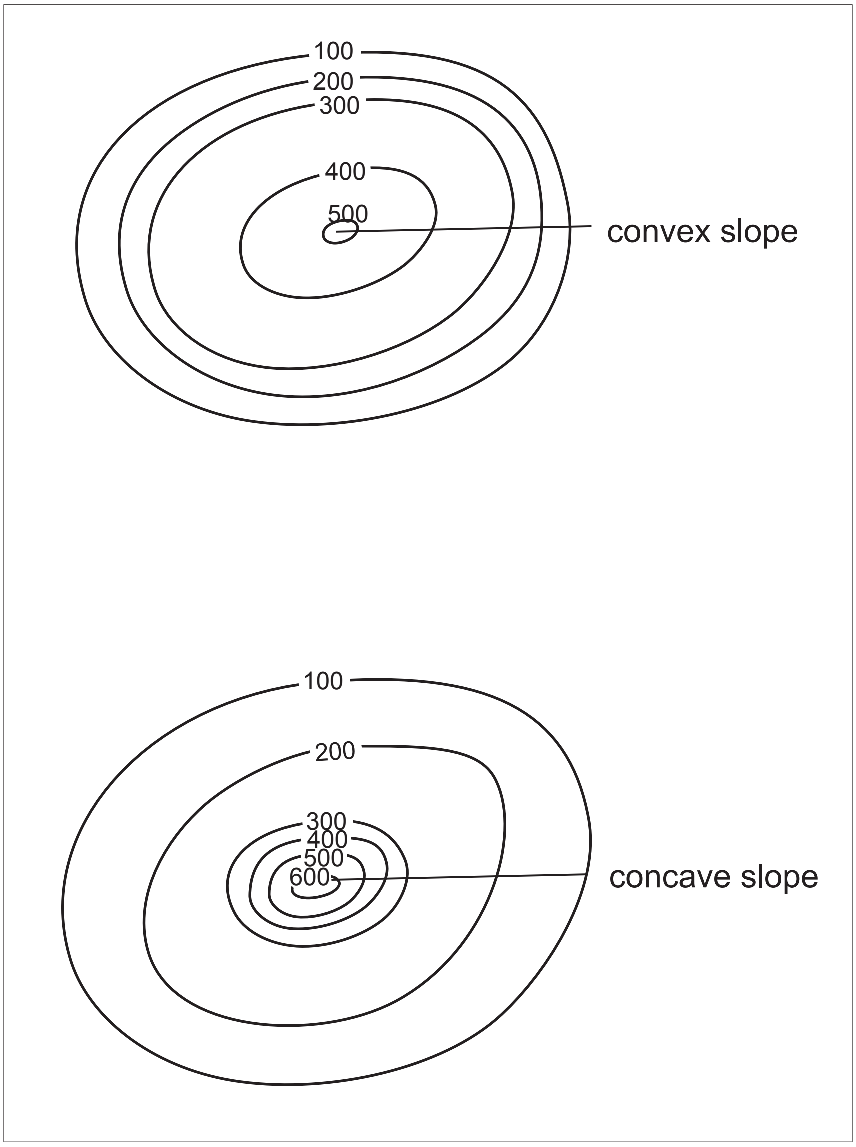
3.1 a) 6 cm x 0,5 = 3 km
b) 23 cm x 0,5 = 11,5 km
3.2 8,5 cm x 0,5 = 4,25 km

3.3



3.4 a) 43˚ NE
b) 220˚ SW

4.



Population distribution and density

1. 1. d; 2. c; 3. b; 4. a

2.
   - A climate that is neither too hot nor too cold is preferred.
   - Soil that is deep and fertile with plenty available water is preferred.
   - A physical landscape which is flat is preferred.
   - Water supplies which are reliable and areas with good annual average rainfall are preferred.
   - The absence of insects which cause diseases is preferred.
   - The ability of people to create extra or surplus food from the cultivation of land.
   - The effective way of organising labour with different roles taken on by different people.
   - Areas with good communication systems and infrastructure (transportation) are preferred.
   - A peaceful and structured government is preferred.
   - Safety and security is obviously preferred.
   - Availability of good job opportunities.

3. a) Gauteng is the economic hub of South Africa. There are job opportunities available with high wages; the infrastructure is excellent; and the availability of gold and other minerals.
   b) The Nile River produces a reliable source of water and very fertile soil for growing crops.
   c) Area of high rainfall and the largest harbour/ port in South Africa; transportation of goods in and out of the area – busiest harbour in South Africa.
   d) Lack of diseases and pests; good communication accessibility.

4. The Sahara Desert – too hot and dry; Alaska – too cold; the Amazon – dense forest; the Himalayas – too mountainous

5. a) India population density is 11 71 000 ÷ 3 288 = 356 people per square kilometre; South Africa's population density is 50 700 ÷ 1 220 = 42 people per square kilometre; Australia's population density is 12 900 ÷ 7 687 = 2 people per square kilometre; China's population density is 1 331 400 ÷ 9 597 = 139 people per square kilometre; Namibia's population density is 2 200 ÷ 825 = 3 people per square kilometre; United Kingdom's population density is 61 000 ÷ 243,3 = 251 people per square kilometer.
   b) India
   c) Australia

6. The impact on natural resources such as clean drinking water and food availability is enormous. Water is usually a problem as there is not always enough clean water to sustain the growing population. Water is also used for farming and industry thereby putting more pressure on the natural resources.

7. inter-basin water transfer schemes; government incentives

Population data and interpretation

1. a) Botswana
   b) tradition; low levels of education; contraception not accessible
   c) Botswana
   d) HIV / AIDS; poor access to medical supplies and facilities
   e) India
   f) There is a huge demand on water which could lead to water shortages.
   g) United Kingdom
   h) An increasing number of people living in urban rather than rural areas.
   i) to seek better job opportunities and higher wages, better standard of living
   j) Botswana
   k) Acquired Immune Deficiency Syndrome
   l) This is a developing country. Access to clinics and contraception is limited.
   m) To make contraceptives more accessible and to provide education about HIV and AIDS.
   n) Botswana – 2 780 000; United Kingdom –16 120 000; India – 179 379 000

2. The essay should have a suitable title and include the following points: Developed countries: Low birth rates; low death rates; high rate of urbanisation; low prevalence of HIV/AIDS. Developed countries have a high level of industrialisation; highly developed infrastructure; easy access to hospitals, clinics and medical supplies. People have a high level of education and most of the workforce is involved in secondary and tertiary economic activities. Level of communication and technology is also very high. From the data, we can see that the United Kingdom falls into this category: birth rate is 9 births per 1 000 people; death rate is 0,4 per 1 000 people; AIDS prevalence is 0,2%; and percentage of the population living in urban areas is 80%.

   Developing countries: high birth rate; high death rate; low rate of urbanisation; high prevalence of HIV/AIDS. Developing countries usually have a low level of industrialisation; poorly developed infrastructure; limited access to hospitals, clinics and medical supplies. People have lower levels of education and most of the workforce is involved in primary and secondary economic activities. Level of communication and technology is low. From the data, we can see that Botswana falls into this category: birth rate is 25 per 1 000 people; death rate is 12 per 1 000 people; HIV/AIDS prevalence is 23.9%; and percentage of the population living in urban areas is 60%.

Worksheet 19 (consolidation) Answers

The oceans

Own answers.

Worksheet 20 (consolidation) Answers

Calculating percentages

Summary view

Households	Total	Poor
Total	13 106 206	5 839 848
Served	11 284 325	5 054 454
%	**86,10%**	**86,55%**

Service level view

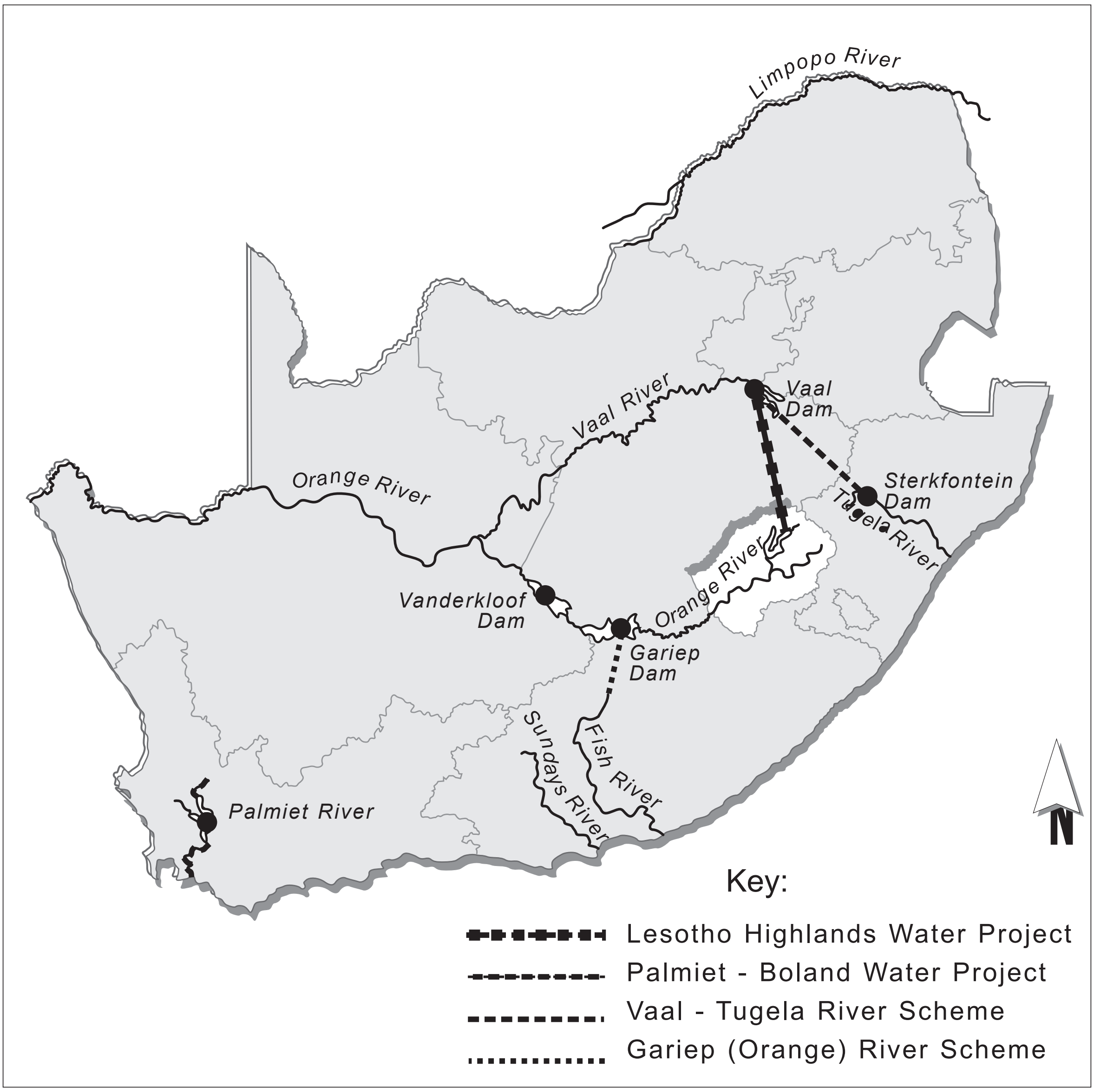
Total Households Served					
Service Level	**Above RDP**	**at RDP**	**Below RDP**	**No Infrastructure**	**Total**
Total	9 630 980	2 405 502	604 960	464 764	**13 106 206**
Served	8 497 275	2 200 909	557 230	28 912	**11 284 325**
%	**88,23%**	**91,49%**	**92,11%**	**6,22%**	**86,10%**

Service level view

Total Poor Households Served					
Service Level	**Above RDP**	**at RDP**	**Below RDP**	**No Infrastructure**	**Total**
Total	3 814 885	1 363 852	350 201	310 910	**5 839 848**
Served	3 504 919	1 210 947	324 957	13 632	5 054 454
%	**91,87%**	**88,79%**	**92,79%**	**4,38%**	**86,55%**

1. Five factors:
   - South Africa is a dry semi-arid country with below world average rainfall.
   - Rainfall is uneven. The western part of the country receives a lot less rain than the eastern part.
   - It has only a few big rivers – Vaal, Orange, Limpopo.
   - The demand for water grows as the population grows and as urbanisation and industrialisation increases.
   - Wasteful use of water and water pollution threaten water supplies.

2. and 3.



4. Gariep and Steenbras Dams

5. Population density is high and there is large-scale industrialisation and urbanisation.

6. Cape Town has winter rainfall and long, hot, dry summers so it is essential to store water in the rainy season.

7. a) Department of Water Affairs is in charge of policy for managing water resources and water supply.
   b) Local government use water boards to help them provide bulk water services and manage dams and interbasin transfer schemes.
   c) Municipalities play a role in providing water and sanitation services. They are responsible for water purification and waste water treatment.

8. Free basic water is the 6 000 litres of free water that is provided to poor households each month.

9.
   - Many households have a high number of occupants.
   - The cost to the government of providing water is high.
   - Free basic water supply system leads to unauthorised or illegal connections that leak water and waste water.
   - Some households do not pay for the water they use above 6 000 litres.
   - It is difficult for the government to identify those who cannot pay for water.

10.
   - fixing and maintaining leaking supply pipes
   - avoiding wasteful irrigation methods
   - encouraging a culture of water saving in households

Worksheet 22 (extension) Answers

Fracking for gas in the Karoo

1. a) Fracking is a process of drilling 1 to 5 km under the surface of the Earth to a layer of shale where natural gas is trapped. Using water, sand and chemicals, the rock is repeatedly fractured by high pressure explosions underground, allowing the gas to be collected.
   b) in the Karoo
   c) Millions of litres of water
   d) treated surface water, deep saline aquifers and seawater trucked in by train
   e) sand and an array of chemicals (many carcinogenic, endocrine-disrupting and plain toxic)
   f) Groundwater will become contaminated with methane or chemicals.
   g) The average annual rainfall in this area is extremely low so residents depend heavily on groundwater for farming and domestic use.
   h) suffer from lesions, cancers and tumours; their livestock could be poisoned; arsenic could poison their vegetables
   i) The government
   j) Shell and the government
   k) He means that there is no assurance that the water will not become contaminated, so going ahead with fracking is taking a big risk and they will be unable to reverse the process.

2. The learners' letters should contain the following:
   - a fictitious address in Somerset East
   - the date
   - Shell's address
   - a greeting (Dear Sir/Madam)
   - a heading (e.g. Complaint about proposed fracking in the Karoo)
   - an introduction which explains why the letter is being written
   - the body of the letter which provides information, deals with the dangers of fracking and suggest a course of action
   - a conclusion
   - 'yours sincerely' and name

Worksheet 23 (consolidation) Answers

Hydrographs

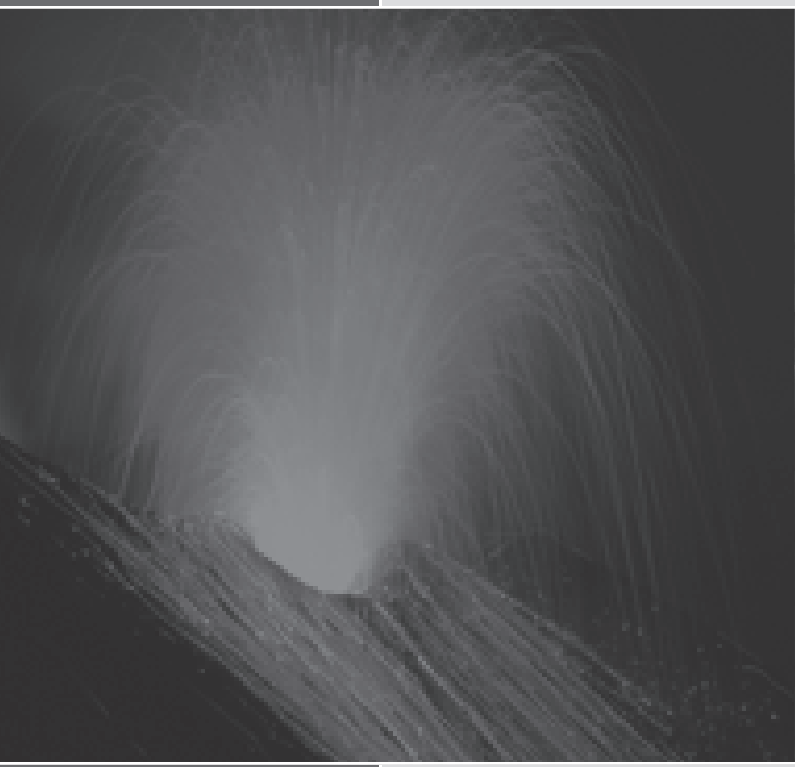
1. about 50 mm
2. a) cubic metres per second or m^3/s
   b) it ranges from about 5–13 cumecs
   c) about 35 cumecs
3. a) 7,75 hours (just under 8 hours)
   b) The runoff has to make its way to the stream or river. And/ or it takes a while for the soil to saturate with water before the runoff increases.

5. LESSON PLAN TEMPLATE

Topic of lesson:	
Time	
Curriculum and Assessment Policy (CAPS) content	
Resources	
The lesson	
Introduction	
Main part of lesson	
Conclusion	
Informal assessment	

5. DOCUMENTS

This section is for you to file the Curriculum and Assessment Policy Statement (CAPS) for Geography (Grades 10–12) and any other documents supplied by the Department of Basic Education.



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ISBN 978-1-107-68847-6
9 781107 688476