NEW

Smart

Basic Science & Technology

PRIMARY 5 TEACHER'S GUIDE

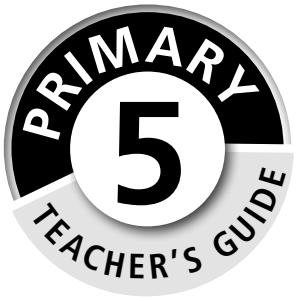
CURRENT NERDC Curriculum

CAMBRIDGE UNIVERSITY PRESS

NEW

Smart

Basic Science & Technology



Reviewer/Contributor:
S. Y. Olatunde

CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

79 Anson Road, #06–04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
© Cambridge University Press 2016

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 2016
New edition published 2018

Contributing authors: Lynn Pocock, Lanise N Bassett, Barbara Munsami, Linda Bredenkamp, Carina van der Merwe, Marietjie van den Heever
Editor: Language Mechanics
Typesetter: Simon van Gend
Illustrators: Will Alves, Karien Naude-Barnes, Tina Nel, Language Mechanics
Cover artwork: labsas/GettyImages

Every effort has been made to trace copyright holders. Should infringements have occurred, please inform the publishers who will correct these in the event of a reprint.

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication, and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

Contents

Introduction

The purpose of the curriculum

The main objectives of the curriculum are to prepare the pupils to:
- develop an interest in science and technology
- acquire basic knowledge and skills in science and technology
- apply scientific and technological knowledge and skills to meet contemporary societal needs
- take advantage of the numerous career opportunities provided by science and technology
- be equipped for further studies in science and technology
- avoid drugs and related vices
- be safety and security conscious.

Time allocation

To cover this curriculum, the recommended weekly time allocation is three periods of 40 minutes each. Pupils need to do regular revision at home in order to cope with the content and new terminology.

The role of the teacher

One of the principal duties of a Basic Science and Technology teacher is to prepare and present good lessons to his or her pupils. The teacher should:
- be as well informed as possible on the scheme of work of the subject
- know the aims and objective of each topic
- select appropriate content materials
- decide on the best methods of presentation such as PowerPoints, workstations, videos, discussion groups, worksheets, question-answer sessions, debate, and experiments
- gather equipment and other resources required for the activities
- keep informed about environmental issues and other current biological news in Nigeria and the rest of the world
- arrange outings and guest speakers from time to time.

To be effective in presentation, the teacher must do a written/typed plan for each lesson. This should include aims, objectives, resources, time frames, content for the lesson, activities, homework, assessment, and ideas/additional worksheets to cater for pupils requiring extension or learning support (remedial).

Prepare each topic in advance. Many teachers go into the classroom inadequately prepared. It is your responsibility as a Basic Science and Technology teacher to involve your pupils in the learning process. It is a proven fact that pupils actively learn far more by *doing* than by listening.

Science involves being curious and asking questions. Wherever possible, ask questions to engage the pupils and to encourage independent thought processes. Start your lessons by asking the pupils to write down answers to approximately five questions related to your lesson. This will settle them into the lesson. You can use different types of questions in your lessons:
- **diagnostic**, enabling you to determine prior knowledge on the topic

- for **consolidation** of challenging concepts during the lesson
- for **stimulation** of interest in the subject
- for **concluding** the lesson. This will help you to find out whether pupils have understood the concepts or terminology in the lesson. It will also highlight any areas that pupils need to revise at home or that you should revisit in the next lesson.

Teachers must ensure that they do not appear to have favourites in the class; so, devise a system to ensure that you ask questions fairly, but be careful not to embarrass weaker pupils if they cannot answer questions.

How to use the guide

The purpose of this Teacher's Guide is to assist you so that you may be more thoroughly prepared and your teaching will be more meaningful to your pupils. This guide supports a hands-on approach and lays a solid foundation for Primary 5.

You need to be familiar with the key features of the guide. The guide is divided into four Themes and 23 Topics. Each Topic is structured in the following way:

- performance objectives required by the curriculum
- content required by the curriculum
- activities to be completed individually, with a partner or in groups.

Each Theme ends with:

- a summary of the topics
- assessment questions.

How to use the curriculum guide provided in the Pupil's Book

A scheme of work is defined as the part of the curriculum that a teacher will be required to teach in any particular subject. Its primary function is to provide an outline of the subject matter and its content, and to indicate how much work a pupil should cover in any particular class. A scheme of work allows you, as the teacher, to clarify your thinking about a subject, and to plan and develop particular curriculum experiences that you believe may require more time and attention when preparing lessons for your classes. The criteria you need to bear in mind when planning a scheme of work are continuity in learning and progression of experience.

You can add your own notes to the Cambridge curriculum guide provided on pages v–x of the Pupil's Book to develop a scheme of work that is specific to your situation.

The curriculum guide is sequential. It is aligned with the contents of the Pupil's Book. Do not be tempted to jump around. Rather spend time carefully planning the term and theme to ensure that you adhere to the sequence of the Themes and Topics.

Although the school year is divided into three terms, we have not divided the curriculum guide into terms, as the time frame may vary depending on the planning of your particular school and we were trying not to be prescriptive.

The first lesson of a topic is usually an introduction to the topic. Make an effort to make this lesson exciting and informative to set the tone for the rest of the lessons. You should always explain the meaning of the topic in this lesson, for example: What is erosion? What is magnetism? What do we mean by nutrition? What are computer games?

The last lesson is usually allocated to revision and assessment. In this lesson, you can give the class a revision worksheet, a test or design a fun activity such as a game or a quiz to consolidate the topic. Pupils can also do their own revision by answering the assessment questions in their exercise books.

It is important to note that the number of lessons for a topic will vary according to the ability of the pupils in your class and their prior knowledge. Your management of the class will have an enormous influence on your ability to adhere to the time frames decided on. Focus on effective discipline strategies. You will have fewer discipline issues if you are punctual, well prepared, follow a plan (write the plan for the lesson on the board or display it at the start of the lesson), keep your word (do not make empty threats and promises), consistently adhere to rules (especially rules related to laboratory safety) and strive to make Basic Science and Technology an exciting subject.

A teacher of Basic Science and Technology is a professional instructor who facilitates, promotes and influences pupils to achieve the outcomes and objectives of the curriculum. It is the wish of the authors of this course that the pupils will, at the end of each course in the series (Primary 1–6) attain a level of Basic Science and Technology proficiency that will equip them for future studies in this field.

THEME 1 Basic Science

Sub-theme 1 Learning about our environment

Topic 1 Environmental changes

Performance objectives

Pupils should be able to:

- describe erosion and state the causes of erosion
- list the effects or dangers of erosion
- identify, discuss and implement simple strategies for controlling erosion
- define pollution and list some water and air pollutants
- list common sources of pollution
- discuss the consequences of water pollution on the people and the environment
- describe the role of the communities, industries and oil exploration in air and water pollution.

Additional resources

- Pupil's Book pages 1–18
- Workbook pages 1–9
- It is important not to just read the content to pupils, but to devise ways to make the pupils discover solutions to leading questions for themselves.

Teaching the lesson

Erosion

- Erosion is a major problem throughout Nigeria, so it should not be difficult to identify real-life examples of erosion in your area to help pupils understand the damage that it causes.
- Use the diagrams in the Pupil's Book to explain to the class the natural processes of weathering and erosion resulting from the actions of wind and water.
- Emphasise that although erosion is a natural process, the actions of people have led to a dramatic speeding up of the rate at which erosion happens, with disastrous effects.

Causes of erosion – natural factors

- Use the examples in the Pupil's Book, as well as other examples from your own area, to explain the differences between water and wind erosion to the class.
- Remind pupils that erosion is a natural process which occurs very slowly in nature. However, human actions are speeding up the rate of erosion, with disastrous consequences.
- Let pupils first do the practical investigation activity on page 3 in the Pupil's Book to experience the effects of the removal of vegetation on the rate of erosion. Then continue working through the human causes of an increased rate of erosion on pages 3 to 5 of the Pupil's Book with the class. Relate these to causes of erosion in your own environment as far as possible.

- The ways in which humans are causing erosion can mostly be linked to the destruction of natural vegetation that provides protection against erosion. This activity provides an opportunity for pupils to observe the effects of the removal of natural vegetation for themselves.
- Let pupils work in groups to follow the instructions in the Pupil's Book for creating two "hills" in the school yard: one with vegetation and the other without. They must then create "rain" and observe the effects on the two hills.

Activity 1 PB page 3

Suggested answers

1–3. Pupils' recorded observations should reflect that erosion of the soil occurred on the "hill" that did not have vegetation to cover it. The roots of the plants on the other "hill" protected the soil against the effects of the "rain".

Causes of erosion – human activities

- Work through the human causes of an increased rate of erosion on pages 4 and 5 in the Pupil's Book with the class so that they have a theoretical understanding of these aspects before they do Activity 2 on page 5.

Activity 2 PB page 5

- In this activity, pupils will work in groups to do some research on how the actions of humans are causing erosion to happen at a faster rate in their area. They must look for examples of erosion in their own environment and identify how these examples are linked to the human causes of erosion that they have learned about.
- Each group must work together to create a poster on their findings and do a short presentation to explain it to the class. Assess the posters using the following checklist:
  - Does the content of the poster explain the types of soil erosion and the human causes of erosion?
  - Is the poster bold and eye-catching?
  - Has all relevant information been included?
  - Did the group work well together?
- You can also combine this activity with what pupils will be learning about the effects of erosion and what can be done to prevent it. They can first look at the causes of erosion in their area, and then do further research on the effects and what can be done about these types of erosion, as described in the next section.

Workbook answers WB pages 1–3

1. a) Farmer B did not think about the effects of water erosion when working the land. Rainwater will flow downhill and wash away the topsoil.
   b) Farmer A protected the fields against the effects of soil erosion by creating contours across the hill when she ploughed. These contours will trap the rainwater as it runs downhill, so the soil cannot erode so easily.
2. a) Deforestation is when trees in forests are chopped down or burned down to create open land for farming or other uses. Without the tree roots to hold the soil in place, rainwater will wash away the soil and the wind will blow away the soil. This leads to soil erosion.
   b) Case study B shows deforestation, as the farmer chopped down and burned down the trees to create farmland.

c) The deforestation caused severe soil erosion when it rained, and washed away the farmer's crops, so that he and his family had to move away.

3. a) Desertification is the loss of topsoil that results from wind erosion. This turns the land into deserts where people and animals cannot survive.
   b) Yes, planting new trees to replace trees that were cut down is one way of helping to prevent desertification. However, once desertification has become very severe, there will not be enough water to keep trees alive. The trees should therefore ideally be planted again soon, before desertification can take place.

Remedial and extension

- Pupils can do this research activity on their own or work in mixed-ability pairs or groups.
- They must research erosion problems caused by the actions of humans in other parts of the country as well. Nigerian newspapers and websites often contain articles in which erosion problems and solutions are highlighted, which pupils can use for further research.
- This research can also be combined with further research on the effects of erosion and what can be done to prevent erosion, which they will be studying further in the next section.
- Let pupils do the pollution word search (under 'Resources' on page 95).

Effects of erosion

- Continue examining the topic of erosion with the class by moving from the causes discussed in the previous section to the effects of erosion, and thereafter to what can be done to prevent soil erosion. Continue linking this to local examples of erosion as far as possible.
- The case studies on pages 6 and 7 in the Pupil's Book highlight three of the main examples of the effects of erosion on the environment, as experienced in different parts of Nigeria: gully erosion (which is especially problematic in south-eastern Nigeria), coastal erosion in Lagos Sate, and desertification resulting from wind erosion in northern Nigeria. Work through these case studies with the class. Explain to them that similar examples of erosion can be found in other parts of Nigeria as well, even if not on such a dramatic scale as in the areas described in the case studies.
- Make sure that the pupils have read and understood the case studies in the Pupil's Book before they answer the questions in their exercise book.

Exercise 1 PB page 8

Suggested answers

1. a) South-eastern Nigeria.
   b) Heavy tropical rainfall combined with soft sedimentary rock such as sandstone that are easily eroded.
   c) Pupils need to list four effects and give a suitable example of each (from the the case study or their own experience):
      - Threats to buildings and development, plus suitable example.
      - Effects on people, plus suitable example.
      - Loss of farmland, plus suitable example.
      - Threat to vegetation, plus suitable example.
2. Lagos is densely populated. People use any available space to build houses, including on land reclaimed from the sea.

   Pupils' own answers should reflect an understanding of the risks of building on reclaimed land, for example: No, it is not a good idea to build on land reclaimed from the sea. The

sea levels may rise, especially because of the effects of global warming that are melting the ice caps at the North Pole and South Pole, so there will always be the risk of these areas becoming flooded again.

3. Any suitable projects by (a) community groups and (b) the government to control erosion (from the case studies or from pupils' own experiences), for example (a) the Fulbe-Fulako Association of Nigeria (a community group fighting desertification) and (b) the government's Great Green Wall for the Sahara and the Sahel Initiative (being done together with other countries in the African Union).
4. The Great Green Wall aims to create a long, dense green barrier of trees to help prevent the Sahara Desert from spreading southwards, like a great green wall. Encourage pupils to find out more about this project to understand the potential benefits it could bring, as well as the difficulties of setting it up (for example in supplying water to keep trees alive in these desert areas).

Controlling soil erosion

- Review what the case studies in the previous section showed about possible ways of controlling soil erosion, and what both the government and community organisations are doing to control erosion.
- Emphasise that all such attempts to repair or prevent erosion are costly and time-consuming, so we all have a responsibility to help prevent erosion. We can do this through our own actions, as well as by sharing information about what we have learned about erosion with people in our community.
- Work with the class through the examples of the suggestions for helping to prevent erosion on pages 8 and 9 in the Pupil's Book. Let them brainstorm further ideas in class for preventing erosion in your community.

Activity 3 PB page 9

Suggested answers

Let pupils work in the groups they worked in when they created posters on erosion in their area.

1. Let them discuss whose responsibility it is to control the type of erosion that they identified. Guide them towards realising that although the government is responsible for controlling erosion, both community organisations and all individuals living in an area also share the responsibility for helping to control it.
2. Let the groups compare the examples of erosion that they identified in their posters to the solutions suggested in the Pupil's Book, and come up with their own list of suggestions on how to control this type of erosion. Let the groups share their ideas with the class.

Remedial and extension

- Encourage pupils to find out which government agencies and community organisations are working on controlling erosion in their area.
- Encourage them to attend meetings where these agencies and organisations are sharing information on erosion with the community, so that they can check whether their suggestions are practical.
- Encourage pupils to ask questions and to share their own suggestions at such meetings. Often great solutions can stem from the ideas of young people!

Pollution

Meaning of pollution

- Define the meaning of pollution for the pupils before reading through the information in the Pupil's Book.
- As a class, discuss the picture on page 10 of the Pupil's Book to determine the types of pollution illustrated. Try to arrive at the consensus that pollution is harmful to the Earth and all living things on it.

Air pollution

Pollutants and sources of air pollution

- Define the meaning of air pollution for the pupils before reading through the information in the Pupil's Book.
- As a class, discuss the pictures on page 11 of the Pupil's Book to determine the sources of air pollution illustrated.

Effects of air pollution

- Divide the class into four groups. Give each group one heading from pages 12 and 13 of the Pupil's Book to discuss and summarise on an A2-sheet of paper. (The headings are Diseases, The greenhouse effect and global warming, The Depletion of the ozone layer, and Acid rain.)
- One pupil per group should present their group's findings to the rest of the class.

Control of air pollution

In the same groups, each group should make a spider diagram/mind map listing different methods of controlling and preventing air pollution. The groups should focus on the following areas of air pollution: at home, in the community, and industries and government.

Exercise 2 PB page 14

Suggested answers

1. Any four of the following: driving a vehicle; burning garbage; deforestation; using too much electricity; not recycling; excessive use of aerosols.
2. The sun warms the Earth during the day and the excess heat is supposed to dissipate into the atmosphere at night. The emission of CO_2 and other greenhouse gases prevents this from happening and traps the warm air on Earth. This causes the Earth's temperature to rise gradually, melting the polar ice caps and glaciers and destroying marine ecosystems sensitive to temperature changes.
3. Most of our electricity comes from coal-burning power plants. Coal is a fossil fuel and burning it to power generators releases huge amounts of toxic gases into the atmosphere. Using less electricity will reduce the need to build more coal power plants.
4. Dirty air causes respiratory diseases and lung diseases such as asthma. It damages the central nervous system and can lead to heart and blood diseases.

Workbook answers WB page 5–9

Air pollution

1. a) The burning of **fossil fuels** by most modes of transport is the biggest cause of air pollution.

b) Manufacturing plants release harmful gases such as **carbon monoxide** into the air.
c) Farmers spray their crops with **pesticides**, which further pollute the air.
d) Aerosol cans may contain **CFCs**, which eat away at the ozone layer.
e) **Smog** is a mixture of fog and smoke from petrochemical plants.

2. a) Respiratory diseases such as asthma.
b) Severe and chronic headaches.
c) Hay fever and sinus irritation.

3. a) In Bodo, a town in the Ogoniland region of Nigeria.
b) The spills came from a pipe on the Trans Niger pipeline, operated by Shell, a Royal Dutch oil company.
c) Damaged pipelines.
d) By proper maintenance of the pipelines.
e) The fishing industry was most affected. Fish stocks decreased due to polluted water. The price of fish, a local staple food, rose as much as tenfold. People who worked in the fishing industry had to find other jobs.
f) People could move away to find jobs, or help clean up and rehabilitate the land to its former status. Communities may also sue to be recompensed. In reality, crude oil destroys ecosystems, which cannot be restored.
g) Pupils' own answers should be reasonable and include an explanation.

4. The Sun's rays reach the Earth and bounce off it back into the atmosphere. If the air is heavily polluted, the radiation of heat back into the atmosphere is stunted. The heat therefore stays in the atmosphere, causing warmer conditions than that which is ideal for many sensitive habitats. Plants and animals try to adapt to these warmer conditions by migrating or changing their eating and breeding habits. Those that cannot adapt do not survive.

Land pollution

1. • Teach people about what littering does to the environment.
• Organise regular community drives to clean up problem areas.
• Collect and recycle plastic, tin and glass and sell it to recycling plants.
• Use wet household waste to make compost for gardens.
• Ask local authorities to place containers in strategic places where people could dispose of waste easily.
• Communities must call on authorities to provide bins to households and ensure regular removal of waste.

Water pollution

Pollutants and causes of water pollution

- Define the meaning of water pollution for the pupils before reading through the information in the Pupil's Book. Pupils could work in groups to read and discuss the different causes of water pollution as summarised on page 15 of the Pupil's Book.

Effects of water pollution

- Read and discuss the effects of water pollution by drawing a mind map on a large sheet of paper.
- Engage the whole class to look for possible effects in the text and encourage pupils to add their own ideas.
- The completed mind map could be displayed in the class.

Control of water pollution

- As a starter activity, ask each pupil to write down three suggestions of ways to prevent water pollution. Then, as a class, sort their suggestions into groups of the same ideas.
- Discuss the pupils' suggestions and look on pages 16 and 17 in the Pupil's Book to see if their ideas are reflected there.
- Emphasise the importance of every little act to prevent pollution.

Exercise 3 PB page 18

Suggested answers

1. Any four: streams, rivers, dams, wells, underground reservoirs, oceans.
2. Notify an adult and the local authorities.
3. It lessens the amount of oxygen in the water causing mass exodus of shellfish onto the beaches. It kills animals ingesting it. Oil clings to the feathers of penguins and sea birds preventing them from flying. It affects their ability to withstand the cold water and they ingest it when trying to clean themselves with their beaks.
4. Accept valid answers from the pupils.

Activity 4 PB page 18

1. Arrange a field trip to observe industries and other sources of air and water pollution in the community.
2. Draw pupils' attention to possible examples of air and water pollution and the roles of communities and industries.
3. Facilitate a class discussion, where pupils share their observations and discuss what could be done to prevent or control air and water pollution in their community.

Workbook answers WB page 4

1. a) Chemical run-off from factories: Prevention by laws and fines from authorities.
   b) Littering: Prevention by educating people, and clean-up drives.
   c) Raw sewage: Prevention by laws, fines and enforced clean-ups.
   d) Oil spills from tankers: Prevention by better control, laws, fines, enforce clean-ups.
2. Oil spills from tankers kill sea animals and birds. Oil prevents oxygen from entering the water, which causes massive walk-outs by crayfish and other crustaceans. Shellfish die due to toxic water and reduced oxygen. Sea birds and penguins die from ingesting oil. It sticks to their feathers, rendering them unable to withstand cold temperatures or to swim. Beaches are covered in oil slick, impacting animals living there and laying their eggs in the sand.

Extension

- Pupils make a poster about the prevention of air and water pollution. Posters can be displayed around the school to create awareness.
- Ask the local authorities to do a presentation at school about air and water pollution.

Remedial

Hold a class quiz on the content taught in this topic.

Topic 2 Waste and waste disposal

Performance objectives

Pupils should be able to:
- explain what constitutes waste
- identify different types of waste
- mention methods of waste disposal
- suggest different ways of recycling waste and the advantages of recycling waste.

Additional resources

- Pupil's Book pages 19–30
- Workbook pages 10–27

Teaching this lesson

What is waste?

- Introduce this topic by reminding pupils that they have been learning about the many negative ways in which humans are affecting the environment – from erosion to pollution. They will now look at the effects of the huge amounts of waste that people generate through our modern lifestyles. In the final topic of this sub-theme, in Topic 3, they will look back at everything they have learned about the ways in which people affect the environment when they compare healthy and unhealthy environments.
- Continue by asking the class to describe what waste is, and what forms of waste can be found in their own environment. Guide pupils towards defining waste as all the things that we throw away because we think they are no longer useful.
- Explain that our modern lifestyles have resulted in a drastic increase in the amount of waste that is produced all over the world. Guide them in identifying waste as explained on page 19 in the Pupil's Book, and emphasise the pollution and toxic risks created by different constituents of waste, as well as how long it takes for the different types of waste to break down.
- Relate this discussion of the types of waste to the real-life situation in pupils' own environment. For example, pupils may be exposed to rubbish dumps where illegal dumping of dangerous substances such as medical waste may be taking place. Emphasise the dangers involved in the dumping of different types of waste, and what should be done to avoid these dangers.

Types of waste

- Explain the difference between liquid waste (sewage) and solid waste (refuse) to the class. Indicate that in the next section, they will learn more about waste removal systems to get rid of these types of waste, and after that about ways to reuse many types of waste.
- Explain the pie graph on page 20 in the Pupil's Book to the class. It shows how much solid waste is produced in a typical household in a developed country such as the United Kingdom. Ask the class whether they think households in their area produce the same percentages of waste.
- Guide them towards thinking about possible differences between developed and developing countries in this regard. For example, in Nigeria, especially in rural areas, people still grow more of their own food, so they probably do not throw away as much plastic packaging materials as in developed countries where people buy everything from supermarkets. In

Nigeria, where people often still grow their own food, they may also be more likely to reuse kitchen and garden waste to make their own compost, so they will not throw away so much organic waste.

Activity 1 PB page 21

- This activity encourages pupils to think about the types of solid waste that people in their area throw away, at home, at school, at work and in the environment. Let pupils work with a partner to explore solid domestic waste that was thrown away at their house or school. Remind them of the health risks of handling waste – they should not touch the waste with their hands, but use gloves or a hard piece of plastic to go through the waste to identify the types of waste it contains.
- They should then compare this waste to the pie graph of waste produced in the UK, and discuss whether they think their waste is similar to, or different from, the waste shown in the pie graph in the Pupil's Book (page 20).

Exercise 1 PB page 22

- Pupils must then each write one or two paragraphs in their exercise books to describe what they discovered during their investigation of the waste. The example in the Pupil's Book will give them an idea of how they could compare their observations to the UK pie graph. Assess the paragraphs using the following criteria:
  - Is the paragraph coherent and on topic?
  - Do the pupils show an understanding of the different types of waste found in their community and how to manage this waste?
- Provide general feedback to the class on how well they did their paragraphs.

Workbook answers WB pages 10–11

1. Solid waste includes all the non-liquid rubbish that we throw away, for example banana peels and egg shells, plastic containers, glass bottles and metal cans. Liquid waste is also called sewage. It includes all forms of waste water from homes and industries.

2.

Types of waste	Description
a) Household waste	Everything that people living in households throw away.
b) Organic waste (includes)	The remains of plants and animals that will break down naturally, and can be used to make compost.
c) Industrial waste	Waste products from manufacturing processes, packaging materials, as well as equipment such as old cars, stoves and fridges.
d) E-waste	Old computers, mobile phones and other electronic equipment that people often throw away when they get newer models.
e) Medical waste	Needles, bandages and other used medical products that can be contaminated with deadly germs.

3. a) Liquid waste can contain **disease-causing** germs from the waste products from our bodies when we go to the toilet to defecate or urinate.
   b) Waste water from washing clothes and dishes contain chemicals from **detergents**, which could be harmful to the environment.
   c) **Industrial** waste water from factories often contain toxic chemicals that could be harmful.

d) Medical waste must be burned in special **incinerators** as they may contain germs of dangerous diseases.
e) **Organic** kitchen and garden waste can be recycled to make compost.

Waste disposal

Disposal of solid waste

- Work through the examples of solid waste disposal methods, as described on pages 22 and 23 in the Pupil's Book, with the class. Discuss with them how these methods compare to the methods used in their own areas, and what the advantages and disadvantages of different solid waste disposal methods would be.
- Encourage pupils to observe what is happening in their own communities with regard to solid and liquid waste removal, and to share their observations with the class. Keep in mind that many pupils may live in environments where there is a lack of proper waste removal systems.
- Encourage a spirit of civic responsibility by trying to look for examples of people who are making a difference in the war against waste in their own environments.

Disposal of liquid waste (sewage)

Work through the examples of sewage disposal methods, as described on pages 24 and 25 in the Pupil's Book, with the class. Discuss with them how these methods compare to the methods used in their own areas, and what the advantages and disadvantages of these would be.

Effects of improper waste disposal

- Review with the class what was discussed in the previous sections about different disposal methods for solid waste and liquid waste, and what they started identifying about the advantages and disadvantages of different methods of waste disposal.
- Discuss with them what the pictures on page 25 in the Pupil's Book show about the effects of improper waste disposal before they work in pairs to do Activity 2 in the Pupil's Book.

Activity 2 PB page 26

- Let pupils work in pairs to discuss the effects of improper waste disposal shown in the pictures in the Pupil's Book, as well as the causes and what can be done to prevent the situations shown in the pictures.
- Pupils should then copy the example of the table on page 26 in the Pupil's Book. After discussing in pairs how to describe each picture, each pupil then completes the table in his or her own exercise book.

Exercise 2 PB page 26

Suggested answers

1&2. Pupils' own tables should reflect an understanding of the effects of improper waste disposal, as well as what can be done to prevent these effects. Accept any logical answers, as in the examples below.

Picture	What the picture shows us about the effects of improper waste disposal and what causes these effects	What could be done differently to prevent these effects of improper waste disposal
A	The solid waste dumped in the overfull bin causes a bad smell.	Put refuse in refuse bins for refuse trucks to take to proper landfill sites.
B	Sewage can spread germs into water used for drinking, cooking and washing. Can cause serious diseases such as cholera and typhoid.	Proper sewage treatment facilities are needed to clean sewage before releasing it into the environment. If water must be used from areas polluted by sewage, water must be boiled and disinfected with bleach before use to kill germs.
C	Mosquitoes can breed in polluted water, and mosquitoes cause malaria, a serious disease in humans.	Proper sewage treatment to avoid dirty water. Also, use mosquito nets to avoid getting malaria from mosquito bites.
D	Flies, cockroaches, rats and mice breed in piles of rubbish, and cause serious infections in humans and animals.	Throw away solid waste in closed bins that are removed regularly and taken to proper waste disposal sites. Do not litter!
E	Sewage from a pit latrine is getting into drinking water through a cracked pipe.	Water pipes need to be kept in good repair. Pit latrines must not be built near places where water pipes are.
F	Detergents from people washing and doing laundry in the river can make people and animals drinking the water sick.	Do not wash or do laundry directly in rivers or dams; do not throw waste water from washing directly into streams.
G	Industrial waste water from factories is polluting a river and killing the fish.	Government must enforce environmental regulations to prevent industries from polluting waterways.

Extension

- If possible, arrange a class visit to a waste treatment facility or landfill site in your area, or invite a local sanitation official to come and tell the class more about the disposal of solid and liquid waste in your area.
- Let pupils do an audit of disposal methods in the areas where they live for solid waste and liquid waste. They can also interview people in the community to find out more about the effects of improper waste disposal. For example, they can talk to staff at the local clinic to find out whether improper sewage disposal is causing infectious diseases. Encourage them to put their findings together in a report, which the class can then present to your local government to ask what the government is doing about such problems.

Workbook answers WB pages 12–17

1. a) The first photograph shows an enclosed refuse van collecting solid waste from households, where the waste was stored until the collection day in large, tightly covered bins. This type of waste collection reduces the risk of diseases and bad odours caused by exposed waste. The second photograph shows a controlled landfill site, where refuse trucks dump solid waste collected from households. The mounds of rubbish are levelled by bulldozers and covered with soil, so that it can start decomposing.
   b) Pupils' answers will depend on the solid waste removal system used in their areas. For example, pupils in some parts of Lagos might explain that their rubbish is collected

and disposed of in closed garbage cans and refuse trucks, as described in the photos. Others might explain that there are no formal rubbish removal systems in their area, and that rubbish is thrown away along roadsides and only occasionally removed by rubbish trucks.

2. a) Some municipalities burn solid waste in **incinerators**. The **methane** gas produced in this way can be used as an energy source.
   b) Official **controlled landfill** sites allow for the controlled dumping of waste.
   c) In **central** sewage systems, sewage from toilets flow through underground pipes to sewage treatment plants before being released into the environment.
   d) Many households in Nigeria still use **septic tanks**, pit latrines or bucket toilets.
3. Pupils' captions for each picture should reflect the effects of improper waste disposal shown, as well as a suggestion on what can be done to prevent the effects shown in each picture. For example:
   a) Mosquitoes breed in dirty water and they can cause malaria. Central sewage systems will prevent dirt pools of sewage water collecting.
   b) Open piles of rubbish attract pest such as flies, cockroaches, rats and mice. Throw rubbish in closed rubbish bins until it can be collected by closed refuse vans.
   c) Open waste disposal sites cause a bad smell! This can be prevented by throwing rubbish in closed rubbish bins and collecting it in closed refuse vans.
   d) Sewage leaking into the water system can cause outbreaks of infectious diseases such as cholera. Central sewage systems can prevent this by using proper pipes to carry sewage safely to sewage treatment plants for purifying before it is released into the environment.
   e) Sewage from the pit latrine can pollute the drinking water through a cracked water pipe. Polluted drinking water can cause diseases such as cholera.
   f) Industrial waste from factories can kill fish and make people sick. The government must enforce environmental health regulations to prevent pollution by factories.
   g) Detergents from washing powder and soap can make people and animals sick. Do not wash or do laundry directly in streams.
4. a) They provide a clean solution for the removal of liquid waste, and at the same time produces free, clean energy.
   b) Without oxygen, disease-causing germs die and a gas is formed which can be burned as an energy source.
   c) In India and China, energy is produced from domestic garbage and animal waste. In Rwanda, prisons run almost entirely from energy produced through biogas generators.
   d) Pupils' own answers should include an explanation of whether these adapted septic tanks can benefit their own communities. For example: Yes, these biogas generators will be very useful in our area. We all use septic tanks for removing liquid waste, and can save a lot of money if we can use biogas generated by the waste instead of buying fuel such as paraffin for cooking and lighting.

Reusing waste

- The different topics so far focused on environmental problems that may seem to be beyond the control of individuals, especially children. However, understanding the causes and possible solutions will empower pupils to develop into informed citizens who can play a role in addressing environmental issues in their communities. One of the most effective ways in which we can all make a difference is by learning how to reuse waste through the three stages of reducing, reusing and recycling the waste that we produce.

- Finding creative ways to reuse and recycle waste also provides good opportunities for pupils to apply their technology skills to produce useful and decorative objects from waste. Encourage the class to put what they learn in this topic into practice in their everyday lives.
- Work through the information on reducing, reusing and recycling waste on pages 27 and 28 in the Pupil's Book with the class. As far as possible, reinforce this information by referring to practical examples from your own community.

Advantages of recycling waste

Work through the advantages of waste recycling on pages 28 and 29 in the Pupil's Book with the class. As far as possible, reinforce this information by referring to practical examples from your own community.

Activity 3 PB page 29

- Let the pupils work in groups to do some research on how people in their areas reduce, reuse and recycle waste. Create a checklist for doing research as a worksheet to guide pupils in doing research.
- Encourage the groups to also think of their own creative ways to reuse waste materials. Let them share their ideas with the class.

Activity 4 PB pages 29–30

- Guide pupils through the steps to make their own compost.
- Pupils collect garden and kitchen waste, and groups take turns to create layers from the bottom up, as described.
- Ask pupils to report on the decomposition of the organic material, until it is ready to be used.

Workbook answers WB pages 18–27

1. a) Reduce: This means using fewer things, or not replacing goods as often. For example, do not buy vegetables packaged in wasteful packaging, but rather grow your own.
   b) Reuse: Finding other ways to reuse things we would otherwise throw away. For example, making lampshades and other crafts from empty plastic bottles.
   c) Recycle: Using products and materials again to make new products. For example, collecting and melting down empty aluminium cans to make new cans.
2. a) Collect waste for recycling, preferably by already sorting them into separate containers, for example for plastic, metal and paper.
   b) Special trucks collect waste for recycling separately from other waste that cannot be recycled, and take them to recycling centres where they are sorted and cleaned further.
   c) Similar types of waste are broken down into small pieces and collected in large bales.
   d) Each type of material then goes to a reprocessing plant, where new goods are made from the waste. (4)
3. a) Example A: water hyacinth, an invasive weed.
   Example B: empty plastic cool drink bottles.
   Example C: plastic bottle tops and other discarded items.
   b) Pupils' own pictures and short descriptions of a cool green product made from materials often thrown away in their community.
4. a) A Lagos municipal government: They have less waste to collect, which saves time and money.

B People living in low-income areas: There is less rubbish lying around in their areas, and they can earn credits to exchange for useful goods by recycling their waste.
C Large recycling companies: They get a steady and reliable supply of waste to keep their recycling operations running.
D Employees of Wecyclers: They can make a living by earning an income from collecting and sorting the waste, and therefore take care of their own families.

b) Pupils' own descriptions should provide a well-motivated argument on whether such a project could benefit people in their own environment, for example: Yes, such a project will have many benefits for the area where I live. In our informal settlement, rubbish is not collected and creates many problems and leads to diseases. There will be less waste if the goods that are suitable for recycling can be collected properly. There are also many people in our area who are poor and who would benefit from exchanging the waste they collect for recycling for credits to buy things they need.
c) This is a practical project that could be of great benefit if pupils should decide to take it on as a longer-term class or school recycling project.

5. Pupils design a poster to make the people in their community aware of the benefits of recycling. These posters could also be used in the above project.

Extension

Encourage the class to turn their ideas for creative ways to reuse waste materials and/or to collect waste materials for recycling, into reality. This will give them an opportunity to apply their technology skills in creating new products from waste. They can also practise their entrepreneurial skills by earning money from selling their creations or by collecting waste to sell to recyclers.

Topic 3 Environmental quality

Performance objectives

Pupils should be able to:

- state the advantages of a healthy environment
- state the disadvantages of degrading the environment
- identify ways of maintaining a healthy and beautiful school environment
- list materials for maintaining a healthy environment.

Additional resources

- Pupil's Book pages 31–33
- Workbook page 28

Teaching the lesson

Explain the meaning of environmental quality to the class, as described on page 31 in the Pupil's Book. As far as possible, use local examples to explain how environmental quality provides a safe, healthy and pleasant place for people to live and work.

Advantages of a healthy environment

- Continue using local examples to explain the benefits of living in a good quality or healthy environment. Also emphasise that we all must take responsibility for protecting our environment and helping to keep it clean and safe.
- Keep in mind that many pupils may live in conditions that may not be healthy and safe, and they may not feel that they are able to change their circumstances to ensure a healthy environment. Encourage all pupils to think of small things that we can all do to make a difference, for example by picking up rubbish, keeping our own rooms clean, caring for our own animals, etc.

Activity 1 PB page 31

- Discuss with the class which of the two pictures on page 31 in the Pupil's Book show a good-quality or healthy environment. Let them identify examples of why they chose this picture as an example of a healthy environment.
- Pupils must then discuss the advantages of living in a healthy environment.

Suggested answers

1. Class discussion.
   Pupil's comments should reflect an understanding that Picture A shows a healthy environment, for example: Picture A shows a healthy environment, because the house is clean and neat. There is no rubbish lying around that can attract pests. The people are also growing their own healthy vegetables and are keeping chickens for eggs in a neat cage. They have a cat and dog that have food to eat and water to drink. The cat can keep their house free of mice, and the dog can help to protect them against intruders.
2. Pupils should be able to explain the advantages of a healthy environment, for example the lack of smells, pests and diseases.

Disadvantages of an unhealthy environment

- This section serves as a summary of everything that pupils have learned in the different topics covered during this theme about how the actions of humans affect the environment.
- Explain to the class that the quality of an environment is partly affected by natural conditions, such as whether it gets enough rain, but even more importantly, by the actions of humans.
- Wrap up the work done during this term by reviewing with the class how the different topics they studied this term show the effects of how humans contribute to unhealthy environments.

Activity 2 PB page 32

- Let pupils work in pairs to look again at the pictures of the two environments on page 31 of the Pupil's Book. This time they should focus on how the actions of people could have contributed to the unhealthy environment.
- Each pupil must then use examples from the picture of the unhealthy environment to explain in their exercise book the disadvantages of living in such an environment.

Suggested answers

1. Pupils should be able to identify aspects such as the following in the picture of the unhealthy environment (B), and how the actions of people led to these conditions: people throwing away rubbish instead of putting it in closed bins, which attract pests such as rats; factories in the background sending air pollution into the air; clouds of polluting gases from car exhaust pipes because of the way in which people rely on using petrol and diesel in cars; people throwing liquid waste into streets, which may even include raw sewage.
2. Pupils should be able to explain the disadvantages of the unhealthy environment, for example infectious diseases caused by sewage in streets and by pests such as rats feeding on waste thrown away; cancer and breathing problems from breathing polluted air; global warming caused by exhaust fumes, etc.

Exercise 1 PB page 32

- Let pupils work in pairs to review all the topics they studied thus far to identify examples in each topic of how the actions of humans can lead to unhealthy environments, with short descriptions of what can be done to prevent these things from damaging the environment.
- They should copy, extend and complete the table on page 32 of the Pupil's Book as this will be a useful tool for revision purposes.

Suggested answers

Pupils' completed tables should include any relevant examples from the different topics, with appropriate suggestions on what can be done to prevent such damage. Some examples are given below, but any suitable examples should be accepted. Pupils can group together similar topics.

Causes of unhealthy environments	Human actions contributing to these causes	What can be done to prevent such damage
Erosion	Chopping down trees for firewood and land for farming causing desertification and erosion	Plant more trees; use other energy sources rather than firewood for cooking
Air pollution	Waste gases from factories and coal-fired power stations; waste gases from cars contributing to greenhouse gases that lead to global warming	Use more efficient transport; use renewable energy sources such as wind or water energy
Water pollution	Sewage in water sources leading to infectious diseases; fertilisers from farming leading to excessive growth of weeds such as water hyacinth in rivers and dams	Proper waste treatment systems or use of septic tanks with biogas converters can prevent diseases; minimising use of fertilisers on farms to prevent run-off
Land pollution	Toxic chemicals from landfills and factories polluting the soil, making it dangerous to use for growing crops	Stricter environmental controls enforced by government to prevent illegal dumping and control toxic waste from factories
Waste and waste disposal	Sewage spilling untreated into water sources, causing diseases such as cholera; throwing away solid waste, creating huge landfills	Use septic tanks fitted with biogas generators to make energy from sewage; recycle paper, plastic and metal to make new products

Maintaining a healthy environment and materials needed to do this

Discuss ways in which pupils could maintain a healthy environment at their school. Ask them to think about the materials that they would need to do this.

Activity 3 PB page 33

Encourage pupils to plan their own project for maintaining a healthy environment at your school and beautifying your school. Ask them to share ideas.

Workbook answers WB page 28

1. Pupils can refer to any three suitable examples of how the actions of humans can lead to unhealthy environments, from the topics they studied so far or from their own experience. Each example must be linked to how these human actions contribute to a poor quality environment. For example: When people chop down trees for firewood or for farmland, this can lead to an increased rate of soil erosion from wind and rain. Such deforestation can cause gully erosion that may be so severe that buildings can collapse and people have to move away. The burning of fuel such as wood or coal for energy also causes air pollution by greenhouse gases, which leads to global warming and climate change. Improper disposal of waste, for example untreated sewage that leaks into sources of drinking water, can lead to very infectious diseases such as cholera and typhoid.
2. Pupils' suggestions should be linked to each of the examples above, and should provide logical suggestions for preventing the negative environmental effects. For example:
   We need to protect our tropical forests to prevent erosion and plant more trees in areas threatened by desertification. We should move towards the use of safe energy sources, such as wind and water energy, instead of relying on coal and firewood for all our energy needs. Our cities and towns need proper sewage collection and treatment systems to keep germs from sewage from infecting our drinking water.

Remedial

Let pupils use their tables from Exercise 1 on page 32 of the Pupil's Book to revise the different topics that they studied in this theme. Let them work in groups to make up their own questions and then challenge the other groups to answer these questions during a class quiz.

Sub-theme 2 Living and non-living things

Topic 4 The human body: the skeleton

Performance objectives

Pupils should be able to:
- identify the major bones in the body
- identify the major joints in the body
- state the functions of bones and joints.

Additional resources

- Pupil's Book pages 34–39
- Workbook pages 29–30

Teaching the lesson

- When teaching this section on living and non-living things, make use of real examples of the bony skeleton and the different types of bones.
- The pupils must know all the names of the main bones in the human body. Show the bones of the skeleton to the pupils and ask them to identify the different bones.

Types of bones

- Ask pupils to distinguish between the different types of bones in the human body.
- Read and discuss the information on pages 35 to 37 of the Pupil's Book and look at the pictures of the different types of bones. Pupils should be able to group bones according to the five different classes.

Functions of bones

- Read and discuss the information on page 37 of the Pupil's Book.
- Ask the pupils to describe the functions of different bones in their body.

Exercise 1 PB page 37

Suggested answers

1. a) Sacrum; b) sesamoid bone; c) hinge joint; d) ligaments; e) tendons.
2. a) 1 – clavicle; 2 – head of the humerus/pectoral girdle; 3 – shoulder blade/scapula; 4 – humerus; 5 – radius; 6 – ulna; 7 – carpals; 8 – metacarpals; 9 – phalanges.
   b) i) long bones (any two): humerus, femur, radius, ulna.
   ii) short bones (any two): clavicle, metacarpals and phalanges in the hands, and the metatarsals and phalanges in the feet.
   iii) flat bones (any two): shoulder blade/scapula, bones of the scull and the sternum.
   iv) irregular bones: facial bones, vertebrae.

Workbook answers (WB pages 29)

Bones

1. cranium
2. orbit/eye socket
3. lower jaw
4. vertebral column
5. clavicle
6. scapula/shoulder blade
7. sternum
8. humerus
9. rib
10. ulna
11. radius
12. pelvis/hip bone
13. carpals
14. metacarpals
15. phalanges of the hand
16. femur
17. patella

18. fibula
19. tibia
20. tarsals
21. metatarsals
22. phalanges of the foot

Types of joint

- Read and discuss the information on the different types of joint found in the human body on pages 38 and 39 as a class.
- Let pupils show you examples of the different types of joint in their bodies.
- At the end of this section the pupils must be able to identify and name the different types of joint in the human body as well as their functions.

Workbook answers WB page 30

Joints and bones

1. a) A: Ball-and-socket joint.
   B: Hinge joint.
   C: Cartilaginous joint.
   D: Ball-and-socket joint.
   E: Synovial joint.
   b) 1: Humerus (long bone).
   2: Scapula/shoulder blade (flat bone).
   3: Vertebrae (irregular bones).
   4: Clavicle (long bone).
   5: Hip bone/pelvic girdle (irregular bone).
   6: Femur (long bone).
2. Ball-and-socket joint: A and D (shoulder and hip joints respectively).
3. Hinge joint: B (elbow joint).

Topic 5 Reproduction in plants

Performance objectives

Pupils should be able to:

- identify parts of a flower
- explain the meaning of pollination
- identify agents and types of pollination
- identify parts of a flower that are concerned with pollination and fertilisation
- describe stages of development from flower to fruit
- distinguish between pollination and fertilisation.

Additional resources

- Pupil's Book pages 40–50
- Workbook pages 31–33
- Ask pupils to bring a selection of suitable flowers to class (where the different parts of the flower are easily seen).

- Equipment needed for the investigation activity on page 42 of the Pupil's Book: white tiles, hand lenses, microscopes, microscope slides, safety razor blades.
- Bean seeds for the investigation activity on page 50 of the Pupil's Book.

Teaching the lesson

The parts of a flower

- Read and discuss the information on parts of a flower on pages 40 and 41 of the Pupil's Book as a class. Show the pupils an actual flower where each part can be seen easily in order to put the content they are learning into context.
- Check that the pupils can identify and name each part of a flower.

The reproductive organs of a typical flower

- Read and discuss the information on the reproductive organs of a typical flower on page 41 of the Pupil's Book as a class.
- Ask questions to check the pupils' understanding of the content and whether they can name the reproductive organs of a flower. For example: Name the parts that make up the female/male part of a flower. What is the function of the stigma?

Sexual reproduction of flowers

- Use the diagram of the pistil of a flower on page 42 of the Pupil's Book to explain sexual reproduction of flowers to your pupils. Check their understanding by asking questions.

Activity 1 PB pages 42–43

- Set up your classroom with the equipment needed for the investigation activity on pages 42 and 43 of the Pupil's Book before this lesson.
- Read through the instructions for the investigation with your pupils before they complete the activity to ensure they understand what they need to do, and how to use the equipment safely.
- Put them into pairs or small groups. Give each pair or group one of the flowers you brought and ask them to complete Activity 1.
- The pupils can draw their own table using the example on page 43 as a guideline. They can use diagrams, photographs and pictures to illustrate their findings.
- Assist the pupils through this investigation. It may be helpful to let the whole class study the same flower for the first example.

Workbook answers WB pages 31–32

1. 1 – petal; 2 – guidelines; 3 – anther;
   4 – filament; 5 – stamen; 6 – nectary;
   7 – receptacle; 8 – sepal; 9 – ovary;
   10 – style; 11 – stigma; 12 – pistil/carpel
2. a) Label 1: stigma; Label 2: anther.
   b) Wind pollination.
   c) The stigma is featherlike with a large surface for pollen to stick to. The flower produces large amounts of pollen. The parts can move around when the wind blows to disperse the pollen.
   d) Many of the pollen grains get lost or do not reach their destination. By forming many, the plant increases the chance that the pollen grains reach the stigma of another flower.

Pollination of flowers

- Read and discuss the information on pollination on page 44 of the Pupil's Book as a class.

Insect and wind pollination

- Read and discuss the information on insect and wind pollination on page 45 of the Pupil's Book as a class.
- Pupils can then complete the identification activity on page 46.

Activity 2 PB page 46

Suggested answers

Example	Type of pollination	Reason
Oat flower	Wind	• No coloured petals • Anthers dangling outside flower • Large amounts of pollen is formed • Large feathery stigma, hanging outside flower
Lily flower	Insects	• Colourful petals • Guidelines visible • Stamens shorter than stigma • Anther inside flower, where insects have to brush past them to get nectar • Stigma inside flower, where insect has to brush past it for nectar • Sticky or spiky pollen grains, which will stick to insects and animals
Garden pea flower	Insects	• Colourful petals • Nectar located inside the flower • Stamens curl up to touch the insect when it crawls in towards the nectar • Anther inside flower, where insects have to brush past them to get nectar • Stigma inside flower, where insect has to brush past it for nectar • Sticky or spiky pollen grains, which will stick to insects and animals

Fertilisation and fruit development of flowers

- Read and discuss the information on pages 46 to 48 of the Pupil's Book as a class before the pupils complete Activity 3.

Activity 3 PB page 48

- Give each pupil bean seeds and the other equipment needed for the investigation. Read through the instructions with the pupils and explain how they should carry out the investigation.

Suggested answers

1. a) Soaked seed swells out and become bigger. The testa of the dry seed is smooth and that of the soaked seed, wringled.
   b) The scar is in the indentation of the seed and is called the hilum.
   c–d) Remind pupils to be careful not to damage the embryo.
2. Refer to the labelled diagrams of a bean seed on pages 47 and 48 of the Pupil's Book.

Exercise 1 PB page 48

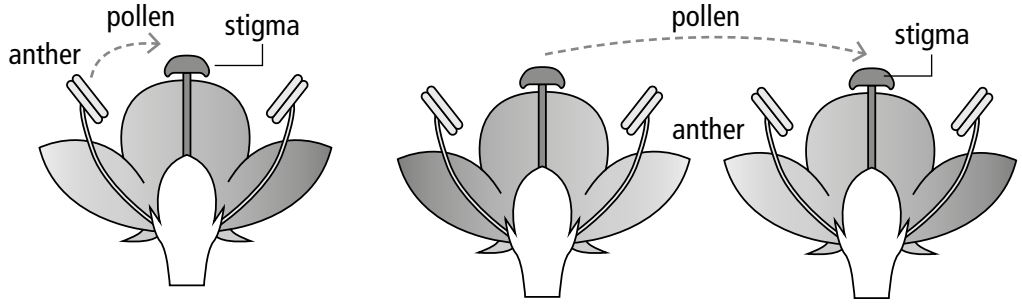
- Ask the pupils to do research using the internet or books about fertilisation to anwer the questions.

Suggested answers

1. Petals – dry out and fall off.
2. Stamens – dry out and fall off.
3. Zygote – develops into an embryo.
4. Ovule – becomes a seed.
5. Ovary – swells up and forms a fruit.
6. Integument of the ovule – the outer layer or integument of the seed becomes hard and water resistant and is called a testa.

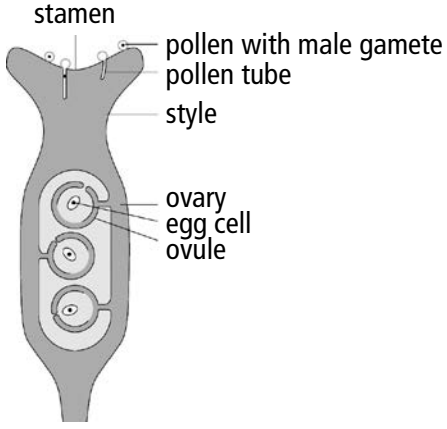
Workbook answers WB page 33

1.



(a) Self-pollination (b) Cross-pollination

2.



Pollination

Differences between pollination and fertilisation

Read and discuss the comparison between pollination and fertilisation in the table on page 48 of the Pupil's Book as a class. Ask the pupils questions to check their understanding.

Dispersal of fruits and seeds

Read and discuss the information on page 49 of the Pupil's Book as a class before the pupils complete the exercise on page 50.

Exercise 2 PB page 50

Suggested answers

Picture	Fruit	Agent of dispersal
1	Apricot	Animals
2	Dandelion	Wind
3	Coconut	Water
4	Strawberry/ any plant with berries	Animals
5	Pine tree seeds	Animals

Workbook answers WB page 33

The seeds and fruit of a plant develop at the same time, but even though they depend on each other, they are not the same. Seeds are the parts of a plant that contain the plant's embryo and develop inside a fruit. The fruit is the ovary of a flowering plant that nourishes and protects developing seeds.

Topic 6 Rocks

Performance objectives

Pupils should be able to:
- identify and classify rocks according to colour, hardness, texture, etc.
- list some important uses of rocks such as construction, beautification, etc.
- name some major landmark rocks in Nigeria.

Additional resources

- Pupil's Book pages 51–58
- Workbook page 34

Teaching the lesson

- Read and discuss the information on the description of rocks on page 51 of the Pupil's Book as a class. Ask questions to check pupils' understanding of the content.

Types of rock

- Read and discuss the information on the types of rock on pages 52 to 54 of the Pupil's Book with your pupils. Check their understanding of the content – can they list the different types of rock?

Uses of rock

Read and discuss the information on the uses of rock on page 55 of the Pupil's Book with your pupils. Check their understanding of the content – can they list the different uses of rock?

Activity 1 PB page 56

Suggested answers

1–4. Examples of the uses of rocks:

- Making glass and marble
- Road construction
- Bridge construction
- Building of houses
- Making jewellery, for example diamonds
- Making tools
- Coal for electricity
- Limestone for cement and chalk.

Workbook answers WB page 34

1. **Igneous**: rocks formed when magma cools and turns to solid rock
   Sediment: bits of rocks from mountains/rock formations that have been worn away by erosion
   Sedimentary: layers of sand and mud at the bottom of lakes, compressed back into rock by the weight of overlying materials
   Metamorphic: rocks made from other rocks that have been changed by heat and pressure caused by the movement of the Earth's crust
   Magma: liquid rock from Earth's crust that comes up to the surface
2. Check that the pupils colour in the arrows accurately, in the correct colour. (See Pupil's Book page 54.)

Major landmark rocks in Nigeria

- Read the information on pages 56 to 58 of the Pupil's Book as a class.
- Ask pupils to name other major landmark rocks or rock formations in Nigeria that they know of.
- Pupils can complete Exercise 1 on page 58 of the Pupil's Book in their exercise book.

Exercise 1 PB page 58

Suggested answers

Examples are:

- **Ewekoro rocks** in southwestern Nigeria, which contain limestone, and **Enugu rocks**, which contain coal.
- The **Kufena Hills** are located in the Zaria Local Government area in the northern part of Kaduna State.
- The **Shere Hills** are massive boulders of granite piled at a corner of the Jos Plateau. This is situated about 10 km to the east of Jos metropolis, the capital of Plateau State in the middle belt region of Nigeria.
- The **Zuma Rock** is just north of Nigeria's capital, Abuja in the Niger State.
- **Aso Rock** is situated in the heart of Abujathe in the Niger State.
- **Olumo Rock**, one of the most popular tourist destinations in Nigeria, sits in the ancient city centre of Abeokuta.

Check the pupils' maps for accuracy.

Topic 7 Acids and bases

Performance objectives

Pupils should be able to:
- give examples of acids and bases
- list some physical properties of acids and bases
- state types of acids and bases
- list some uses of acids and bases
- distinguish between acids and bases
- name local materials used in soap-making
- identify the active ingredients in the local material used in soap-making
- make soap from local materials
- state the uses of soap.

Additional resources

- Pupil's Book pages 59–69
- Workbook pages 35–45
- Display of soaps and detergent containers

Teaching the lesson

- Read and discuss the information on the description of acids and bases on page 59 of the Pupil's Book as a class.
- Discuss the following safety measures when working with acids and bases:

Caution

Acids can be found in many workplaces and laboratories, and a few of them are powerful enough to damage body tissue and even corrode metals. However, if handled safely with the right equipment, acids need not be feared.

Burns to skin or clothes should be washed immediately with copious amounts of water and neutralised with bicarbonate of soda. If bicarbonate of soda is not available, don't waste time looking for some, just use water.

In the case of contact with eyes, wash with plenty of water, preferably under a tap for at least ten minutes, and seek medical advice.

Physical properties of acids and bases

Activity 1 PB page 60

- Pupils can work separately or in groups for this activity.
- Let each pupil in a group bring one type of liquid to class. Note that bleach can damage clothes, so they must be careful when handling it.
- Let each pupil draw the table on page 60 of the Pupil's Book in their exercise book.
- Discuss the results with the class after all the groups/pupils have finished it on their own. Other examples of indicators can also be used.
- Then discuss the uses of acids and bases, as explained on page 63 of the Pupil's Book.

Workbook answers WB pages 35–36

1. Solution A: Black tea in water has a medium neutral brown colour.

Solution B: Black tea serves as an indicator. The lemon juice makes the tea acidic and the tea has a lighter colour.
Solution C: The bicarbonate of soda makes the tea alkaline and the colour is darker.

2.

	Acid	Base
a) How does it feel?	Corrosive "burn"	Slippery
b) How does it taste?	Sour	Bitter
c) What ions does it produce in solution?	H-ions	OH-ions
d) What is the result when testing with litmus paper?	Red	Blue
e) Give two examples of common household products.	Vinegar, battery acid, citrus juice/fruits	Soap, shampoo, window cleaner, drain cleaner, baking soda, anti-acids
f) What is the pH range?	0–7	7–14

3. They are corrosive and can burn or hurt the skin. They can be poisonous.

Exercise 1 PB page 62

Suggested answers

1. Milk of Magnesia: base – strong
   Black Coffee: acid – mild
   Gastric acid: acid – very strong
   Soapy water: base – very strong
   Tomato juice: acid – strong
2. Milk of Magnesia: blue
   Black coffee: red
   Gastric acid: red
   Soapy water: blue
   Tomato juice: red
3. Milk of Magnesia: blue
   Black coffee: red
   Gastric acid: red
   Soapy water: blue
   Tomato juice: red

Soap

- Ask pupils to bring a bar of soap and a detergent. Set up a corner of interest. Ask pupils what the difference would be. Discuss the uses of both.
- Discuss the labels on these products. Discuss the importance of labels, for example: by law all manufactured goods need to have labels attached. Ask pupils why this is important.
- As a class, list the different cleaning household tasks at home and the different types of detergents used for each.
- Ask the following questions:
  - Which are soaps and which are detergents?
  - What are the best cleaning materials for the job?
  - Are there safety precautions we need to be made aware of? Discuss why this is important.

- Also read the information on page 64 of the Pupil's Book as a class.

Exercise 2 PB page 64

- Pupils complete this as an individual activity.
- Refer to page 64 of the Pupil's Book for the answers.

Workbook answers WB pages 37–39

Soaps and detergents

1. a) Pupils label and colour in Picture A. Refer them to the display of soaps and detergent containers if necessary.
   b) Pupils label and colour in the soap in Picture B.

2.

Question	Soap	Detergent
a) What does it look like?	Solid block or in a liquid form	Liquid or powder form
b) Where can it be used?	To wash the skin of an animal	Laundry, dirty surfaces such as tiles, windows, etc.
c) Is it gentle or harsh on the skin?	Gentle	Harsh
d) Does it have chemicals in it?	No. Produced from natural products	Yes. Made of synthetic products, such as petroleum, foaming agents and alcohol
e) Why do you think chemicals would be added?	No added chemicals	Chemicals are stronger that the natural ingredients of soap. You can use, for example, smaller quantities to wash large volumes of clothes

A limerick

1–3. Each pupil completes their own answers and then they can discuss their answers in groups.

The wonders of *ose dudu*

- Read and discuss the information on African black soap on page 65 of the Pupil's Book as a class. Ask the pupils to list the benefits of using this soap.
- Discuss the advantages of supporting local manufacturers, for example: provides work/ income for the people in the country; improves the economy, etc.
- Show pupils a copy of a poster advertising African black soap products. Discuss how the information is set out: What makes the poster attractive? How have the space, colour and fonts used made the poster effective? What information has been included on the poster?

Activity 2 PB page 65

- Pupils create their own poster for African black soap as individuals or in pairs.

Active ingredients of African black soap

- Recap on the previous section of work about African black soap.
- Refer pupils to the class display. Ask them to read the ingredients listed on soap labels. Discuss the ingredients and their benefits.

- Pupils should answer the Exercise 3 questions on page 66 of the Pupil's Book in their exercise book.

Exercise 3 PB page 66

Suggested answers

Active ingredient	Benefits
Plantain skin and leaves	Has a high concentration of Vitamin A and E, helps to moisturise skin and stimulate growth of new skin cells
Cocoa powder and cocoa butter	Help repair damaged skin , moisturise skin and ease skin rashes, eczema and psoriasis
Shea butter	Helps heal burns, sores, scars, and treat psoriasis, eczema and dermatitis
Palm oil, coconut oil	They have anti-bacterial and anti-fungal properties, which help to remove grime and make-up.

Soap making

Workbook answers WB pages 40–41

Methods of soap preparation

1. Containers, clay oven, filter, pestle and mortar, stove. (Accept any reasonable answers.)
2. In a clay oven.
3. A solid form (a bar of soap).
4. The soap would need to be packaged and labelled before being sold.
5. Pupils' answers will vary. Example: African black soap is still made today as it is has vitamins A and E as well as iron, which makes it an effective beauty product.

Local materials used to make soap

- Show pupils a copy of an advertisement for African black soap products. Discuss how the information is set out:
  - What makes the advertisement attractive?
  - How are the space, colour and fonts used to make the advertisement effective?
  - What information has been included in the advertisement?
- Pupils can complete their own advertisements in the space provided in their workbooks.

Activity 3 PB page 67

- Explain to the pupils the importance of packaging. Discuss the importance of the suitability of the package, for example: size, suitability of the cardboard, information needed, etc.
- Read and discuss the information on pages 67 and 68 of the Pupil's Book as a class.
- Hand out templates (from page 96) that pupils can use to make simple boxes. A template is also supplied on page 42 of the Workbook, or you can ask pupils to trace a template from existing packaging.
- Explain that the cut lines are solid lines and the fold lines are broken lines.
- Remind pupils to write the information on their boxes before the template is folded and glued.

Extension

Pupils can do a peer assessment of the completed soap boxes.

Activity 4 PB pages 67–68

- Do this as a supervised group activity.
- Refer pupils to instructions on how to make novelty soap on page 68 of the Pupil's Book. Discuss safety issues and clean-up operations.
- Divide the pupils into small groups and let them make the novelty soap.
- The activity may be performed as a demonstration lesson. Pupils can observe and write a report on how soap is made.

Extension

- To make novelty shaped soap, soften cheap bars of soap and spray molds with non-stick spray. Press the softened soap into the molds and allow to dry. This makes interesting gifts.
- Pupils can make their own gift wrap using liquid soap and food colouring by following the instructions on page 43 of the Workbook.
- If possible, plan an excursion to a soap manufacturing company in your area.

Workbook answers WB pages 42–45

Soap packaging

Pupils use the template to complete Activity 3 on Pupil's Book page 67.

Make your own gift wrap using liquid soap and food colouring

Pupils make their own gift wrap using liquid soap and food colouring by following the instructions on page 43 of the Workbook.

Washing your hands

- Show pupils copies of different posters. Encourage them to include the following things on the poster:
  - pictures – cut them out of magazines or draw pictures
  - a heading in bold, large print
  - colour
  - strong words or short phrases.
- Pupils then complete their own posters individually in their workbooks. Space is provided for the poster.

Uses of soap PB page 69

- Discuss the reasons why the use of soap and detergents are important in daily life.
- Work with the class through the information on Pupil's Book page 69.
- Explain how a detergent works by referring to the illustration.
- Ask pupils to think of fun activities with soap and soap bubbles.

Assessment: Answers PB pages 73–77

1. a) Wind erosion is caused by dust and sand being blown from one place to another, creating large sand dunes, or blown against rocks, causing rocks to erode to form smooth domes/rock formations. Water erosion is the effect that moving water has on river banks and rock formations over a long period of time. Coastal erosion is when the waves from the ocean erode the coastline, causing damage, especially in densely populated areas. (3)
   b) Desertification is when land becomes desert as a result of drought, deforestation or poor farming practices. Nigeria's northern areas are especially at risk of desertification. (2)
   c) Deforestation is when land such as forests are cut down or cleared to make way for developments and agriculture. This causes soil erosion to happen at a very fast rate, which allows deep gullies to form in softer rock layers, which then threaten homes, buildings, roads, etc. (2)
   d) The rock in these areas is made up of soft sedimentary rock, which erodes easily. There is also heavy rainfall in the south-eastern parts of Nigeria and this causes soil/gully erosion to happen at a very fast rate. (2)
   e) Mangrove swamps are coastal wetlands formed by mangrove trees, found in tidal waters along the coast. They retain soil and sand, which helps to control coastal erosion. (2)
2. Crop rotation is growing different types of crops on the same field at different times of the year. Mixed-farming is growing a mixture of crops that develop at different rates on the same field. These methods can prevent soil erosion from happening as the land is not left bare/without plants, which reduces the risk of soil eroding. ($2 \times 2 = 4$)
3. a) False. Marine animals live in oceans and water pollution affects their entire environment. It poisons the food they eat and takes oxygen from the water. (2)
   b) True. Birds and animals see plastic and other solid waste as food. They swallow it, leading to strangulation and starvation. (2)
   c) True. It causes diseases such as cholera, typhoid fever and cancer. (2)
   d) False. Air pollution is mainly caused by the transport industry. (2)
   e) False. Industries and oil exploration are major contributors to air and water pollution, for example, oil spills cause pollution of the ocean as well as water sources on land. (2)
4.

Column A	Column B
a) Burning fossil fuels	D Releases waste products such as carbon dioxide, nitrogen oxides and hydrocarbons into the air
b) Smog	G A dark, hazy layer of dirty, polluted air that covers large cities like fog
c) Acid rain	I Caused when the air contains gases such as sulphuric acid; can kill trees and even strip paint from buildings and cars
d) Some aerosol products	A Contain chlorofluorocarbons (CFCs) that can damage the ozone layer of the Earth
e) The greenhouse effect	B Refers to the way in which carbon dioxide and other waste gases in the air, from the burning of fossil fuel, prevent heat from escaping back into space from the Earth's surface

Column A	Column B
f) Solar power	C Uses the heat energy of the Sun to provide electricity without polluting the air the way generating electricity from burning fossil fuels does
g) Sewage	J Liquid waste from toilets and waste water from homes and factories
h) Use of fertilisers on farms	F If it gets washed into rivers, causes algae and water plants to grow so fast that they use up all oxygen in the water, causing fish to die
i) Oil spills	E Kill marine animals when they ingest oil while trying to clean their feathers
j) Plastic bags and other solid waste	H Can block the intestines of marine animals that swallow them, and can also kill animals that get entangled in them

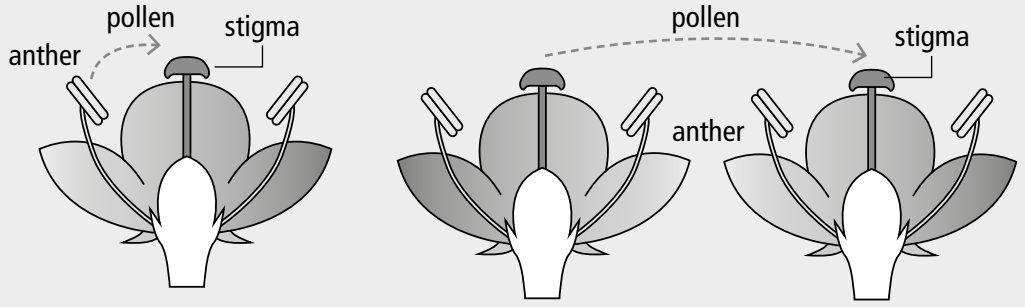
(10)

5. a) Kitchen and garden waste. (1)
   b) Pupils' answers will vary. Example: We could use the waste to make our own compost as fertiliser for plants, instead of using shop-bought products. This is better for the environment because it reduces the amount of waste landing up in landfills. (2)
   c) Liquid waste is also called sewage. This is all forms of waste water from homes and industries. (2)
   d) Accept examples supplied and any reasonable explanation for each management system: Controlled dumping (there will eventually be no space left in landfills, so the waste will end up polluting the surrounding areas); burning waste (the smoke/gases from burning waste could pollute the air); composting (machines or vehicles are needed to move and break down garden refuse, and the use of fuel and electricity could pollute the air). (3 × 2 = 6)
6. a) Central sewage systems allow the sewage from toilets to flow through underground pipes to sewage treatment plants where the sewage is treated before being released into the environment. (2)
   b) Cholera and typhoid. (2)
   c) Pupils' answers will very. Use the pictures and text on page 25 of the Pupil's Book as a guideline to assess pupils' answers. (2 × 2 = 4)
7. a) Any two of the following: cardboard, paper, glass bottles, aluminum cans, plastic bottles. (2)
   b) Check that pupils give appropriate products that can be made from the materials they listed. (2)
8. a) A good quality environment means animals and people who live in this environment are safe, healthy and comfortable. People keep their environment clean. In a poor quality environment people and animals who live there are at risk of, for example, contracting diseases through pollution or other effects that cause damage, such as erosion. Often this unhealthy environment is caused by the actions of people themselves. (2)
   b) Pupils' answers will vary. Examples: People throwing litter in the streets or public places can attract rats and other animals that spread disease. A vehicle that is not roadworthy or has not been looked after properly emits smoke and gases that add to air pollution and puts people and animals at risk. (2)
   c) Pupils' answers will vary. Check that they have either agreed or disagreed with the statement and can substantiate their response. (2)

9. a) A; b) C; c) A; d) B (4)
10. a) i) 2, 4; ii) 1, 6; iii) 5; iv) 3 (4)
    b) The knee. (1)
11. Flowers are specialised structures of plants that are adapted for sexual reproduction. They contain the reproductive organs of the plant and through their colours, scent or shape and by offering "rewards" to insects and birds, they also attract pollinators. Their function is also to make gametes and ensure that fertilisation takes place. (2)
12. 1 – petal; 2 – anther; 3 – filament; 4 – stamen; 5 – receptacle; 6 – sepal; 7 – ovary; 8 – style; 9 – stigma; 10 – pistil; 11 – guide lines; 12 – stalk. (12)
13. a) anthers; b) ovule; c) ovule (3)
14.

Pollination	Fertilisation
Pollination only occurs in flowering plants	Fertilisation applies to almost every organism on Earth
Pollination is the transfer of ripe pollen, which contains the male gamete, to a respective stigma of a flower	Fertilisation is the fusing of a male and a female gamete in the ovary of a flower
Pollination can be done by the plant itself or by other agents, e.g. wind, insects and birds	No fertilisation can take place if there is no pollination

(4)

15. 

(a) Self-pollination (b) Cross-pollination (10)

16. Very large amounts of pollen are made by wind-pollinated flowers, because most will be blown away. Only a few will reach their destination. (2)
17. a) petals: dry out and fall off.
    b) stamens: dry out and fall off.
    c) zygote: forms an embryo.
    d) ovule: forms a seed.
    e) integument of the ovule: testa of the seed.
    f) ovary: swells up and forms a fruit. (6)
18. The liquid rock that originates from the Earth's crust that comes up to the Earth's surface is called magma. When the magma gets up to the surface and flows out, then the liquid is called lava. (4)
19. Igneous: When volcanoes erupt and the liquid rock (magma) comes up to the Earth's surface, new igneous rock is made. Igneous rocks form when magma cools and turn to solid rock. Examples: granite and basalt. (2)
    Sedimentary: The rocks of mountains are worn away due to erosion. Rain, snow, wind and running water cause the big igneous rocks of mountains to crumble a little bit at a time. Eventually most of the broken bits of the rock end up in the streams and rivers that flow down from the mountains. These bits of rock and sand are called sediments. Over time the layers of sand and mud at the bottom of lakes are compressed back into rock by the weight of overlying materials. These are called sedimentary rocks. Examples: sandstone, limestone and coal. (2)

20. Ewekoro rocks, in south-western Nigeria; Enugu rocks, in south-eastern Nigeria. (2)
21. a) Indicator
    b) Alkali
    c) Neutralisation (3)
22. a) B: Red
    b) D: Fruit juice
    c) B: Base (3)
23. False. Some acids are not so strong and therefore not dangerous, for example lemon juice. (2)
24. To clean/remove dirt. (2)
25. Any three of the following:

Soap	Detergent
Produced from natural ingredients, i.e. fats and oils taken from plants and animals and combined with sodium or potassium salts	Made of synthetic products, i.e. petroleum products, foaming agents and alcohol
Softer and less harsh on skin	Harsh on skin
Does not give off pollutants into rivers, streams and air	Gives off pollutants
Is biodegradable	Contains synthetic materials that take long to degrade
Does not have antibacterial chemicals and preservatives	May contain preservatives and antibacterial agents
Leaves a residue on clothes	Does not leave a residue on laundry
Not suitable to wash laundry because scum turns laundry gray	Is stronger than soap and takes a small quantity to wash large volumes of clothes
Can be in a liquid or solid form	Powder or liquid form

(3)

26. African black soap is a traditionally made soap made by Nigerian woman that has been used for many generations because of its many benefits. (2)
27. Any three ingredients and their benefits:

Active ingredient	Benefits
Plantain skin and leaves	Has a high concentration of Vitamin A and E, helps to moisturise skin and stimulate growth of new skin cells
Cocoa powder and cocoa butter	Help repair damaged skin , moisturise skin and ease skin rashes, eczema and psoriasis
Shea butter	Helps heal burns, sores, scars, and treat psoriasis, eczema and dermatitis
Palm oil, coconut oil	They have anti-bacterial and anti-fungal properties, which help to remove grime and make-up.

(3)

Total: 140

THEME 2 **Basic Technology**

Sub-theme 1 Understanding basic technology

Topic 1 Materials and maintenance

Performance objectives

Pupils should be able to:
- identify materials used in technology
- list types of wood, metal and plastic
- state what these materials as used for
- explain the meaning of maintenance
- state the need for maintenance.

Additional resources

- Pupil's Book pages 78–96
- Workbook pages 46–75

Teaching the lesson

Identification of material

- Discuss the various objects found in the classroom and ask the pupils which materials they are made of.
- Then read through the description of materials on page 78 of the Pupil's Book, emphasising the difference between natural materials such as wood and synthetic material such as plastic.
- Divide the pupils into pairs to discuss the pictures and materials from which they are made.

Activity 1 PB page 78

Suggested answers

1. a) wood; b) wood/steel; c) cardboard; d) wool; e) glass; f) wood, steel/metal; g) cardboard; h) metal.
2. a) trees; b) trees/iron ore; c) trees/plants; d) sheep; e) sand; f) trees, iron ore; g) trees/plants; h) various metal ores. (Accept any reasonable answers.)

Workbook answers WB pages 46–49

Choosing the right material

Discuss as a class the picture of the aeroplane. Talk about the different types of materials used in the construction and why. Pupils should fill in their answers on Workbook page 47.

Complete the table

1. a) plastic/wood; b) metal; c) plastic; d) metal; e) wood; f) metal; g) wood; h) plastic/metal; i) plastic/wood.

2–3. Pupils' answers will vary. Check the appropriateness of their answers.

Types of materials

- Discuss the difference between organic and inorganic materials, introducing the two new terms.
- Discuss the picture of organic and inorganic materials with the pupils, focusing on the differences between the two, mainly the processing.

Activity 2 PB page 80

- Divide the pupils into groups of three so they can carry out some research on the products their families use every day and the materials of which these are composed.
- Discuss the elements of a bar graph with the class and the Mathematics teacher so that pupils can draw up a bar graph of their results. Put these up in the classroom and discuss any similarities and differences.

Workbook answers WB pages 50–53

Materials used to make products

Divide the class into pairs to make a list of the products and the materials from which they are made.

1.

Product	Material
Bottle	glass
Packaging box	cardboard
Books	paper
Chair	wood
Cooler box	plastic
Pan	metal
Crayons	wax
Gloves	rubber

2. a) Eight.
   b) Plastics.
   c) New materials are invented for new uses; they are cheaper.

3–6. Pupils' answers will vary.

Types of material

1–4. Pupils' lists and answers will vary. Guide their discussions around the advantages of specific materials.

Uses of wood

- Go through the pictures of the wood process on page 81 of the Pupil's Book with the pupils, explaining how it works.

- Discuss and read through the section on hardwood and softwood with the class.
- Read and discuss the different kinds of manufactured wood.
- Discuss the main types of solid timber and the fact that trees provide not only wood, but cardboard and paper as well, and how these can be recycled.
- For Exercise 2, pupils should write a short paragraph describing either the mechanical pulp or the chemical pulp process, describing it from the cutting down of the trees. They can use the pictures in the Pupil's Book as a guide.

Exercise 1 PB page 84

Suggested answers

Mechanical pulp

The trees are cut down, stripped of their leaves and branches, cut into logs of similar size, divided into piles and floated down the river. The bark is then removed, ground into a pulp and water is added. It is then bleached, dried and cut into sheets.

Chemical pulp

The trees are cut down, stripped of their leaves and branches, cut into logs of similar size, divided into piles and floated down the river. The bark is removed and the timber chopped into 2 cm chips. It is then cooked under pressure with chemicals. It is bleached and cut into sheets.

Workbook answers WB pages 54–55

Uses of wood

1. Pupils' lists will vary.
2. Alternative materials could include glass, metal or plastic.
3. Pupils' answers will vary. Example: Advantage of wood – attractive; Disadvantage – needs regular maintenance

Uses of metals

- Look around the classroom to see what metals have been used and why.
- Discuss and revise where metals come from as learned in Primary 4. Discuss the various types of metals as a class. Look at the pictures of different metals on page 85 of the Pupil's Book.
- Ask the pupils to examine the products made from metal on page 86, and to complete the table in Exercise 2.
- Read through the table on metals on Workbook page 58 with the class and discuss the different uses of the metals.
- Discuss the difference between ferrous and non-ferrous metals.

Exercise 2 PB pages 86–87

Suggested answers

Object	Metal used
a) train	steel
b) necklace	gold
c) car	steel/aluminum

Object	Metal used
d) aeroplane	steel/aluminum
e) stove	steel
f) pots and pans	copper/aluminum/steel
g) cutlery	brass/silver/plastic
h) screws	steel
i) nails	steel
j) food tins	steel/aluminum
k) bell	brass
l) ring	silver
m) kettle	copper

2. Pupils' examples will vary. Discuss the responses with the class.

Workbook answers WB pages 56–64

Uses of metals

1–2. Pupils' answers will vary, depending on the two metals they choose.

3. Pupils read about the different metals, their properties and uses listed in the tables on WB pages 58 and 59. Check that lists and answers are relevant.

Different methods to identify metals

1. f; 2. c; 3. a; 4. b; 5. e; 6. d

Animal, vegetable or mineral?

1.

Materials	Animal, vegetable, mineral?
Newspaper	Vegetable, made from trees
Glass bottle	Mineral, made from silicon dioxide
Plastic bottle	Animal and vegetable, made from oil
Clothes	Look at the label: sheep's wool, cotton, synthetic
Washbasin	Mineral or vegetable, made from clay
Bath	Mineral or vegetable, made from metal, plastic or fiberglass
Toothpaste	Mineral or vegetable, made from chalk, glycerine (plants) and chemicals (mineral)
Bicycle tyre	Vegetable, made from rubber tree
Aspirin	Mineral, consisting of a variety of minerals
Pepper	Vegetable, made from pepper plant
Salt	Mineral, made from sea water or dug up from the ground
Pencil lead	Mineral and vegetable, made from clay and graphite (coal)

2. Pupils' answers will vary.

Uses of plastics

- Read through the information on plastics on pages 87 to 89 of the Pupil's Book.
- Discuss the raw ingredients used to make plastics.
- Look at the advantages and disadvantages of plastics and discuss the two main groups of plastics illustrated on page 89 (thermoplastic and thermosetting plastic products).
- Discuss the various plastic items that may be found in the classroom and the substances from which the plastic is made. Either discuss or record how many objects are made of plastic and how many could be made of plastic.
- Look at the pictures on pages 87 to 89 of the Pupil's Book to stimulate discussions.
- Complete Activity 3 on Pupil's Book pages 90 and 91 as a class discussion.

Activity 3 PB pages 90–91

Complete this activity as a class discussion.

Suggested answers

1–2. Pupils identify the various plastic items in the pictures and discuss with the aid of the pictures the two types of plastics.
3. Ask the pupils to try and think why plastic could be a problem. Explain the term "biodegradable" and the problems that plastic presents as it degrades so slowly and is often hazardous to the environment.

Exercise 3 PB page 92

Suggested answers

1. Wood, plastic, metal, glass.
2. a) Metal to make it strong and safe to ride.
   b) Steel/aluminum as it transmits heat well.
   c) Plastic/glass as it is hygienic and cheap, and glass and some plastics can be recycled.
   d) Copper/steel/aluminum as it transmits heat well.
3. Plastics are made from coal, gas and oil.
4. Organic materials are made from living organisms and inorganic materials from human-made synthetic materials.

Workbook answers WB pages 65–67

1. a) Thermoplastic: carpets, kitchen crockery, ropes, pool toys.
   b) Thermosetting plastics: computer keyboard keys, certain toys, storage containers, bottle lids.

2–3. Pupils' lists will vary. Check for accuracy.

4. So much plastic is used as it is durable and plastic objects last longer than objects made from other materials.
5. They do not break easily – crockery; they are cheap – chairs; they do not rust – outside furniture; they are lighter than clay, wood, metal or glass – aeroplane and car bodies; they are easy to maintain – ropes, toys, etc.
6. Long lasting, cheaper, durable, easy to mold/manufacture, light in mass.
7. Plastic products degrade very slowly and are often hazardous to the environment. They are not biodegradable and litter the environment and seas, creating a pollution problem.

Extension

- Time permitting, encourage the pupils to collect plastic bags from which they can weave a placemat. See pages 68 and 69 of the Workbook for instructions. A printable copy is also available on pages 97 and 98 of this Teacher's Guide.
- Pupils can complete the research activity on how glass is made on page 70 of the Workbook in groups. Encourage the help of the computer/IT teacher to enable the pupils to do research on glass as a material. They can also use the library, or print out information to use. They should then write up the process in step-by-step format.

Workbook answers WB pages 70–71

1. Pupils should list ten items made of glass. Their lists will vary.
2. Examples: Advantage of glass – attractive; Disadvantage – breaks easily.
3. Wood is more durable than glass and does not break easily, so it would last longer.

What is maintenance?

- Discuss the idea of what it means to look after or maintain an object and why this is necessary.
- Pupils look at the photograph on page 92 of the Pupil's Book and complete Activity 4 in their exercise books.

Activity 4 PB page 92

Suggested answers

- Clothes and bedding are lying crumpled on the floor. They become dirty. They are expensive and need to be packed away.
- Books are not stored on the bookshelf properly. They get torn and broken.
- Wooden furniture will need to be cleaned and polished and kept free of clutter, especially metal items that could scratch and mark the wood.

Maintenance of wood

- Read through the information on maintaining wood on pages 93 and 94 of the Pupil's Book as a class.
- Look at the pictures on pages 94 and 95 of the Pupil's Book and discuss the different ways of protecting wood, before pupils complete Activity 5 on page 94.

Activity 5 PB page 94

Suggested answers

1. Ask the pupils to look at wooden objects at school and at home. Ask them to identify the finishes that were used on these objects and to record their answers in their exercise books.
2. Finishes are used to protect the objects so that they last longer and stay in good condition. They have lasted well because they are protected.
3. This answer will depend on the pupils and their preferences. They must give a reason why they prefer the finish they do.

Workbook answers WB pages 72–73

Maintenance of wood

1. The wood has not been looked after. The paint is peeling, some parts are broken and sun damaged.
2. The furniture should be sanded and a protective finish such as varnish or paint should be applied to the wooden furniture. Any parts that are broken should be fixed. Furniture left outside should have the correct exterior varnish or paint products applied to make sure that it lasts for a long time.

Ways of preserving or maintaining wood

2. Pupils' answers will differ. Examples: Poles: apply preservative as it protects the wood from insects, etc. Furniture: Use oil for a piece of furniture inside the house. Fence outside: apply lacquer or paint as it protects the surface from water and sun.

Maintenance of metal

- Read through the information on metals on pages 94 and 95 of the Pupil's Book and discuss with the pupils.
- Divide the pupils into groups and read through the directions for the experiment on page 74 of the Workbook. Make sure each group have pieces of metal such as nails, bolts and pins, a beaker/container with water, and oil or grease to carry out the experiment. Get them to record the results.
- Divide the class into pairs or small groups of three pupils to carry out the experiment with steel wool on page 96 of the Pupil's Book. Make sure there is enough steel wool, water, latex or plastic gloves for each group.

Activity 6 PB page 95

Suggested answers

Encourage the pupils to ask their older family members or elders in the community to suggest other methods of maintaining metal. Try and bring a silver, copper and brass object to school to show the class how the methods work.

Activity 7 PB page 96

Suggested answers

1. The steel wool has turned brown with rust.
2. The steel wool has been exposed to oxygen and water.

Workbook answers WB page 74

The objects that were coated with oil or grease have not rusted as quickly compared to the objects left in water without any protection.

Maintenance of plastic

- Read through the paragraph on maintaining plastic on page 96 of the Pupil's Book, then let the pupils complete Activity 8 orally in pairs.

Activity 8 PB page 96

Suggested answers

1. Very little of it has decomposed.
2. Animals and birds can eat or get trapped in the plastic and are injured or die.

Workbook answers WB page 75

- Give the pupils time, i.e. at least two weeks to collect pieces of plastic. Read through the information on finishes for plastics on page 75 of the Workbook as a class.
- Divide the pupils into groups to choose two finishes to apply to two pieces of plastic.

Topic 2 Basic motor vehicle parts

Performance objectives

Pupils should be able to:

- mention the internal parts of a car
- identify the internal parts of the car
- discuss the basic functions of the internal parts of a car.

Additional resources

- Pupil's Book pages 97–99
- Workbook pages 76–77

Teaching the lesson

Activity 1 PB page 97

- Initiate a class discussion about motor cars.
- Ask the pupils to look at the picture of the interior of a car on page 97 of the Pupil's Book and discuss the various parts.

Activity 2 PB page 98

- In pairs or individually, pupils match up the various parts of the interior to their functions.

Suggested answers

Parts of the car	Uses
1. Cubby hole/glove compartment	m) Compartment on the dashboard to store small items such as dark glasses and gloves
2. Handbrake	g) Brings the car to a stop in an emergency or on a hill to prevent it from rolling
3. Passenger seat	a) Place for the passenger to sit
4. Driver's seat	c) Place for the driver to sit
5. Side mirror	d) Exterior mirror on the side to see what is approaching from the side
6. Windscreen	r) A plate of specially treated glass through which you can see the road

Parts of the car	Uses
7. Dashboard	p) Panel for the driver's instruments and gauges
8. Windscreen wiper	b) Cleans away the rain from the windshield
9. Steering wheel	e) Changes the direction of the car
10. Fuel gauge	h) Indicates how much fuel is left
11. Rear-view mirror	q) Helps you see the cars behind you
12. Seatbelt	j) Protects you and keeps you in place during an accident
13. Speedometer	k) Tells you how fast you are driving
14. Clutch	n) When you depress/push down on this pedal you can change gears
15. Brake	f) Brings the car to a stop
16. Odometer	l) Tells you how many kilometres you have driven
17. Gear lever	o) This lever enables you to change gears to go faster or slower
18. Head rest	i) Place to rest your head while sitting

Activity 3 PB page 99

Take the class to look at the interior of a teacher's car, with permission, to see if they can point out the different parts.

Activity 4 PB page 99

Arrange a visit to a nearby workshop to see how the mechanics and panel beaters work on cars that need a service or have been damaged in an accident.

Activity 5 PB page 99

Divide the pupils into pairs to work out the function of the different parts.

Suggested answers

- Airbag: protects the body from injury during an accident.
- Radio/CD palyer: plays music to listen to.
- Mats: protect the floor of the car underneath the driver's and passengers' seats.
- Air conditioner: controls the temperature in the car.
- Indicators: indicate in which direction the car is turning.
- Visor: protects driver's and passengers' eyes from the sun's glare on the road.

Workbook answers WB pages 76–77

1. a) True.
   b) False; it tells you how much fuel you have left.
   c) False; it tells you how many kilometres you have gone.
   d) False; it controls the direction in which you are travelling.
   e) True.
   f) False; it shows you what is approaching from behind.
   g) False; it stores small items such as sunglasses and gloves.
   h) True.

2. Divide the class into groups to design a futuristic dashboard. They should draw and label it. They should be able to explain the purpose of each part to the class.

Topic 3 Drawing instruments

Performance objectives

Pupils should be able to:
- identify drawing instruments
- list five drawing instruments
- state the uses of drawing instruments
- use some drawing instruments.

Additional resources

- Pupil's Book pages 100–102
- Workbook pages 78–81
- Examples of different drawing instruments, for example: set squares, pencils, protractors, compasses, etc.

Teaching the lesson

What are drawing instruments?

Look at the photographs of different drawing instruments on pages 100 to 102 of the Pupil's Book as a class. Have examples of different drawing instruments available for the pupils to see and use.

Different drawing instruments

- Read and discuss the information on the different drawing instruments on pages 100 to 102 of the Pupil's Book as a class.
- If pupils have their own mathematical sets, it will then be possible for them not only to handle the instruments but to practise using them. Discuss this with the Mathematics teacher so that you can work together to help the pupils to use the instruments correctly.
- Help the pupils complete Activity 1 on page 102 in their exercise books. They can also complete the activities on pages 78 to 81 of the Workbook.

Activity 1 PB page 102

Check pupils' answers and make sure they demonstrate a good knowledge of using the various instruments.

Workbook answers WB pages 78–81

1. Any four of the following: set square, drawing pencils, T-square, drawing board, compass, ruler, protractor.
2. Pupils' answers will depend on the drawing instruments they chose. Example: A pencil is used to draw shapes and lines on the paper.
3. Pencil, eraser, ruler, compass, divider, set square, protractor.

Measuring and drawing

1–4. Guide pupils in the correct use of rulers, dividers, protractors and compasses to measure and draw.

Sub-theme 2 You and energy

Topic 4 Energy conversion

Performance objectives

Pupils should be able to:

- explain the meaning of energy conversion
- name forms of energy conversion
- state the importance of energy conversions.

Additional resources

- Pupil's Book pages 103–105
- Workbook page 82

Teaching the lesson

Concept of energy conversion

- Explain the properties of energy to your pupils.
- Make sure pupils are able to provide a definition of energy.
- They should know that energy is conserved and transferred from one object to another. It cannot be created out of nothing nor can it be destroyed.

Forms of energy conversions

- Pupils can work in groups to make posters of the different forms of energy conversions to display in class.
- Use the pictures on pages 103 and 104 of the Pupil's Book to distinguish between the different forms of energy.
- Take care to emphasise the conversions of energy that occur within each example.
- Explain how an electrical current or a chemical reaction can release heat energy.
- Focus on food and fuel and the conversion of chemical to heat energy.
- Explain how electrical current can produce mechanical energy to create movement.
- Try to demonstrate how a dynamo converts mechanical energy to electrical energy.
- Show the students videos of other examples of this conversion.

Energy conversions are important to us

- Discuss the importance of energy conversions as a class.
- Activity: Divide students into groups to make a list of how energy conversions make their lives easier and better.
- Students can then classify their examples under the four conversion headings as in the Pupil's Book.
- Recap the process of photosynthesis. Pupils should have learned about it in previous years.

Workbook answers WB page 82

2. a) Heat energy into chemical energy.
   b) Chemical energy into electrical energy into kinetic energy.
   c) Solar energy into electrical energy into heat energy.
   d) Nuclear energy into electrical energy into mechanical energy.
   e) Kinetic energy into mechanical energy into electrical energy.
   f) Chemical energy into heat energy.

Remedial

- Hold a class quiz on the content taught.
- Recap the importance of energy conversions by having students present their posters to the class.

Extension

- Let pupils do independent research on energy conversions related to crude oil.

Topic 5 Heat and temperature

Performance objectives

Pupils should be able to:
- distinguish between heat and temperature
- identify and name different types of thermometers
- identify and write the units and symbols of temperature scales
- use the thermometer to measure the temperature of objects accurately.

Additional resources

- Pupil's Book pages 106–114
- Workbook pages 83–85
- Flashlight, hot water, spoons made from metal, wood and plastic
- Different thermometers, for example: mercury/alcohol; digital/electronic; dial; infrared

Teaching the lesson

- Explain the three processes whereby heat transfer can take place.
- Ensure that the pupils can define heat and temperature and understand the difference between them by demonstrating radiation, conduction and convection as on pages 106 and 107 of the Pupil's Book.

Differences between heat and temperature

- Emphasise the fundamental differences between heat and temperature as shown in the table on page 107 of the Pupil's Book and have a class quiz to test comprehension.
- Let the pupils then complete Exercise 1 in their exercise books.

Exercise 1 PB page 107

Suggested answers

1. Heat is the amount of energy transferred from one thing to another. Temperature is a measurement of the degree of heat transferred (how hot or cold something is).
2. Radiation: heat projected from a source to a destination, e.g. from the sun to the Earth's surface.
   Conduction: transferring heat from the source through a substance, e.g. from a hot surface to an object touching it, like a pot on a stove.
   Convection: transferring heat in liquids and gases, when hot and cold air mixes.
3. a) Calorimeter.
   b) Thermometer.

Types of thermometer

- Explain different types of thermometers by using a chart, or collect and demonstrate different thermometers that pupils can safely handle and examine.
- Ensure that they understand the measuring unit of temperature before they attempt to measure it.
- Read through the information on thermometers in the Pupil's Book on pages 108 to 111 as a class before the pupils complete Exercise 2.

Exercise 2 PB page 111

Suggested answers

1. a) Dial thermometer.
   b) Electronic thermometer with remote sensors.
   c) Alcohol-filled clinical thermometer.
   d) Infrared thermometer.
2. A temperature label would be better because it can be stuck to a child's skin to quickly show if they have a high temperature. A glass thermometer must be kept in the mouth for at least a minute and the child may not keep still enough for an accurate reading. Glass can break.

Workbook answers WB pages 83–84

1. a) The Sun's rays reaches Earth by way of **radiation**.
   b) When hot water is added to cold water, the temperature of the cold water will rise. This transfer of heat is called **convection**.
   c) When one form of energy is changed to another it is called an energy **conversion**.
   d) **Temperature** is the measure of heat.
   e) Cooking food on a hot plate is an example of heat **conduction**.
2. a) Name: alcohol thermometer; Uses: measures air temperature inside or outside the house. Measures water temperature in a swimming pool or aquarium.
   b) Name: digital thermometer; Uses: measures temperature of a person or of a liquid.
   c) Name: thermal gun or infrared thermometer; Uses: finds survivors at a disaster site, measures hot spots in a building on fire. Accept any relevant and logical answer.
   d) Name: dial or bimetallic thermometer; Uses: for cooking meat or making boiled sweets. Use inside a cooling room or truck. (Accept relevant answers.)

Units and symbols of temperature scales

- Use the table on pages 111 and 112 of the Pupil's Book to provide historical background and scientific information about the main temperature scales.
- Emphasise the use of degrees Celsius for Nigeria.

Relationship between degrees Celsius and degrees Fahrenheit

- There is no need to teach pupils the mathematical conversion at this stage. They can do this by comparing temperatures from the illustration on page 112.
- Explain the relationship between degree Celsius and Fahrenheit using the table on Pupil's Book page 111 and the picture on page 112.
- Make sure pupils know the difference in the unit readings of freezing and boiling point, body temperature and where the different units intersect at –40 degrees.

Some uses of thermometers

- Invite students to list a few uses for thermometers.
- Then read and discuss the list on page 113 of the Pupil's Book.

Taking measurements with a clinical thermometer

- Pupils can work in pairs or groups to do Activity 1 on Pupil's Book page 114, depending how many thermometers are available.
- Adapt the list of things to measure if the activity is done at school.
- Compare the temperature of inside and outside objects such as water, plant soil, air, etc.
- Pupils record their answers in a table in their exercise books and report their findings to the class.

Activity 1 PB page 114

Suggested answers

Accept pupils' answers and let them check each other's readings to see if theirs fall within the average range.

Workbook answers WB page 85

3.

	Celsius scale	Fahrenheit scale
Inventor	Anders Celsius	Daniel Gabriel Fahrenheit
Year of invention	1742	18th century
Units	degrees (°)	degrees (°)
Symbol	C	F
Freezing point of water	0 °C	32 °F
Boiling point of water	100 °C	212 °F

4. a) 2 °C; 33 °F
   b) 25 °C; 78 °F
   c) 40 °C; 103 °F

Remedial

- Hold a class quiz on the content covered in Topic 5. You can divide the class into mixed-ability groups for this activity.
- Recap the differences between heat and temperature and degrees Celsius and Fahrenheit

Extension

- Do independent research on the first thermometer used in a clinical setting.

Topic 6 Basic electricity

Performance objectives

Pupils should be able to:

- identify types of electricity
- explain how electricity is produced (generated) and used
- explain how electricity travels (is conducted) from one point to another
- group materials into conductors (metals) and non-conductors (wood, glass, plastic)
- make a simple electric circuit connection.

Additional resources

- Pupil's Book pages 115–123
- Workbook pages 86–87
- Coloured paper, plastic ruler, balloon.
- If possible, circuit sets or the components to make circuits.
- Copies of circuit diagrams on page 99.

Teaching the lesson

Electricity as a form of energy

- This concept can be confusing for pupils who might possibly link it to the other forms discussed earlier on. Electricity is a secondary *source* of energy and cannot be created anew. If that were true, the world's energy problems would be at an end.
- Play a game in groups to illustrate static electricity.

Types of electricity

- Explain to pupils that in static electricity the protons and electrons may gather together but do not move to another object as is the case in current electricity.
- Pupils do Activity 1 on page 115 of the Pupil's Book in pairs and record their findings in their exercise books. Make sure that each pair have a plastic ruler, small pieces of paper, wool or acrylic fabric.
- Demonstrate further by performing the balloon experiment as shown in the illustrations on page 116 of the Pupil's Book.
- Explain the movement and balancing of neutrons and protons with charts and videos.
- It is a difficult concept for young pupils to grasp; therefore, the more ways in which it can be demonstrated, the better they will retain the knowledge.

- Current electricity is best explained by demonstrating with various circuit boards. Find out if the school has circuit sets available or explore the possibility of acquiring the components for your class. It is inexpensive and invaluable in getting the content of this module across.

Activity 1 PB page 115

Check that pupils adequately perform this simple experiment to demonstrate static electricity.

Methods of generating electricity

- Pupils need to grasp the concept of a current (stream) of electricity moving from a generator to their homes.
- Use different mediums to illustrate this concept in class.
- Discuss the workings of a coal-fired power station as illustrated on page 117 of the Pupil's Book and identify similar power stations in Nigeria.
- Explain why coal is most commonly used to generate electricity, even though it is a non-renewable natural resource and will not last forever.
- Discuss the positive and negative aspects of using coal as an energy source to generate electricity.
- Ask pupils to suggest more environmentally friendly ways to generate electricity.
- Explain that current electricity can be generated by converting various types of energy into electrical energy. Discuss the examples on pages 118 and 119 of the Pupil's Book.

The national electricity grid

- Make sure pupils understand what the national electricity grid is.
- Pupils can work in groups to each construct from cardboard a component of the electricity grid. Their products could be displayed in the class to show how the components are linked.

Conductors and non-conductors

- Demonstrate conductivity by using examples of conductors and non-conductors in the circuit boards. Use coins, pencil leads, jewellery, teaspoon, etc.
- Study the table on page 120 and add suggestions by pupils.

Exercise 1 PB page 121

Suggested answers

1. It is an electrical cord conducting the electricity from the wall socket to the element of the kettle to heat the water inside the kettle.
2. The container, lid and handle are made of plastic. The element is made of metal. The cord consists of copper on the inside and plastic on the outside.
3. The plastic is a non-conductor and prevents the user from burning. The metal is a good conductor to make the water boil quickly. Copper is a good conductor of electricity, and plastic isolates each wire to avoid electrical shocks.

Electric circuits

- Read the information on page 121 of the Pupil's Book as a class.
- Repeat the key circuit terminology often while demonstrating or assisting pupils. It is important that they hear and use the correct terminology as often as possible.
- Engage the pupils at all times while assembling a circuit. Ensure that they understand the purpose of the components.

- Draw a diagram on the board to illustrate the different components.
- Pupils work in pairs to build their own electric circuit and test it.
- Pupils can experiment with two or more batteries, adding a switch and more light bulbs to see the effect.
- Guide pupils through Activity 3 on page 122 of the Pupil's Book, to create an electromagnet and magnetic field.
- After Activities 2 and 3, discuss the uses of electricity by looking at the diagram on page 123 of the Pupil's Book.

Activity 2 PB pages 121–122

Suggested answers

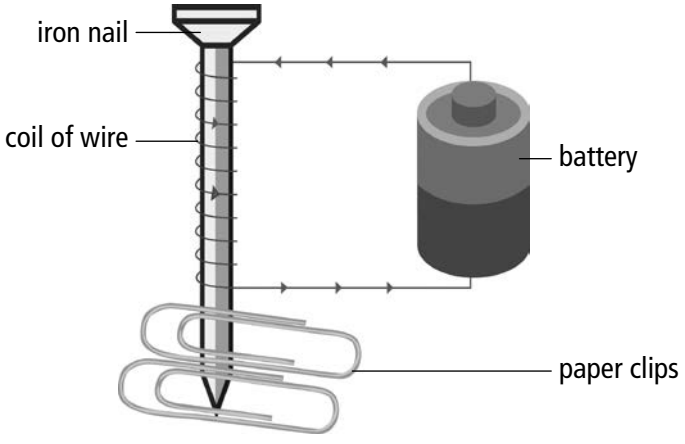
1. Bulb lights up. The circuit was completed enabling the electric current to flow from the battery to the light bulb.
2. The light goes out. The electric current and flow was interrupted. The energy is still there but without a conductor it cannot reach the destination.
3. The arrows show the direction and path of the flow of electrons (current).
4. The battery will lose its energy until it runs out.

Activity 3 PB pages 122–123

- Guide pupils through the activity to create an electromagnet and magnetic field.

Workbook answers WB page 86

1. **Static** electricity is generated when two objects are rubbed together. The **friction** creates an electric **charge** that stays in the same place. Electricity moving from one place to another is called **current** electricity. The particles carrying the electricity are called **electrons**.
2. a) wind turbines (wind energy); b) solar panels (sun); c) coal (fossil fuel); d) car battery (chemical energy); e) heat from inside the Earth (geothermal energy); f) fast-moving water from a waterfall
3. A copper wire is coiled around a metal nail and the ends connected to the positive and negative terminal of a battery. The battery makes electrons move through the wire which magnetises the nail.



4. a) conductor.

b) conductor.
c) non-conductor/insulator.
d) non-conductor/insulator.
e) conductor.
f) conductor.

Remedial

Ask pupils to work in groups to build their own versions of circuit boards. The idea is to let them experiment with various ways to connect the wires and to solve problems as they occur.

Topic 7 Magnetism

Performance objectives

Pupils should be able to:
- state the characteristics (properties) of magnets
- group materials into magnetic and non-magnetic
- state common applications of magnetism
- make and use magnets.

Additional resources

- Pupil's Book pages 124–133
- Workbook pages 88–97

Teaching the lesson

What is magnetism?

- This section requires experiments to be carried out in order to learn about magnets and their properties. Make sure that the equipment and materials needed for all these activities are available and adequate (e.g. various types of magnets, iron filings, nails, coins and various other objects).
- It is better educationally if the pupils conduct the experiments themselves and record the results. However, if resources are limited, help them to conduct the experiments.

Activities 1–3 PB pages 124–127

- In Activity 1, pupils experiment with a variety of objects to establish which are magnetic and which are not. They must draw a table, like the one shown on page 124 of the Pupil's Book, to record their results.
- In Activity 2, pupils test the properties of magnets by sprinkling iron filings on a sheet of paper placed over a bar magnet. They should record that the filings make a definite pattern around the magnet.
- In Activity 3, pupils observe what happens when they put the ends of the magnets together. They will find that unlike poles attract and like poles repel.
- Ask pupils to do Activity 4 on Pupil's Book page 128 by discussing and defining the terms in the table as a class.

Activity 4 PB page 128

Suggested answers

1. Magnet – an object that repels or attracts another object.
   Attract – draw towards something.
   Repel – push an object away.
   Magnetic pole – the area where a magnet's force is the strongest.
   Magnetic object – something that is attracted to a magnet.
   Force – energy that can cause something to be pushed or pulled.
   Demagnetise – to take away the magnetic ability of a magnet.
   Compass – an instrument with a needle that points north and is used to determine directions.
2. 1. True.
   2. False; the pole is the strongest point on a magnet.
   3. True.
   4. False; a magnetic pole is the end of a magnet.
   5. True.
   6. False; when two magnets attract they stick together.
   7. True.

Activity 5 PB page 129

Suggested answers

a) Round magnet: poles around the edges.
b) Horseshoe magnet: poles at end.
c) Bar magnet: same poles at ends push apart.
d) Bar magnet: different poles at ends attract.

Activity 6 PB page 129

Suggested answers

4. All the iron filings are attracted to the magnet, forming around the pole.
6. The iron filings gather around each pole but do not join up as they are pushed away.
7. The filings form a pattern where they are linked in magnetic lines.

Activities 7–9 PB pages 130–133

- In Activity 7, pupils observe what happens to a magnet that is allowed to swing freely. They will find that the magnet always settles in a north/south direction.
- In Activity 8, pupils make a magnet.

Suggested answers

8. a) Yes.
   b) It repels the south pole of the compass needle. The end of the needle where the magnetic pole was lifted has a polarity opposite to that of the pole used for stroking.
   c) X will be south.

- In Activity 9, pupils make a magnet with electricity. Ensure that all resources are available.
- When doing these activities, make sure they follow the instructions carefully.

Workbook answers WB pages 88–97

There are a range of fun and interesting activities in the Workbook. It is best that pupils work in pairs or small groups for these. Ensure that they have all the equipment and resources they need for these experiments/activities ahead of time. Some can be done as homework assignments or as projects.

Magnets at home

Answers will vary, depending on the home.

Make a metal detector

Divide the class into groups and ensure that the requirements are available.

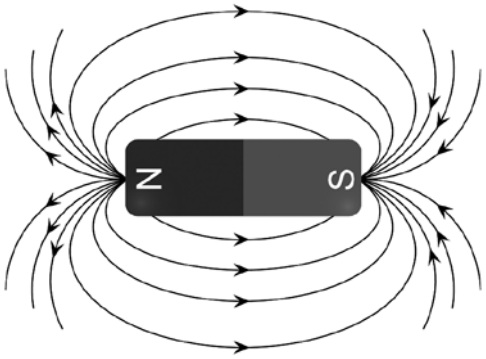
Is it true?

1. True.
2. False; the pole is the strongest point on a magnet.
3. True.
4. False; a magnetic pole is the end of a magnet.
5. True.
6. False; when two magnets attract, they stick together.
7. True.

Fun activities

Divide the class into groups and ensure that the requirements for the various fun activities are available.

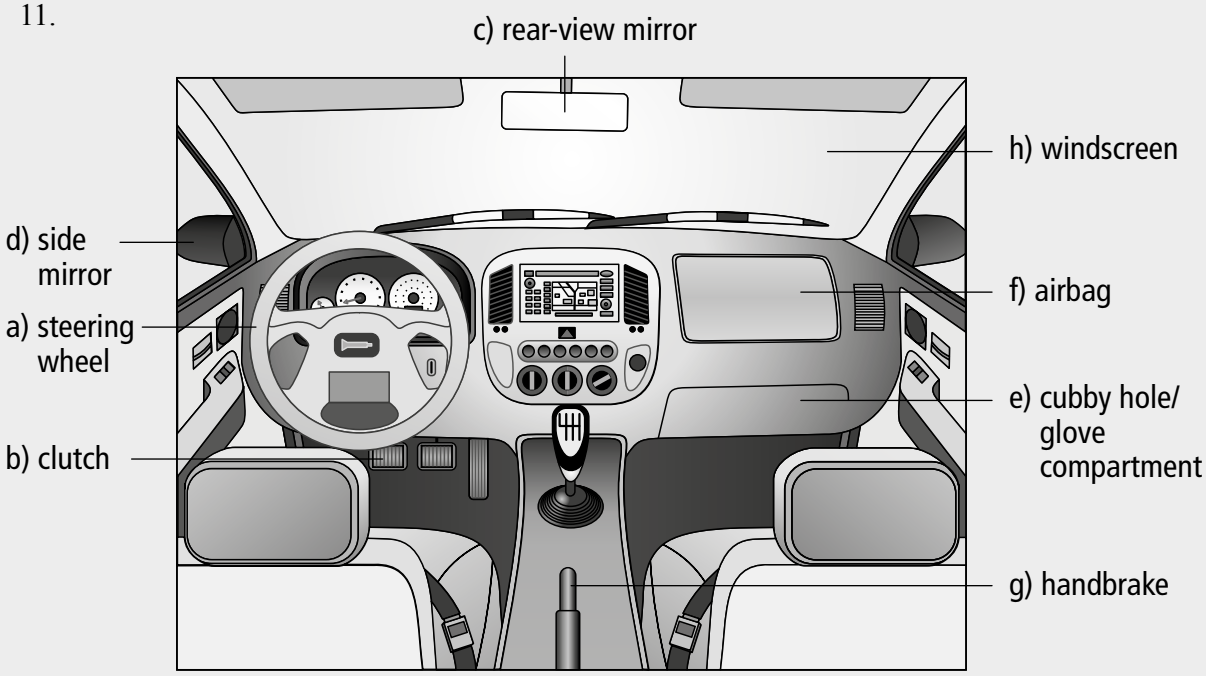
Questions about magnetism

1. An object that attracts or repels another object.
2. Metal paper clips, nails, metal teaspoon.
3. Erasers, plastic cup, paper.
4. The space around a magnet where the force of magnetism acts is the magnetic field.
5. At the end (poles).
6. Poles.
7. Repel; attract.
8. Accept any appropriate answers. Examples: Lid opening can opener, refrigerator door, magnetic conveyor belts, magnetic sweeper, magnetic toys.
9. Magnetising a knitting needle with a magnet; using electricity.
10. 

A diagram showing the magnetic field around a bar magnet

Assessment: Answers PB pages 139–142

1. Material is the matter or substance from which a thing can be made. (2)
2. metal, wood, plastic, glass. (4)
3. a) wood; b) brass; c) plastic; d) glass. (4)
4. a – wooden spoon, b – cardboard box, and c – paper bag. (4)
5. To maintain something means to protect and preserve objects so that they last as long as possible. (2)
6. Any two of the following: wax polishing; varnishing; painting. (2)
7. Matt is a clear, non-shiny finish and gloss is a shiny finish. (2)
8. Any two: Wipe silver down with a soft cloth; use supermarket cleaners for silver; use a paste of baking soda and water; use a paste of banana peel and water. (2)
9. Silver: Rub a paste made with banana peel and water onto the object with a soft cloth and then rinse.
   Gold: Liquid detergent and warm water or vinegar water.
   Copper: Rub cut lemons on the object, wash off and dry with a soft cloth. (3)
10. Ferrous metals contain iron, e.g. steel; non-ferrous metals do not, e.g. aluminium. (4)
11.



Part of the car	Use
a) Steering wheel	Changes the direction of the car
b) Clutch	When you depress/push down on this pedal you can change gears
c) Rear-view mirror	Helps you see the cars behind you
d) Side mirror	Exterior mirror on the side to see what is approaching from the side
e) Cubby hole/glove compartment	Compartment on the dashboard to store small items such as dark glasses and gloves

Part of the car	Use
f) Airbag	Protect you from being injured by the interior of the car in an accident
g) Handbrake	Brings the car to a stop in an emergency or on a hill to prevent it from rolling
h) Windscreen	A plate of specially treated glass through which you can see the road

(16)

12. When measuring a straight line you would use a ruler. You use a compass to draw circles and arcs of circles. If you need to measure and angle of 120° you would use a protractor. (4)
13. a) Eating: Chemical energy is converted into heat and kinetic energy. The food you eat contains chemical energy, which is changed by chemical reactions in your body to provide
    body heat and energy to work. (4)
    b) Mixer: Electrical energy is converted into mechanical energy. (4)
    c) Toaster: Electrical energy is converted into heat energy. (4)
14. Wood can create heat because when wood is set on fire, a chemical reaction takes place that produces heat. Chemical energy is converted into heat energy. (4)
15. Energy cannot be created out of nothing, but it can be transferred from one form of energy to another. (2)
16. a) The metric unit used to measure temperature in Nigeria is °Celsius.
    b) A thermometer is an instrument used to measure temperature.
    c) The boiling point of water at sea level is 212 °F.
    d) The unit used to measure heat is called calories.
    e) The process through which heat is transferred from the Sun to your skin is called radiation. (6)
17. Accept any appropriate examples. (2)
18. Alcohol is sensitive to changes in heat. It expands when heated and the only place for it to go is up into the thin, hollow space inside the glass tube. (2)
19. a) False, the plastic is to protect people from electric shocks. It is a non-conductor of electricity (insulator).
    b) False, it is a secondary source. The primary sources are, e.g. fossil fuels and other natural resources used to generate electricity.
    c) True.
    d) False. Static electricity only lasts until the balance between the positive and negative electrons has been restored. Current electricity is much stronger and can be transported great distances without diminishing.
    e) True.
    f) True. (6)
20. a) Copper, iron, steel.
    b) Wood, lead, glass. (6)
21. When it can attract and repel other substances. (1)
22. At either end of the magnet. (1)
23. South. (1)
24. Neither; they are equal in strength. (1)
25. • Magnets are used for devices such as compasses, telephones, telegraph equipment, loudspeakers, electrical measuring instruments and magnetic sweepers.
    • Doctors use strong magnets to remove pieces of steel from people's eyes.
    • Some refrigerator doors have magnets in the rubber strip to keep the door firmly closed.

- A large variety of magnets are used to secure articles to iron and steel in the home, office or classroom.
- Some screwdrivers are magnetised to pick up or hold iron or steel screws while they are being screwed in. (5)

26. a) Compass, for navigation, to find direction.
    b) Picking up screws, nails or pieces of metal.
    c) Removing steel from a person's eye. (3)
27. There is a magnetic strip in the note that attracts the magnet. (2)
28. Yes. Using the north pole of the magnet, start in the middle and stroke 50 times outwards towards the eye. Then start in the middle again and stroke 50 times outwards towards the point of the needle. (4)

Total: 107

THEME 3 Physical and Health Education

Sub-theme 1 Basic movements

Topic 1 Creating rhythmic activities and measuring physical fitness

Performance objectives

Pupils should be able to:
- explain rhythmic activities
- mention any two types of rhythmic activities
- perform any two types of rhythmic activities
- mention some physical fitness components
- identify activities for measuring endurance, strength and speed
- explain how endurance and speed are measured
- measure their endurance, strength and speed levels.

Additional resources

- Pupil's Book pages 143–151
- Workbook pages 98–100

Teaching the lesson

Creating rhythmic activities

Explain to pupils how rhythm adds fun to physical activities. It also keeps you fit. The pupils need to be aware that fitness can come from fun activities.

Activity 1 PB page 144

1. The pupils will choose any four of the movements and respond to the whistle. They need to listen carefully and then change into the movement.
2. The pupils will then get into groups of four and practise their movements with music. Encourage them to make interesting rhythmic sequences.
3. Once each group has mastered their movements, they will demonstrate it to the rest of the class.

Activity 2 PB page 144

Demonstrate different tempos to the pupils. Play some music and get the pupils to decide if the tempo is quick or slow. Choose songs that change tempo so they can distinguish the different tempos.

1. Play music with different tempos for the pupils. They can start with galloping like a horse. When the tempo increases they gallop faster; if it is a medium tempo they gallop at a

normal speed; and when it is slow they gallop slowly. Think of other movements such as marching, skipping, etc.
2. Get the pupils to put together three different movements. They should practise them first and then they can perform them to the different tempos.
3. At the end of the lesson, slow the music down and let the pupils move freely in self-expression.

Measuring physical fitness

- Read the paragraphs on page 145 of the Pupil's Book about stamina and fitness. Encourage the pupils to exercise, as an awareness of staying healthy should start early in life.
- Demonstrate the different steps in the measuring of pulse rate to the class.
- Let the pupils practise doing this with a partner. Check that they are following the steps.
- Ask them to record their pulse rate once a week and record it in their exercise books. They can measure their pulse rate before exercising and during or after exercising.

Press-ups

Explain to the pupils that you have to build up stamina slowly by repeating exercises and doing them every day will help. Press-ups are difficult to do if you do not have upper-arm and upper-body strength.

Activity 3 PB page 146

1. Ask two pupils to demonstrate the game first. One person is the wheelbarrow and the other one will be the person pushing the wheelbarrow. The one who is the wheelbarrow has to move forward by moving one hand in front of the other and keeping their body straight as a plank. The other person slowly pushes the "wheelbarrow" forward. Once they have watched the demonstration, the pupils will get into pairs to do the activity. Make sure they all get a chance to be the wheelbarrow.
2. Once the pupils have developed their stamina they can try to do press-ups. Read through the instructions with the pupils and see if they can follow them.
3. When the pupils have finished their press-ups they can measure and record their pulse rate.

Minute run

Read through the instructions with the pupils. Remember that each exercise can be repeated every time you take the pupils outside to exercise.

Activity 4 PB page 147

1. Each time you do the minute run with the pupils choose a different pupil to run up front. They must start off slowly and not run too fast and away from the rest of the class. This is a good warming-up exercise.
2. Some of the pupils can then go off on their own and run the minute run. The slower or less fit pupils can continue to play follow my lead. This time they can change to skipping or galloping.
3. At the end of the lesson they can all attempt the run.

Walk-bench step-on step-off

Make sure you have blocks or a bench for stepping on, or a set of steps that the pupils can use. This exercise strengthens the legs.

Activity 5 PB page 147

1. Demonstrate how pupils should put their right foot on the bench or block. The heel of the right foot must press down and then they bring up the left foot. When both feet are on the bench, step down with the right foot. When you demonstrate this activity, do it slowly at first but keep moving. Then do it a bit faster once you have the rhythm.
2. Then ask them to change the first step around and start with the left foot.
3. Divide the pupils in groups to do the exercise. You could play some music so that they can get a rhythm going.
4. Once they have ended the exercise they can record their pulse rate.

Squat thrust

- The pupils have to be fit to do the squat thrust. Therefore, their fitness has to be built up first. This exercise requires five steps that must be done properly. Demonstrate it to the pupils or ask an older pupil to demonstrate the exercise as it is a difficult one.
- Read through the steps with the pupils before and after the demonstration.

Activity 6 PB page 148

1. Let the pupils work with a partner so that they can check that they are doing the exercise properly.
2. Once they have mastered the exercise, they can time each other, but they must make sure that they do all the steps.

Strength: pull-ups and sit-ups

- The two different exercises strengthen the upper body and arms.
- Read through the three steps for doing pull-ups with the pupils.
- Encourage the pupils to do stretching exercise before attempting a pull-up.
- Demonstrate a pull-up so the pupils have a good idea how to do it. Make sure that the pull-up bar is low enough for the age group you are working with, as the pupils have to lift themselves into the air.
- There are a number of different ways to do sit-ups, but the easiest one for younger pupils is to do it with a partner. Read through the five steps and then ask two pupils to demonstrate the sit-up.
- Encourage pupils to continue building up their stamina.

Activity 7 PB page 149

1. The pupils will time how long they can keep their chin above the bar. Each pupil can time their partner with the stopwatch.
2. They will then work in pairs and set the stop watch for 10 seconds. They need to see how many pull-ups they can do in this time.

Activity 8 PB page 150

Divide the pupils into two groups so that the two different activities are happening at the same time. Half the class will do pull-ups and the other half will do sit-ups. Ask the two groups to work in pairs. They do the exercises with their partners, assisting each other as needed, and then swap places. Once everyone in the groups has had a chance, they can swap exercises.

Speed: 50 m dash

- Let the pupils do stretching and warming-up exercises before they do the 50 m dash.
- Explain to the pupils that the race is over 50 metres, and that they will have to run as fast as they can.
- Read through the paragraphs on pages 150 and 151 of the Pupil's Book with the pupils. It is important that they know how to start the race, run the race and finish the race.
- Read through the safety tips.

Exercise 1 PB page 151

Suggested answers

1. Any four:
   - You need to sprint all the way when running the 50 m dash.
   - Always run your race in your lane.
   - Get in the crouching position at the start of the race.
   - Lean forward and start running as soon as the gun or whistle goes off.
   - Move your arms and lift your knees.
   - Put on an extra spurt to run as fast as possible across the finish line.
2. Any two:
   - Stretching and warming up before any exercise is very important as it helps you do the exercise properly and stops you from getting cramps.
   - Listen to your teacher. This is important so you know what you have to do.
   - Eat healthy food and drink plenty of water. Healthy food gives you stamina and drinking water stops you from dehydrating.
3. Let the pupils run the 50 m dash. Read the instructions on how to run the race with them. Time them each week and see by how much they improve from week to week.

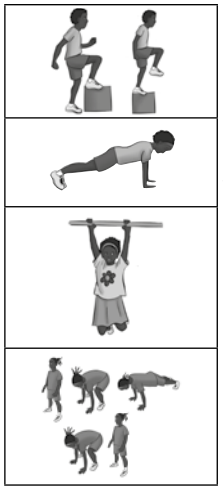
Workbook answers WB pages 98–100

Rhythmic activities

1. Play pieces of music with a different beat and tempo, and encourage pupils to perform different movements to the different beats. Do the different activities with the pupils.
2. Pupils' answers will vary. For example: You can do some movements in sequence to the music, you can move like different things in nature – sway like a tree, etc.

Measuring physical fitness

1.



a) Pull-ups are for strengthening your upper torso.

b) A squat thrust builds strength in the lower body. It will also improve your hip movements and endurance and stamina.

c) Press-ups start from a plank position, with your hands placed firmly on the ground under your shoulders.

d) You do the walk-bench step-on step-off when you step up onto the bench and then step down. When you do it a number of times, you are building up your stamina.

2. Any three of the following:
   - You have to sprint all the way.
   - You have to run the race in your own lane.
   - Go down into a crouching position and when the gun or whistle goes off you will lean forward and move into the upright position.
   - You need to lift your knees and move your arms. You need to keep swinging your arms when running.
   - When the finish line is just ahead of you, you must put in that extra spurt of energy and throw yourself across the finish line.
3. Pupils draw someone taking a pulse (the illustrations will vary). Accept any accurate drawing. (See Pupil's Book page 145.)
4. a) True.
   b) False.
   c) False.
   d) True.
   e) False.

Sub-theme 2 Athletics

Topic 2 Field events

Performance objectives

Pupils should be able to:
- mention the basic skills of long jump
- perform the basic skills of long jump
- mention the basic skills of high jump
- perform the basic skills of high jump.

Additional resources

- Pupil's Book pages 152–157
- Workbook pages 101–102

Teaching the lesson

Long jump

- Build on knowledge gained in Grade 4 about the long jump.
- Read through the first paragraph about long jump on page 152 of the Pupil's Book with the pupils.
- Then talk about the five different steps to long jump: the run-up, the take-off, the flight, the landing and the recovery. Discuss these five steps with the pupils.
- Discuss the basic skills needed for the run-up, take-off, flight, landing and recovery with reference to the Pupil's Book.
- Demonstrate or have older pupils demonstrate the different skills at the long jump pit.
- Demonstrate simple exercises they could use to improve their speed and jumping power.
- Show videos of competitive long jumpers and discuss the different stages of the jump.

Activity 1 PB page 154

- Do this activity outside to build the pupils' confidence and skills in this event and repeat it a few times.
- Take the pupils outside, read over the method and demonstrate the steps slowly.

High jump

- Give a recap of the techniques they have learned about in Grade 4.
- Discuss the scissor jump that the pupils did when they were younger, but encourage them to try the Fosbury flop.
- This book focuses on the Fosbury flop.
- High jump can be dangerous, so make sure that the pupils are supervised at all times. Always have a first aid kit with you on the field.
- Read through the different steps of the Fosbury flop: run-up, take-off, flight, landing and recovery.
- Discuss the run-up, determining the starting point of the run-up, the take-off, flight, landing and recovery.

Activity 2 PB page 157

- This is a practice activity to build confidence.
- Have other adults attend, to monitor the safety of the athletes.
- Demonstrate the technique in sections and have pupils repeat it.
- Replace the bar with a long piece of elastic. Before the pupils jump over the bar, let them try it with the elastic.
- Go through the 11 steps one at a time until they have mastered the jump.

Extension

Do individual research on long-jump and high-jump techniques.

Remedial

- Complete pages 101 and 102 in the Workbook.
- Give a recap of the rules of long jump and high jump.

Workbook answers WB pages 101–102

Long jump

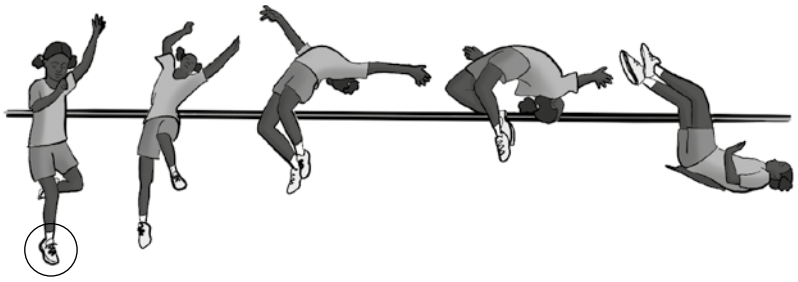
1.

Take-off | Flight | Flight | Landing

2. Any two of the following:
   - Measure out the strides of the run-up from the board back to starting point.
   - When you try it out, do not lengthen or shorten your strides, rather lengthen or shorten the run-up.
   - Focus on the end of the pit instead of the springboard.
3. The arms are up to help to gain height while keeping your balance in flight and on landing; and then the arms are brought forward to propel the body forward.
4. Do not let any part of your body touch the area behind where you have landed and do not leave the pit at any place other than the far end.

High jump

1. Accept any drawing clearly showing: the starting point, J-curve and take-off distance from the first upright and crossbar (approximately ½ metre from both)
2. a) The take-off is done from the dominant foot, furthest from the crossbar.



   b) Flinging her arms up; dropping her head more to face backwards.
   c) Crossing the arms over the chest and pulling feet up to clear the bar.
   d) Three times.
   e) Speed and jumping power.

Sub-theme 3 Games and sports

Topic 3 Ball games

Performance objectives

Pupils should be able to:
- define ball games
- state the facilities and equipment needed to play ball games
- play ball games
- state the advantages of playing ball games
- use safety measures when playing ball games.

Additional resources

- Pupil's Book pages 158–163
- Workbook pages 103–107
- A display of various equipment for ball games, including equipment to play field hockey.

Teaching the lesson

- Any activity that is played with a ball is called a ball game.

- Discuss the ball games such as volleyball, basketball, football, hockey and tennis.
- See if the pupils can identify any other ball games.
- Distinguish between other types of sports and ball games.
- Ask pupils about their favourite sports.
- Discuss Nigeria's favourite ball games. Ask pupils to identify the games shown in each picture on Pupil's Book page 158.

Equipment and facilities needed

- Discuss the various sports pupils play. Identify the equipment needed for the different types of sport and draw pupils' attention to the importance of safety in sport.
- It is important to have the correct equipment for all sports activities. Discuss the equipment with the pupils.
- Create a corner of interest/display by asking pupils to bring in their favourite sporting equipment and attire.

Activity 1 PB page 159

Suggested answers

1. A: Volleyball
   B: Basketball
   C: Football/soccer
   D: Hockey
   E: Tennis
2. • Volleyball: court, whistle, poles, net.
   • Basketball: court, backboard, shot clock, net.
   • Football: shin guards, football, goal posts, whistle, goal keeper gloves.
   • Hockey: court, hockey stick, whistle, goal keeper, gloves, mouth guards, helmets, chest protector, net.
   • Tennis: racket, tennis ball, court, whistle and net.
3. The pupils will have to research these answers for the male as well as female sport teams.
4. Pupils can create an individual or group poster to advertise a match being played for a sport of their choice. Ensure they include details of the teams playing and the time and venue of the match.

Ball skills

- Pupils discuss different ball games and the skills and equipment needed to play each of the games.
- Read the interesting facts about a referee and umpire to the pupils.

Activity 2 PB pages 159–160

Suggested answers

1 and 2. A: Netball; B: Tennis; C: Basketball; D: Volleyball; E: Hockey; F: Football/soccer.

3. A: Netball: netball, poles and net, court, referee.
   B: Tennis: tennis racket and ball, court, poles and net and umpire.
   C: Basketball: basketball, court, hoop and backboard and referee.
   D: Volleyball: volleyball, poles and net, court and referee.
   E: Hockey: hockey stick, field or court, hockey ball, net, shin guard and mouth guard, protective gear for goal keeper, and umpire.

F: Football/soccer: football, field, nets, referee, goal keeper with protective gear.

4. A: Two pupils doing a high pass; jump shoot.
   B: Serving the ball at the start of the game.
   C: One player is bouncing the ball and the other player is trying to defend: bounce pass.
   D: The volleyball player is about to hit the ball over the net; dig.
   E: The hockey player is about to hit the hockey ball – it could be a corner shot.
   F: The football player is dribbling; ready to kick the ball.

5 and 6. Pupils discuss the skills and safety equipment needed to play the various games.

Exercise 1 PB page 161

Suggested answers

	Skills					Which sport?
1.	chest pass	bounce pass	dribble	shoot	jump shoot	Basketball
2.	kick	dribble	trap	head	save	Football
3.	serve	follow through	drive	forehand stroke	backhand stroke	Tennis
4.	set	volley	block	spike	dig	Volleyball

Field hockey

- Read through the paragraphs with the pupils and discuss the game. Look at the illustration of the hockey field on Pupil's Book page 161 and discuss how many players are needed.

Safety

- Hockey is a fast game and it can be dangerous if the hockey sticks are not controlled properly.
- It is important to have safety rules and the pupils must aware of the rules. Read through the safety rules.

Activity 3 PB page 162

Suggested answers

1. Explain how hockey is played and watch a video with the pupils. Then demonstrate the different activities: dribble, pass, and drive. Also demonstrate how to hold the hockey stick.
2. Divide the pupils into teams of 11 and get them to play a game.

Advantage of playing ball games

Read through the different advantages of ball games on page 162 of the Pupil's Book. Explain why staying healthy is very important.

Safety in sport

- Discuss how all sports need safety rules to keep all the players safe. Read through the safety rules with the pupils and then study the picture on Pupil's Book page 163.
- Let pupils have a group discussion on the importance of the basic safety equipment used in sports.

Activity 4 PB page 163

Discuss all the protective equipment in the illustration. All parts of the body have to be protected if you are the goal keeper. The ball is hard and there are hockey sticks that might hit the keeper. The ball and the players are fast moving.

Suggested answers

- Football/soccer: shin guards, cleats and a mouth guard.
- Baseball and softball: a batting helmet with face mask, cleats, mouth guard, elbow guards and cup (for boys). Catchers should also wear a helmet, face mask, throat guard, long-model chest protector and shin guards.
- Basketball: basketball shoes with good ankle support, and a mouth guard.
- Volleyball: knee pads, a mouth guard and lightweight shoes with strong ankle and arch support.
- Field hockey: shin guards and mouth guards are required, as are helmets. A face mask will also protect against facial injuries.

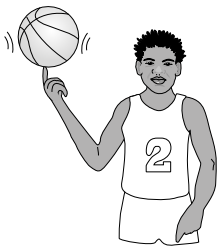
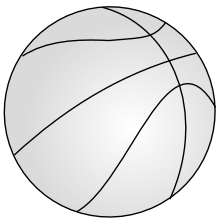
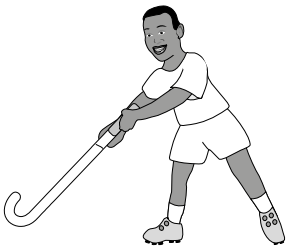
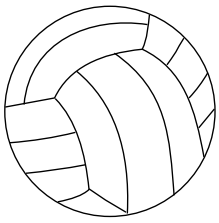
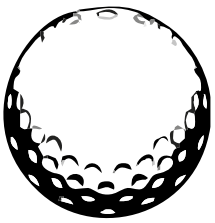
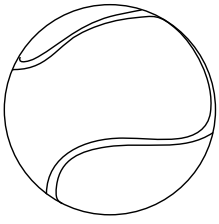
Workbook answers WB pages 103–107

Equipment and facilities needed

1.

Football	ball whistle **umpire** referee shin pads
Tennis	racket court ball umpire **mouth guard**
Volleyball	**umpire** ball **shin pads** net poles
Basketball	backboard referee ball **helmets** **bat**
Hockey	shin pads stick whistle ball umpire

2.

Player	Ball
	
	
	
	
	

Revision of ball skills

A: netball: block, shoot (any one).
B: tennis: serve, set (any one).
C: basketball: dribble.
D: volleyball: follow through, volley, dig (any one).
E: hockey: dribble.
F: football: shoot, kick (any one).

Field hockey

Field hockey is a ball game played with eleven players on each team. It is played with a wooden hockey stick and hockey ball on a rectangular court. Goals can only be scored when the ball is in the shooting circle. Players need to wear shin pads and mouth guards for protection.

Word search

S	A	S	H	O	O	T	I	N	G
D	B	A	L	L	I	H	X	I	E
E	L	E	V	E	N	R	E	K	B
S	T	W	O	O	D	E	N	C	X
X	F	V	A	S	H	I	N	O	N
I	E	G	N	I	T	A	O	B	O
N	M	O	U	T	H	D	C	Z	S
A	B	B	C	O	U	R	T	Z	M
H	O	C	K	E	Y	N	K	U	Y
W	A	U	M	P	I	R	E	G	D

Safety in sport

- Football: shin guards, cleats, mouth guard.
- Volleyball: knee pads, mouth guard, lightweight shoes with strong ankle and arch support.
- Tennis: tennis shoes.
- Basketball: basketball shoes with good ankle support, mouth guard.
- Field hockey: shin guards, mouth guards, helmets, face mask.

Sub-theme 4 Health education

Topic 4 Nutrition

Performance objectives

Pupils should be able to:
- mention sources of food nutrients
- list three nutritional diseases
- describe the characteristics of nutritionally deficient persons
- describe the effect of family size on nutrition.

Additional resources

- Pupil's Book pages 164–177
- Workbook pages 108–114
- Requirements and equipment for the Activity 1 tests, e.g. orange juice, banana, bread, milk, egg white, butter or margarine, a breakfast cereal, baby food, iodine solution, saucer, absolute ethanol, test tube.

Teaching the lesson

Refer to Pupil's Book page 164 and explain why humans need food. Discuss the reasons as listed.

Sources of food nutrition

- Work with the class through the theoretical information on the various types of organic substances, and which foods contain them. Explain the functions of the different food groups.
- Do Activity 1 on Pupil's Book page 166 as a demonstration or oversee while pupils conduct the experiments in pairs or groups. Discuss the results with the pupils.
- Then work through the information on the types of inorganic substances and their sources. Explain their importance and functions.

Activity 1 PB page 166

You can try this test on a variety of foods, such as orange juice, banana, bread, milk, egg white, butter or margarine, a breakfast cereal and baby food.

Starch

1. Obtain a small quantity of the foods that were mentioned. (You may use any other example of food as well). It can be in liquid or solid form. If the food is solid, it must be chopped finely or crushed with a pestle and mortar.
2. Put each food in turn onto a white tile. Cover it with a diluted iodine solution. The solution is brown. If there is starch in the food, it will turn very dark blue – almost black. Record each result as you go along.
3. Draw up a results chart. It should have spaces for the name of the food being tested, the colour it turns, and what you can conclude from this.

Food type	Colour change	What you can conclude

Fat

1. Pour about 1 cm² of absolute ethanol into a test tube.
2. Obtain a small quantity of the foods that were mentioned. (You may use any other example of food as well). It can be in liquid or solid form. If the food is solid, it must be chopped finely or crushed in a pestle and mortar. Add a small amount of the food to the ethanol.
3. Shake the test tube.
4. Add about 1 cm² of water to the test tube. If a cloudy white precipitate develops, fat is present.
5. Repeat these steps for each food you want to test. Record the results as you go along in a table as above.

Simple test for fat: You can rub the food onto a piece of filter paper. Hold the paper in front of a light so that light shines through it. If the food has left a translucent mark on the paper, fat is present.

Food type	Translucent mark or not	Contains fat or not

Inorganic substances

Work with the class through the theoretical information on minerals on pages 168 and 169 of the Pupil's Book, and explain its importance, sources and functions. Emphasise the importance of water for our bodies.

What is a balanced diet?

- Work with the class through the theoretical information on the components of a balanced diet on pages 169 and 170 of the Pupil's Book and make sure pupils understand the relative importance of all the food groups.
- Have some food examples at hand and ask pupils to say how important they are in their diet.
- Make sure they understand how the food pyramid works.
- Let pupils discuss Activity 2 in pairs. They look at each group of pictures, write down what food group is shown and say which picture in the group does not belong to that food group.

Activity 2 PB page 171

Suggested answers

1. a) Fruits.
   b) Milk products.
   c) Vegetables.
   d) Meat products.
   e) Bread and cereals.
2. a) Sweet.
   b) All these foods belong to the milk products food group.

c) Cake.
d) Pear.
e) Tomato.

Exercise 1 PB page 171

Suggested answers

1. a) Bananas.
   b) Eggs.
2. Nuts or Bananas.
3. Cellulose provides the body with roughage. The main job of roughage is to help prevent constipation.

Remedial

Recap on:
- the meaning of a balanced diet
- name the different food groups
- understand how a food pyramid works.

An unbalanced diet

Explain the different types of malnutrition and what the consequences of each are. Show pictures, if possible, of the various types of malnutrition.

Exercise 2 PB page 173

Suggested answers

	Kwashiorkor	Marasmus
1. Explanation	Growing children who have a lack of protein in their diet can develop a disease called kwashiorkor.	Starvation is a serious disease that can occur when a person does not get enough food to eat and does not get the energy they need. Starvation is called marasmus.
2. Symptoms	• Colour and texture change in skin and hair (a rust colour) • Swelling of ankles, feet and belly • A damaged immune system, which can lead to more frequent and severe infections • Irritability • A flaky rash • Shock • Fatigue • Diarrhoea • Loss of muscle mass	A child will have a small body, a large head, thin limbs and a swollen belly.

	Kwashiorkor	Marasmus
3. Treatment	Kwashiorkor can be corrected by eating more protein and more calories overall. The calories should be increased slowly because the person has been without proper nutrition for a long period.	Treatment for marasmus should take place in a clinic or hospital. This is because the fluid levels in the body must be raised (the patient is put on a drip). The patient is then gradually reintroduced to food.
4. People at risk	Kwashiorkor is often seen in regions experiencing famine caused by natural disasters, such as droughts and floods or political unrest. A lack of nutritional knowledge and regional dependence on low-protein diets, such as maize-based diets, also cause people to develop this condition.	Marasmus is common in children; it is often seen in regions experiencing famine caused by natural disasters, such as droughts and floods or political unrest.

Deficiency diseases

- Discuss the meaning a deficiency. Explain the different types of deficiency diseases and what the consequences of each are. Show pictures, if possible, of the various types of deficiency diseases and its symptoms.
- Emphasise the ways in which these deficiencies can be prevented.

Exercise 3 PB page 177

Suggested answers

	Rickets	Scurvy	Pellagra
Affects which part(s) of the body?	Bones	Several bodily structures and processes	Digestive system, skin, and nerves
A deficiency of what in the body?	A deficiency of vitamin D, calcium or phosphate	A severe vitamin C deficiency	A deficiency of vitamin B3
Can be prevented by what?	Vitamin D is essential for the normal formation of bones and teeth and necessary for the appropriate absorption of calcium and phosphorus from the gut	Consuming enough vitamin C, either in the diet or as a supplement. (Foods that contain vitamin C include oranges, lemons, papaya, tomatoes and vegetables such as carrots, potatoes, cabbage and spinach.)	Consuming enough green vegetables, seafood, meat and eggs. No smoking and no drinking of alcohol.

	Rickets	Scurvy	Pellagra
Symptoms?	• Bone pain or tenderness • Decreased muscle strength	• Anaemia (when the blood lacks enough red blood cells to carry oxygen to the different parts of the body) • Red, soft and tender gums that bleed easily • Bleeding under the skin • Large areas of reddish blue to black bruising, often on the legs and feet	• Fatigue • Anxiety • Mental confusion and lack of coordination • A high sensitivity to sunlight
		• Tooth decay • Tender, swollen joints • Shortness of breath and chest pains • Eye dryness, irritation, and blood in the whites of the eyes • Light sensitivity and blurred vision • Mood swings, often irritability and depression	
Signs?	• Dental deformities and delayed formation of teeth • Predisposition to infections • Impaired growth – short stature • A number of skeletal deformities, including abnormally shaped skull, bowlegs, rib-cage abnormalities, and breastbone, pelvic and spinal deformities • involuntary muscle contractions or seizures	• Weakness • Unexplained exhaustion • Reduced appetite • Irritability • Aching legs • Low-grade fever	• Dermatitis and hair loss • Swelling of body parts • Tongue inflammation • Dementia

Over-nutrition

- Briefly discuss the dangers of obesity and eating too much energy-rich foods.
- Approach all these topics with sensitivity.

Family size and its effect on nutrition

- Facilitate a class discussion on the possible effects of family size on nutrition and health in a family. Emphasise that there could also be some advantages to a large family.

Extension

Let pupils do the fruit salad logic puzzle on Workbook page 114. Let pupils discuss the clues with a partner. Then they can complete the table in their exercise books. Help explain the reason for the answers to pupils who struggle to work it out.

Workbook answers WB pages 108–113

Sources of food nutrients

Pupils find pictures of the food types and stick them in; or make drawings in the boxes.

Answer questions about food types

1. Inorganic food: Inorganic food comes from the non-living environment, for example, water, soil and air.
   Organic food: Organic foods are natural. They contain carbon and are made by the bodies of living organisms, such as plants and animals.

2.

Function		Food type	
1.	Promotes growth and repair	A	Fat
2.	Provides the body with roughage	B	Vitamin
3.	Is the main source of energy in the body	C	Mineral
4.	Is organic and has a regulating function in the body	D	Carbohydrate
5.	Is inorganic and has a regulating function in the body	E	Cellulose
6.	Is a reserve energy source	F	Water
7.	Makes up 70% of the cells in the body	G	Proteins

Read a graph about baby foods

1. 9 g
2. B
3. B
4. B; contains more proteins than the other baby foods, which is the best option for a growing child.

Deficiency diseases

1. A balanced diet contains all five different kinds of foods (carbohydrates, proteins, fats, vitamins, minerals) in the right amounts.
2. a) Diet A (caveman).
   b) Their diets are more or less the same, except the peasant's diet contains more carbohydrates in the form of a small percentage of sugar and less fat and protein.
   c) Modern man's diet has too little carbohydrates and too much fat and sugar.

3.

	Condition		Description
1	Rickets	A	Can cause obesity
2	Pellagra	B	Large amounts of food are eaten, followed by vomiting
3	Scurvy	C	When a person refuses to eat
4	Kwashiorkor	D	A bone disorder caused by a deficiency of vitamin D, calcium or phosphate
5	Bulimia	E	A deficiency of vitamin B3
6	Anorexia nervosa	F	A severe vitamin C deficiency
7	Over-nutrition	G	A shortage of proteins in the diet

4. a)
   - Kunmi did not eat breakfast.
   - He had too much sugar: 2 cans of fizzy drinks, ice cream, 2 chocolates, piece of apple pie, 2 chocolate biscuits, and 2 teaspoons full of sugar.
   - He had too much fat: 2 bags of crisps, chips, ice cream.
   - He had too little protein, only fish and a beef patty.

   b) He should have: only one can of fizzy drink, only one chocolate, a cereal for breakfast (will prevent him from eating all the other unhealthy food), baked potatoes (rather than chips), one portion of cake, and a glass of water with every meal.

Do a fruit salad logic puzzle

Let pupils discuss the clues with a partner. Then they can complete the table in their exercise books. Help explain the reason for the answers to pupils who struggle to work it out.

Order	Name	Fruit
First	Mayowa	Watermelon
Second	Omoyi	Grapes
Third	Nalani	Kiwi
Fourth	Alani	Pineapple
Fifth	Ediali	Mango

Sub-theme 5 Pathogens, diseases and prevention

Topic 5 Diseases

Performance objectives

Pupils should be able to:

- differentiate between sickness and illness

- differentiate between signs and symptoms
- distinguish between communicable and non-communicable diseases.

Additional resources

- Pupil's Book pages 178–182
- Workbook page 115

Teaching the lesson

Differentiate between sickness and illness

Read the information on page 178 of the Pupil's Book with the pupils. Explain, with examples, the difference between a sickness and an illness.

Differences between the symptoms and the signs of a disease

- Explain the difference between the symptoms and signs of a disease with the pupils before reading with the pupils through the information in the Pupil's Book.
- Discuss the information on common diseases in the table on page 179 of the Pupil's Book, before pupils do Exercise 1 in pairs.

Exercise 1 PB page 180

Suggested answers

Deficiency	Cause	Symptom	Sign
Night blindness	Shortage of vitamin A in the diet	Cannot see in dim light	Night blindness
Beriberi	Shortage of vitamin B1 in the diet	• Body weakness • Pain	• Weight loss • Brain damage • Irregular heart rate • Heart failure • Death
Marasmus	Severe malnutrition, usually in children	• Little or no energy or enthusiasm • Irritable	• Lost muscle mass and subcutaneous fat • Look older • Short-tempered • Chronic diarrhoea • Respiratory infections • Intellectual disabilities • Stunted growth

Communicable and non-communicable diseases

- Explain what communicable and non-communicable diseases are and make sure pupils understand the difference, before they do the activities in the Workbook.
- Read with pupils through the information on Pupil's Book pages 181 and 182.
- Discuss what can be done to control and prevent diseases.

Workbook answers WB page 115

1. a) Sickness is a term used to refer to an individual suffering from short-term diseases or ailments such as flu, cold, cough, fever and a sore throat, or refers to a person that is throwing up. A person can feel sick, but it does not always mean the person is ill. A sickness is also the reaction that a person shows if he or she does not feel well.
   b) Illness is a term used to describe when a person is suffering from some long-term diseases or ailments such as cancer, or short-term diseases such as pneumonia. An illness is a more serious condition than just a sickness.
2. a) A symptom is a phenomenon that is experienced by the individual affected by the disease. For example, anxiety, pain and fatigue are all symptoms.
   b) A sign is a phenomenon that can be detected by someone other than the individual affected by the disease. For example, a bloody nose is a sign of an injured blood vessel in the nose, which can be detected by a doctor or a nurse.
3. a) A communicable disease is contagious. It means the disease can spread from one person to another or from an animal to a person either directly or indirectly through different agents.
   b) A non-communicable disease is a disease that is not spread from person to person. Therefore, it is non-contagious. It can be inherited, or caused by allergies, malnutrition, long-term illness and the side-effects of medicines, or changes in lifestyle, eating habits or environment.

Sub-theme 6 Health education

Topic 6 Drug education

Pupils should be able to:
- list ways drugs can be taken into the body
- differentiate between alcohol and tobacco
- state reasons why people drink or smoke
- differentiate between the effects of alcohol and tobacco on the body
- explain the effects of drug abuse on an individual
- list effects of drug abuse on the family
- list three effects of drug abuse on the society
- define herbal medicine
- differentiate between NAFDAC registered and listed herbal medicine.

Additional resources

- Pupil's Book pages 183–192
- Workbook pages 116–117

Teaching the lesson

What are drugs?

- When teaching this topic, keep in mind that many people in Nigeria do not have easy access to modern medical facilities, and therefore often rely on herbal remedies from traditional healers, or self-medicate by buying products from unreliable sources.

- Explain to pupils that drugs are chemical substances that can affect how our bodies work or how we feel. Some drugs help us to feel better, while others are abused and can cause serious health problems.
- Work through the different categories of drugs on page 184 of the Pupil's Book with the class. Use the examples in the book, and add any other examples of drugs that are commonly used in your area.
- Encourage pupils to do their own research on natural and synthetic drugs in their community. You and the pupils can bring examples of packaging of drugs to class as examples.

Ways in which drugs can be taken

- Explain the importance of using medicinal drugs according to instructions provided. Also explain the risks of abusing recreational drugs, as well as the highly addictive nature of illegal drugs. Emphasise that some legal drugs can also be addictive.
- Pupils should have a broad understanding of the risks of different categories of drugs, and should be able to identify appropriate examples of how different types of drugs are used or abused.

Extension

- Let the class do research on fake medicinal drugs and "magic cures" that are often sold at bus stops and on street corners. You can also invite a doctor or pharmacist, as well as a traditional healer, to come and share their knowledge with the class.
- Collect some of these types of medicine yourself, and let the class compare them to drugs that are available from controlled sources, such as pharmacies and some shops.
- Emphasise the dangers of using drugs when you are not sure how and where they were produced.
- Help pupils to collect articles from newspapers on how the government is taking action against the sellers of illegal drugs.

Alcohol and tobacco as drugs

- Explain to the class that alcohol and nicotine (in cigarettes) are also drugs that have serious health effects. Just because something is made from natural products does not mean that it is safe or harmless.
- Work through the information on alcohol and nicotine, and discuss the reasons why people abuse these substances, as well as the effects of abusing alcohol or tobacco.
- When pupils do Activity 1, guide them in their own research, class discussions and role play around alcohol and tobacco addiction.

Activity 1 PB page 188

- Divide the class into groups to facilitate the research and information campaign around alcohol and tobacco addiction.
- Assist where possible to access any ICT tools the pupils may need.

Exercise 1 PB page 188

Pupils can discuss these questions with a partner in class, and then find some of the answers in the text they have studied. The pupils can then answer the questions in their exercise books – in class or as homework.

Herbal medicine

- Use the example of bitter leaf to show that modern science provides proof of the medicinal benefits of many traditional medicines. However, there are also risks associated with relying too much on herbal remedies or self-medication. If such medications are used over long periods, they may hide symptoms of more serious diseases.
- Make pupils aware of the risk of medications sold by street sellers at much lower prices than those sold in pharmacies or shops. Often these drugs are fake and may contain useless or even dangerous substances as the manufacturing of these drugs is not properly controlled.
- Work through the information about the control of the manufacturing and selling of herbal medicines in Nigeria. Discuss the role and benefits of organisations such as NAFDAC and NANTMP, before pupils do Activity 3 and Exercise 2.

Activity 2 PB page 190

- Facilitate the class discussion around the safe use of herbal and other medicine, based on the information on pages 188 to 190 of the Pupil's Book. Discuss the selling of medicine on the street, as depicted in the illustration.
- Encourage discussion around the use of herbal medicines in pupils' own family.

Activity 3 PB page 192

Help pupils to find sources with more information about the use and control of the manufacturing and selling of herbal medicines in Nigeria. Encourage them to talk to people in their community.

Exercise 2 PB page 192

- Check that pupils include a definition, and appropriate examples of herbal medicines.
- Make sure they can explain what to do to find out which medicines are safe to use.

Workbook answers WB pages 116–117

1. a) Medicines are drugs used to treat different types of diseases or health problems.
   b) Legal drugs can be bought directly from pharmacies.
   c) Prescription medicines can only be bought from a pharmacy if you have a prescription from a doctor.
   d) Illegal drugs are substances that are so dangerous that there are laws to prevent people from using them.
   e) Natural drugs are made from plants and include traditional herbal medicines
   f) Synthetic drugs are manufactured by people from chemicals.
2. Accept other relevant examples in addition to the examples given below, including brand names of products that pupils may be familiar with.
   a) Painkillers; cough syrup; insulin; antibiotics.
   b) Cough syrup; blood tonics; aspirin.
   c) Tranquillisers; sleeping pills; insulin; antibiotics.
   d) Cocaine; heroin; LSD.
   e) Kola nut; bitter leaf; alcohol; marijuana; nicotine in cigarettes.
   f) Antibiotics; painkillers; cocaine.
3. Alcohol abuse: Any relevant examples of dangers can be emphasised, for example: that it can cause liver disease; that it is a leading cause of death from drug use; that drunk people

cause road accidents; that a pregnant woman who drinks can cause serious damage to the unborn baby, etc.

Tobacco abuse: Any relevant examples of dangers can be emphasised, for example: that it can cause lung cancer and emphysema; that it is a leading cause of death from drug use; that pregnant women who smoke can harm their unborn babies; that second-hand smoke affects not only the smoker, but other people as well, etc.

Extension

- Encourage the pupils to read newspaper articles about drugs and drug abuse, as well as free information leaflets and posters that are available at police stations and clinics. This will help to enrich the learning experience.
- A highly effective way of getting the message about the dangers of drug abuse across to the pupils is to invite reformed addicts to share their experiences with the pupils.
- You can also invite someone from the police to explain to the class what they are doing to fight the trade in illegal drugs.

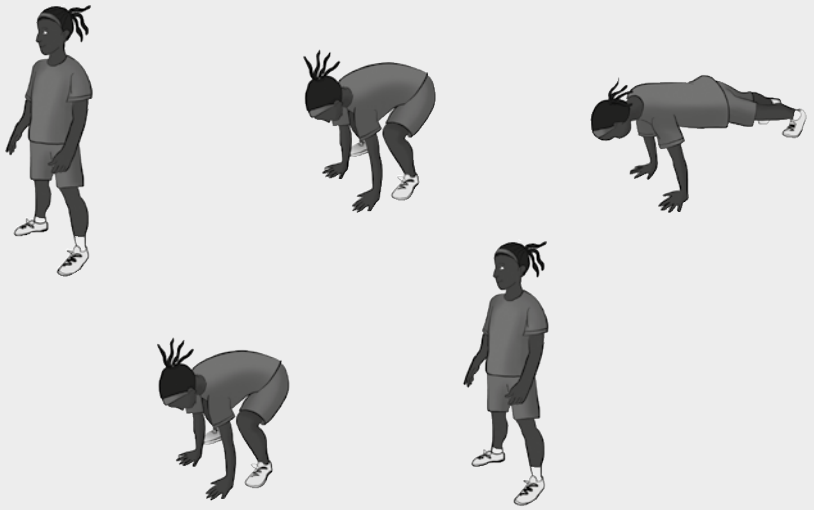
Assessment: Answers PB pages 198–201

1.

a) Walk-bench step	C Using a bench to step up and step down
b) Press-ups	D Lying on the floor like a plank and then using your arms to lift your body off the ground while still staying as straight as a plank; going down slowly again and bending your elbows
c) 50 m dash	B Running as fast as you can by lifting your knees and swinging your arms
d) Squat thrust	E Using three different positions: standing, squatting and press-up position; then going back to the squatting position; and then standing up again
e) Pull-ups	A Using a bar and pulling your whole body off the ground until your chin is near the bar and then letting yourself go slowly down

(5)

2. Squat thrust, step-on-step-off. (2)
3. Any two: Pull-ups, sit-ups and squat thrust. (2)
4. • Go down into a crouching position. (c)
   • When the whistle blows or the gun goes off, lean forward and move into the upright position. (d)
   • Stay in your lane and lift your knees and swing your arms. (b)
   • Sprint to the end and throw your body forward. (a) (4)
5. Any acceptable drawings showing the positions correctly.



(10)

6. Great jumping power: they must be fit and able to propel their bodies high up.
   Speed: they need a fast run-up to the pit. (2)
7. The jump is measured from the edge of the springboard nearest to the pit to the nearest mark in the sand made by the jumper. (2)
8. A no-jump will be when an athlete oversteps the springboard; jumps with both feet; does not land feet first; or lands on one leg only. (2)
9. Scissor jump or Fosbury flop. (2)
10. It is about half a metre from the upright on the approaching side and the cross bar. (2)
11. To lift your hips so that the body curves upwards to clear the crossbar. It will force your hips to move upwards and your back to arch. (2)

12. A ball game is a game that is played with a ball. (2)

13.

Football	Volleyball	Tennis	Basketball	Hockey
a football	a volleyball	tennis racket	a basket ball	hockey stick
a field	a pole and net	tennis ball	a court	hockey ball
a goal post	a court	court with net	net and backboard	field and nets

(15)

14.
- Warm up and cool down.
- Wear protective gear.
- Know the rules of the game.
- Watch out for the other players.
- Do not play when you are injured. (5)

15. a) Digestive system
b) Anorexia nervosa
c) Vitamin C
d) Minerals
e) Iron (5)

16. a) E
b) A
c) D
d) C
e) B
f) F (5)

17. Any two: minerals, vitamins, cellulose or water. (2)

18. Starvation: When the body needs more energy than is being supplied.
Malnutrition: If a person does not eat a balanced diet. (2)

19. Organic substances are natural. They contain carbon and are made by the bodies of living organisms, such as plants and animals, for example proteins, carbohydrates and fats. Inorganic substances come from the non-living environment, for example, water, soil and air. (4)

20. a) Vitamin D: Rickets
b) Vitamin C: Scurvy
c) Vitamin B3: Pellagra
d) Vitamin A: Poor night vision (4)

21. a) Sodium chloride (table salt)
b) Iodine
c) Phosphorus or calcium
d) Phosphorus (4)

22. Being part of a large family may have negative consequences for the family members, specifically for the dependent part of the family, for example, the children.
- A child in a family with a large number of siblings younger than six is likely to receive less food because the entire family may be short of food.
- In many cases, the quality of the food also decreases as the number of family members increases.
- Many essential food types, such as proteins that are important for the growth and health of children, are very expensive. This can then lead to malnutrition of the children, which may cause many different deficiency diseases that were referred to earlier in the topic.

(3)

23.

Term	Definition	Example
Disease	A disease is an abnormal condition that affects the body of an organism. It is often called a medical condition and has symptoms and signs that can help identify the type of disease it is.	Cholera
Disorder	A disruption of the normal or regular functions in the body or a part of the body. Disorders can be classified into the following areas: mental, physical, genetic, emotional, behavioural, structural	Bulimia
Symptom	A symptom is a phenomenon that is experienced by the individual affected by the disease	Fever
Sign of sickness	A sign is a phenomenon that can be detected by someone other than the individual affected by the disease.	Runny nose
Non-communicable diseases	Those diseases that are not spread from person to person. Therefore, they are non-contagious. They can be inherited, or caused by allergies, malnutrition, long-term illness and the side-effects of medicines, or changes in lifestyle, eating habits or environment.	Stroke

(18)

24. a)
- Through the mouth: tablets/capsules/powders/cough syrups.
- Rubbing on the skin: ointments.
- Injecting: strong painkillers/antibiotics.
- Inhaling: nose drops or sprays. (8)

b) Any two of the following for each:
- Curiosity, peer pressure and rebellion: Young people are naturally curious and interested in exploring new things. They want to be accepted by others and may be tempted to try drinking and smoking. They may see it as a way of rebelling against the rules of their parents and society.
- Social norms, environment and availability: We are exposed to images of people drinking and smoking in films, TV programmes and advertisements, which may make it seem normal. Alcohol and drugs are widely available, increasing the temptation.
- Stress: Alcohol and tobacco may at first help users to feel relaxed and less stressed. But users may not realise that they have become addicted. (4)

c) Individuals: (Any one) Serious liver diseases, heart attacks.
Families: Alcohol abuse is often linked to domestic violence.
Society: Alcoholics find it hard to keep a steady job and may end up living on the streets. (3)

d) Individuals: (Any one) Lung diseases, such as emphysema and lung cancer, early death.
Families: Women who smoke during pregnancy may endanger the health of the unborn child.
Society: Smoking not only affects the health of the smoker, but also of other people breathing in the smoke. (3)

e) Any valid example: vaccines, traditional medicines (1)

f) Any three of the following:
- What the product is made of.
- How it must be used.
- Possible side effects.
- An expiry date, showing when it is no longer safe to use. (3)

Total: 126

THEME 4 Information Technology

Sub-theme 1 Basic computer operations

Topic 1 Computer games

Performance objectives

Pupils should be able to:
- play the games
- predict the actions of the key players
- suggest solutions to the key problems.

Additional resources

- Pupil's Book pages 202–203
- Workbook page 118
- Computer with academically inclined adventure games, such as Prince of Persia, Test Drive, Dangerous Dave and Super Mario Bros. installed.

Teaching the lesson

Playing computer games can help pupils to develop their problem-solving skills and fine motor skills. The gamification of learning has many benefits, but we need to ensure that they are the right type of computer games and that screen time is limited to an hour a day.

- Display some of the latest suitable adventure games and read about the games on Pupil's Book pages 202 and 203.
- Have a class discussion about what makes a computer game an adventure game.
- Show the pupils one of the latest suitable adventure games and demonstrate how to play it.
- The pupils then work in groups and take turns playing the adventure game, and predicting the actions and results.
- Ask leading questions on the problems encountered by the adventurers.
- As pupils finish playing the game, ask them leading questions. It is important not to just show them how to play but to devise ways for them to discover solutions to the leading questions for themselves.
- You could supply each group with a short questionnaire to complete while they are playing and working out the game.

Activity 1 PB page 203

2. Pupils' own answers should reflect an understanding of the aim of the game.
3. Pupils should be able to explain what problems the adventurer or player must solve.

Activity 2 PB page 203

2. Pupils' own answers should reflect an ability to predict the actions of the key players.

3. Pupils should be able to suggest possible solutions to the key problems of the game.

Workbook answers WB page 118

1. The pupils are to design and plan their own adventure computer game. Check that they have described the key actions of the avatars, the problems that are to be solved, and the world or environment of the game.
2. The pupils design and draw the main avatars of the game they designed.

Extension

Repeat the process of playing and predicting the actions with a few of the other games you have available. Can the pupils suggest possible solutions to the key problems?

Remedial

Not all pupils will have had prior experience with computer games. If any pupils are having difficulty playing the game or completing the workbook activity, give them extra opportunities to play the game and ask further leading questions so that they learn to predict the actions of the key players.

Topic 2 Care and protection of the computer

Performance objectives

Pupils should be able to:
- list ways of taking care of a computer system
- state reasons for taking take care of computers
- list ways of protecting computers.

Additional resources

- Pupil's Book pages 204–206
- Workbook pages 119–120
- Desktop computer

Teaching the lesson

- Gather pupils around a desktop computer or take them to the school's computer room.
- Recap with pupils regarding what they have learned about computer software. Introduce computer hardware to pupils. Help pupils to identify computer hardware and discuss computer software with them.
- Refer pupils to page 204 of the Pupil's Book. Pupils complete Activity 1 as a group activity.

Activity 1 PB page 204

Suggested answers

A: CPU/tower
B: Monitor
C: Speaker
D: Printer

E: Scanner
F: Keyboard
G: CD or DVD
H: Mouse
I: Headphones

Basic rules to care for your computer

- Have a class discussion on how to care for a computer, and make sure pupils know the basic rules.
- Explain the importance and function of antivirus and password protection for computers.

Passwords to protect your computer

- Pupils discuss and complete Activity 2 as a group discussion and Activity 3 as a teacher-supervised activity.

Activity 2 PB page 206

- Pupils practise creating their own passwords keeping the following in mind:
  1. Keep your password eight or more letters long. Long passwords are harder to crack.
  2. Use letters, numbers, and symbols in your password. They are harder to guess.
  3. Change your password every six months. This way, even if someone guesses your password they cannot use it for long.
  4. Do not use your nickname or family and pets' names. They are easy to guess.
  5. Give your password to your parents just in case you forget what it is.

Activity 3 PB page 206

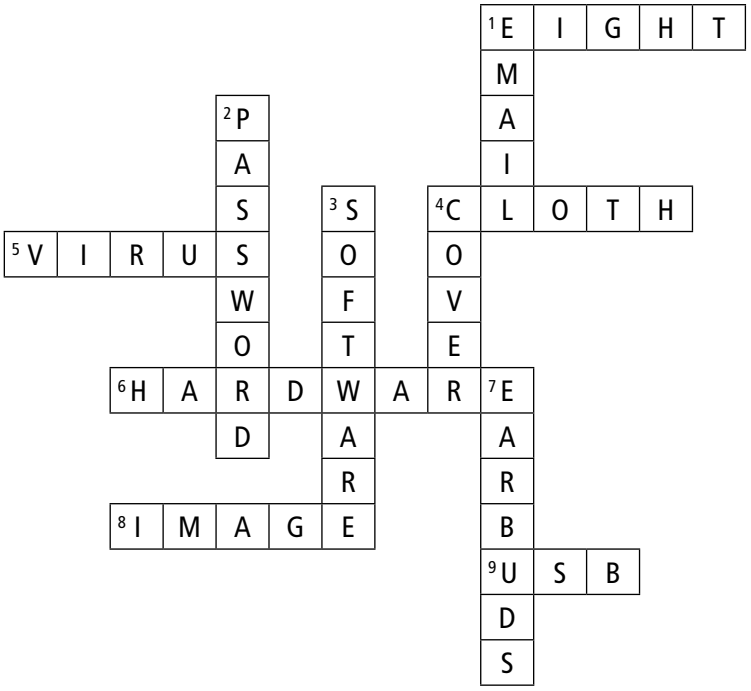
Discuss the antivirus program that your school uses with the pupils. Make sure they understand how important it is that they run it whenever they use the computer.

Workbook answers WB pages 119–120

1. a) Any one of the following:
   - Keep him clean, dry and safe.
   - Use clean hands so that he does not have sticky keys.
   - Use a lint-free cloth or clean with ear buds in-between keyboard keys to keep his keyboard clean.
   - Do not eat or drink near him.
   - Keep him on a stable, flat surface.
   - Cover him when he is not in use to prevent dust from settling on him.
   - Wipe his monitor clean with a soft cloth; it is easier to read on-screen.
   - Install surge protectors that will protect him during lightning storms.
   - Unplug him when he is not being used.

   b) CPU, monitor, keyboard, mouse, speaker

2.



Extension

Act out being a computer: Play a game where your class acts out being a computer. One pupil acts as the keyboard. The teacher uses the keyboard to give the computer a task to do or a problem to solve. Another pupil acts as the CPU and solves the problem. The CPU tells the answer to the pupil who is acting as the monitor, who then shows the answer. Some pupils can also act as the wires that connect the keyboard to the CPU and the CPU to the monitor. You may include a couple of pupils as speakers who will sing for the class! You can have your class take turns being different parts of a computer.

Sub-theme 2 Basic concepts of information

Topic 3 Internet I

Performance objectives

Pupils should be able to:

- define the internet, World Wide Web (WWW), electronic mail (email), email address and website
- identify the internet browser and email address on the computer, and the website address on the address bar
- access the internet
- send and receive email
- mention the benefits of the internet
- mention the misuse of the internet.

Additional resources

- Pupil's Book pages 207–216

- Workbook page 121–122
- Internet-connected computer lab or cyber café

Teaching the lesson

Internet terms and their meanings

Lead the pupils in a whole-class discussion to define various internet terms, such as internet, email address, website and browser.

Activity 1 PB page 208

Suggested answers

1. Pupils read the magazine extract about the internet. Hold a whole-class discussion about what the internet and the World Wide Web are.
2. a) The internet is a worldwide system of computer networks connecting computers to each other. Computers that are connected through the internet can send and receive all kinds of information, such as email text, graphics, voice, video and computer programs.
   b) You can find a website by typing in the webpage address (URL) in the address bar or using the search engine by typing specific keywords.
   c) Email lets people with an email address send and receive messages anywhere in the world.

Activity 2 PB page 210

Revise the structure of website addresses and email addresses with the pupils before allowing them to practise writing valid addresses.

Internet browsers

Hold a class discussion about internet browsers and allow the pupils to volunteer what they know about the search engines they have used and what they used them for.

Activity 3 PB page 211

Pupils use an internet connected computer lab or cyber café to access the internet.

Suggested answers

1. Give them a specific URL (for school content for a specific project) to type into the address bar and then guide them to click on the hyperlinks to move to other webpages.
2. Pupils practise using the search engine to find definitions and images for their specific project.

Using email

Guide pupils in creating email accounts, and in sending and receiving emails. The steps and diagrams on Pupil's Book pages 211 and 212 will guide them.

Activity 4 PB page 212

Working in pairs, the pupils create Gmail accounts by following the steps. They then practise sending each other short messages.

Uses and benefits of the internet

Hold a class discussion about the uses and benefits of the internet. Ask the pupils to contribute points to a list you write on the chalkboard. Divide their points into the general categories of information, communication, online shopping and entertainment.

Activity 5 PB page 214

Working in groups, the pupils brainstorm uses and benefits of the internet.

Suggested answers

1. a) Communication: The information on the internet is always up-to-date and always available. It has opened up many channels of communication, such as email, blogs and social networking sites.
   b) Research: The internet makes available a vast amount of information on any topic imaginable.
   c) Education: Online courses, Youtube videos, educational games and resources are all examples of how the internet benefits education.
   d) Banking: The internet has brought online banking, which means cheaper and faster banking services and payments at any time of day. People can do their banking via the internet or with mobile banking on their smartphones.
   e) Looking for work: There are thousands of recruitment organisations online, some are recruitment specialists, while others are websites that include a careers section where jobs can be advertised.
   f) Entertainment: How we spend our free time has changed completely with online games and streaming music and movies. The internet allows us to get real-time updates on news and sports results.
2. Facilitate this discussion about internet chatting in groups. Pupils' experiences will vary.

Abuses of the internet

The pupils are to do some online research on how the internet can be abused. Hold a class discussion and allow pupils to provide examples, as well as suggestions for preventing abuse online. This is an important opportunity to prepare pupils for working safely on the internet.

Exercise 1 PB page 216

Suggested answers

1.

Concepts	Explanations
1. Cyberbullying	B. Posting nasty comments about another person and always responding in a mean way to anything they say or do online
2. Identity theft	E. Stealing someone's name, image or information to carry out actions as if done by them
3. Internet addiction	A. Online-related, compulsive behaviour, which interferes with normal living and causes severe problems
4. Internet fraud	C. Using the internet to deceive someone and take money from them in an illegal way
5. Trolling	D. Use of online communication to threaten, scare or hurt a person

2. Each group must work together to create a poster and short presentation on the basic rules for netiquette and internet safety. Assess the posters using the following checklist:
   - Does the content of the poster explain the basic rules for internet safety?
   - Is the poster bold and eye-catching?
   - Has all relevant information been included?
   - Did the group work well together?

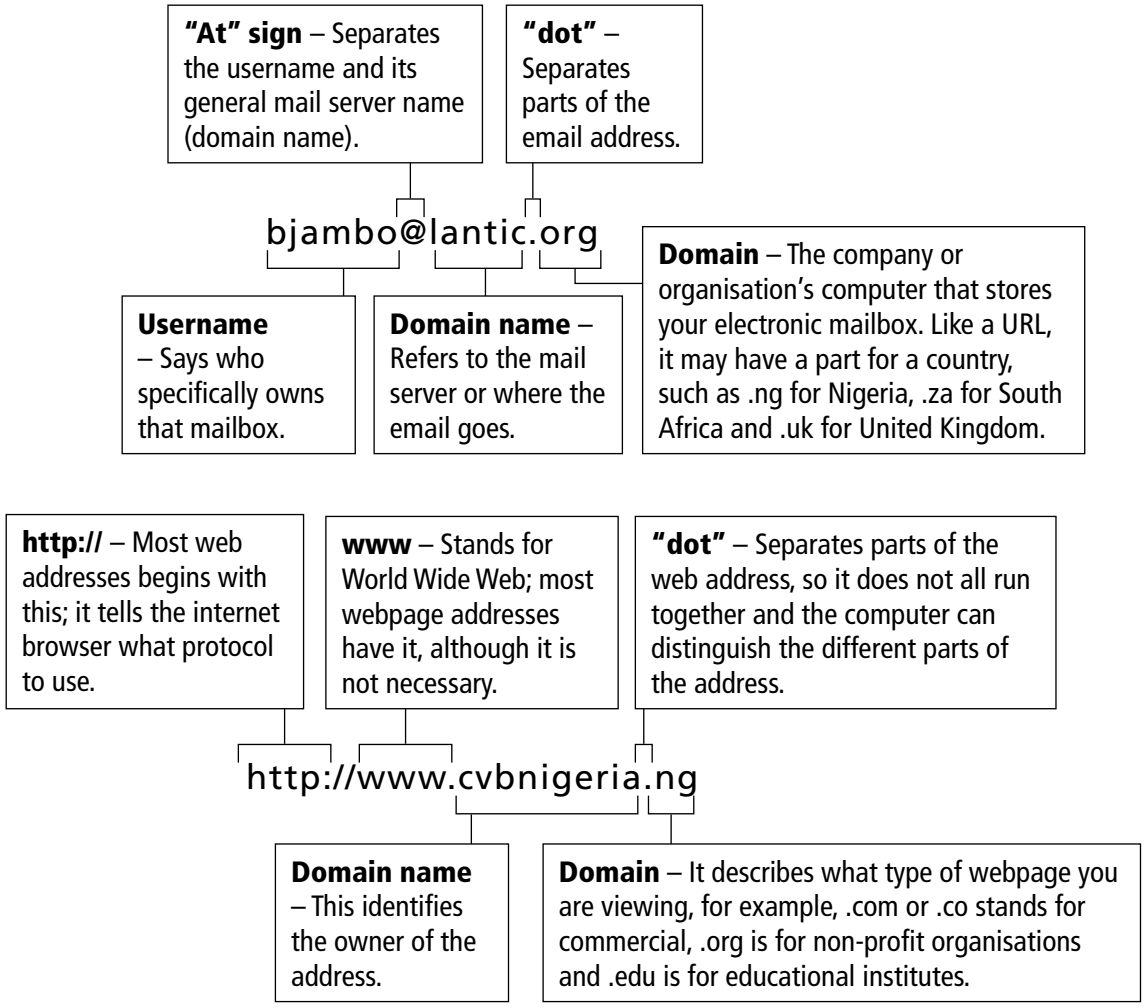
Workbook answers WB pages 121–122

1.

Internet terms	Meanings
a) This is when two or more computers are connected	E. computer network
b) A worldwide system of computer networks connecting computers to each other	C. internet
c) This is an information-sharing system on the internet	D. World Wide Web
d) A specific location on the World Wide Web with a URL address	B. website
e) The information in a document on a website	A. webpage

2. The internet and the World Wide Web (WWW) are two separate but related things. The internet is a global computer network where information resides. The web is a part of the internet that allows us to share information.

3.



The difference between an email address and a website address is that the email address is used to communicate with a specific address on an organisation's mail server by email, while the other is a URL for a specific website on the web.

Extension

Set up a safe chatroom or Facebook page for the class to chat about projects and homework, as well as hobbies. Let the pupils decide on the rules of the chatroom and how online behaviour will be moderated. Remind pupils that the rules also apply to all types of social media, such as WhatsApp groups.

Remedial

Provide those pupils who have not had a great deal of experience with sending and receiving emails and finding websites online with extra opportunities to practise these skills. Pair them up with pupils who have more experience for classroom activities.

Assessment: Answers PB page 218

1. Pupils' answers will vary. (4)
2. Pupils' answers will vary. (2)
3. Pupils' answers will vary. (2)
4. Any three of the following:
   - Keep it clean, dry and safe.
   - Clean hands mean no sticky keys.
   - Use a lint-free cloth or clean with ear buds in-between keyboard keys. Do not use spray cleaners.
   - Do not eat or drink near the computer.
   - Cover the computer when it is not in use to prevent dust from settling on it.
   - Wipe your monitor clean with a soft cloth; it is easier to read on-screen.
   - Ask your parents to install surge protectors that will protect your computer during lightning storms.
   - Never force external devices such as USBs into your computer.
   - Plug them in gently to prevent damage to the delicate internal components.
   - Make sure your computer is on a stable, flat surface.
   - Unplug your computer when it is not in use. (3)
5. Antivirus software; passwords. (2)
6. Any two: Viruses can be disguised as funny attachments, such as greeting cards and images. They can be spread by emails or downloads. (2)
7. Computers are expensive and are used to store and provide important information. Taking care of the computer prolongs its life and avoids damaging any of its hardware and software. (2)
8. Any three relevant answers:
   - Do not eat or drink near the computer.
   - Make sure that you run the antivirus program whenever you use the computer.
   - Cover the computer when it is not in use to prevent dust from settling on it. (3)
9. a) Internet: a worldwide system of computer networks connecting computers to each other. (2)
   b) World Wide Web: an information sharing system on the internet. (2)
   c) Electronic mail: lets people with an email address send and receive messages anywhere in the world. (2)
   d) Website: a location on the World Wide Web. (2)
10. Any three: Google Chrome; Mozilla Firefox; Internet Explorer; Opera, etc. (3)
11. An email address is used by people or organisations to send and receive messages anywhere in the world.
    A website address is the address for a website on the web. (4)
12. Pupil's response will vary. Assess pupils according to their ability to perform these tasks. (3)
13. Any three uses of the internet:
    - It makes available a vast amount of information on any topic imaginable.
    - The information on the internet is always up to date and always available.
    - It has opened up many channels of communication, such as email, blogs and social networking sites.
    - The internet can be used for online shopping.

- How we spend our free time has changed completely with online games and streaming music and movies. (3)

14. Any three abuses of the internet:
    - Social media can be used to bully people anonymously with little punishment.
    - The internet makes it easy for people to pretend to be other people or create a fake identity to commit crime.
    - The internet facilitates (makes easier) the spread of private pictures and pornography.
    - The internet allows people to self-diagnose medical conditions, which is not always safe as there is a lot of false information.
    - The internet facilitates fraud. Fake websites are often used to lure people into providing information that is then used to steal identities. The internet also gives hackers the opportunity to steal banking information from online shoppers. (3)

Total: 44

© You may photocopy this page for use with *Smart Basic Science & Technology Primary 5 Teacher's Guide.*

Resources

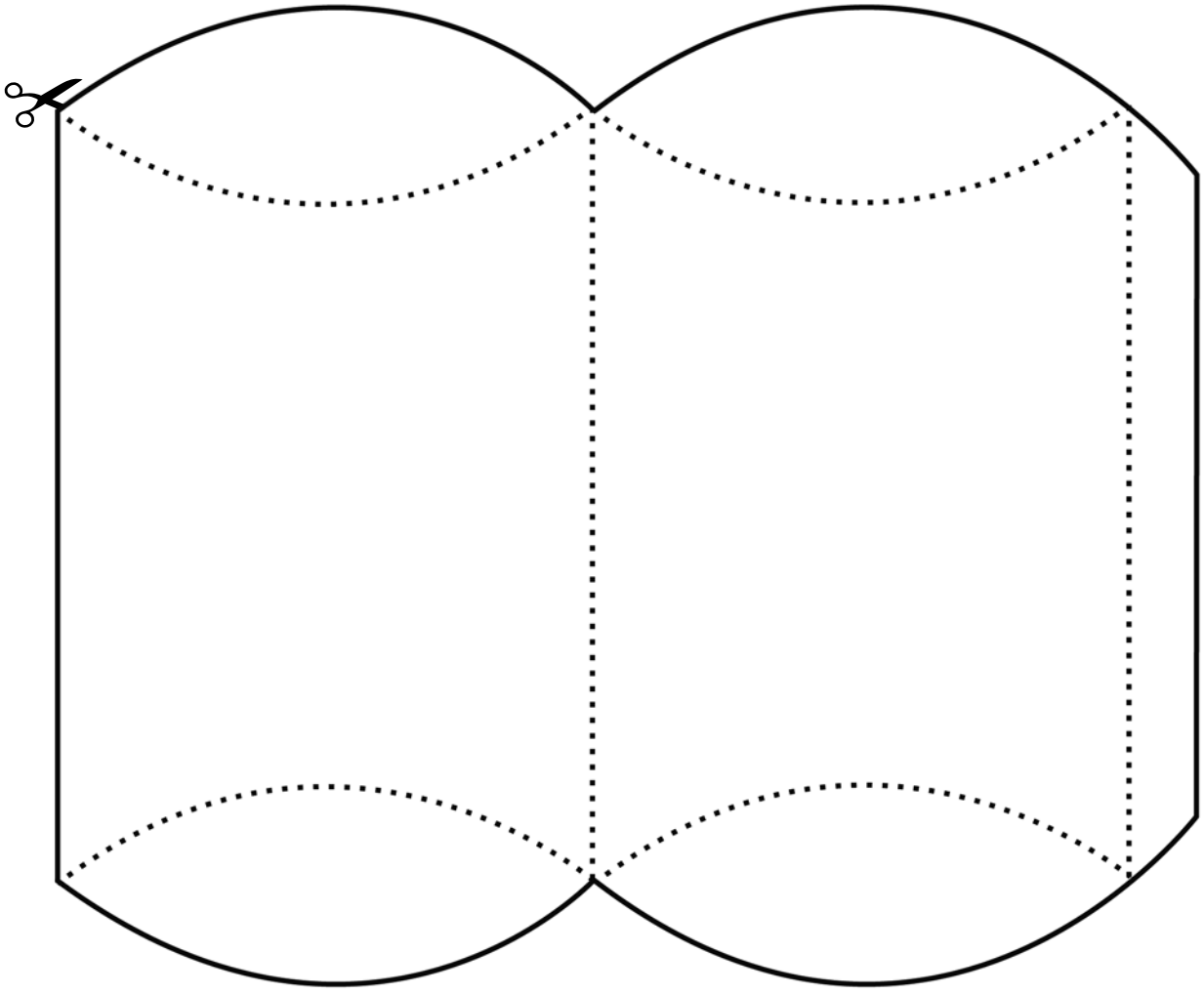
Pollution word search

Search for 16 words about pollution and the environment in the word search. Look for words that you have learned in Theme 1. The hidden words run from left to right and down.

W	R	S	K	E	P	D	I	Q	B	S	A	J	E	D
A	X	R	J	R	E	U	S	E	D	M	L	F	K	A
T	S	E	G	B	N	K	D	Y	N	O	D	K	P	M
E	Z	C	J	G	V	R	F	Y	L	K	I	F	B	A
R	W	Y	E	D	I	S	E	A	S	E	T	U	O	G
A	S	C	D	G	R	H	K	I	L	Z	C	B	M	E
P	I	L	S	M	O	G	Y	R	R	W	E	T	R	U
D	E	E	F	R	N	G	T	H	Y	G	A	S	E	S
S	Z	D	C	F	M	V	G	B	H	N	J	M	D	K
C	B	M	P	R	E	V	E	N	T	L	J	G	U	D
N	K	H	G	D	N	A	Q	E	R	Y	I	P	C	S
O	L	M	N	B	T	V	C	X	Z	E	A	S	E	D
I	W	N	R	S	I	P	E	S	T	I	C	I	D	E
S	F	L	A	N	D	U	T	S	O	P	I	E	T	F
E	O	B	A	E	D	P	O	L	L	U	T	I	O	N

water	smoke	sea	prevent
noise	reduce	smog	pesticide
recycle	reused	disease	land
environment	damage	gases	pollution

Soap packaging template



Solid lines are the cutting lines.
Broken lines are the folding lines.

© You may photocopy this page for use with *Smart Basic Science & Technology Primary 5 Teacher's Guide.*

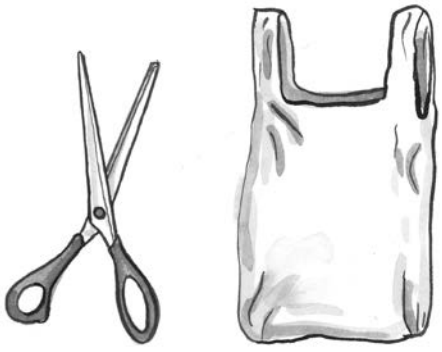
How to make a plastic bag placemat

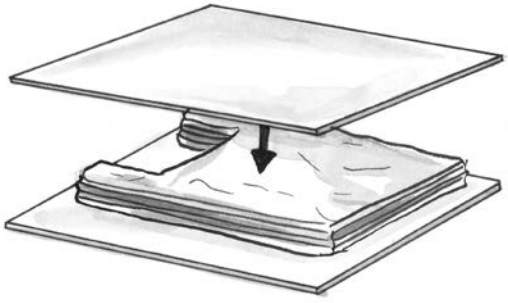
Collect plastic bags to make a plastic placemat.

What you will need:

- four plastic bags
- a ruler
- a pen
- scissors
- two sheets of wax or parchment paper
- an iron and ironing board

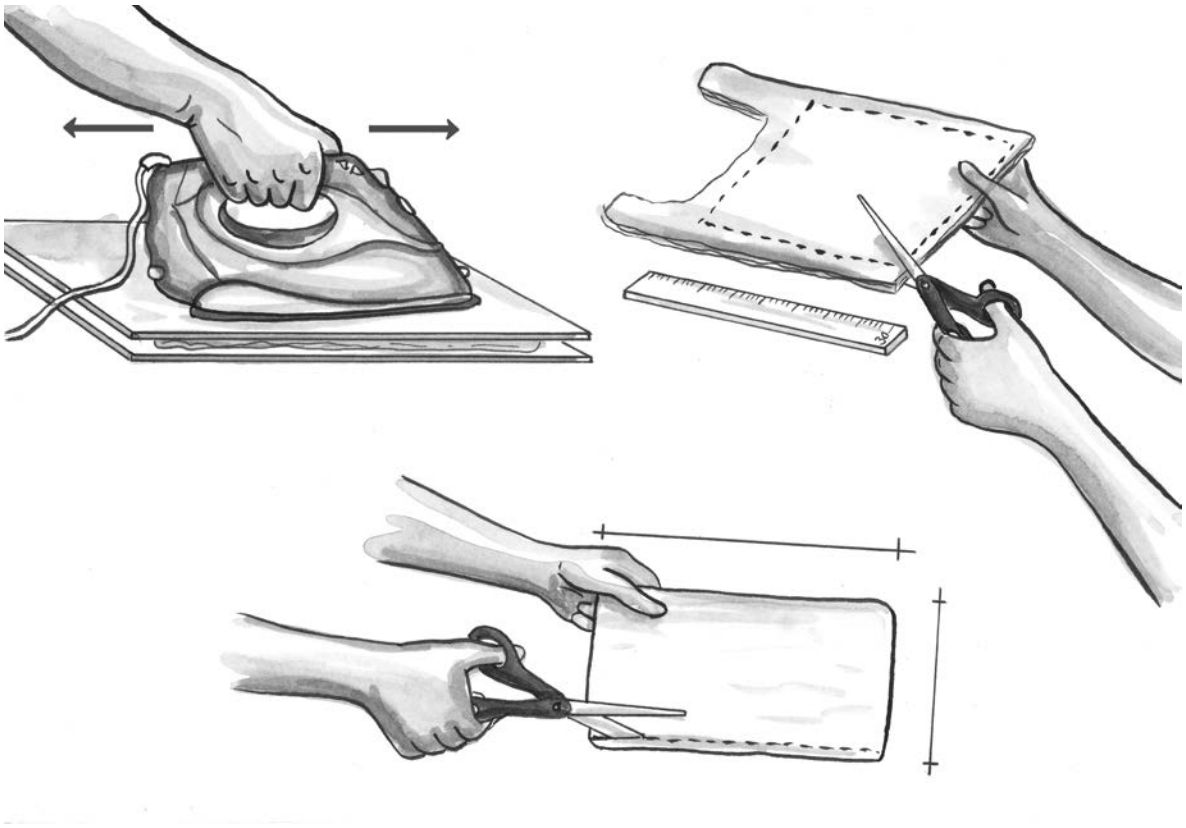
Step 1 Measure and cut 2.5 cm off the bottom of each plastic bag.
Step 2 Turn the bags inside out. Stack them one on top of the other.
Step 3 Place the pile of bags on one large piece of wax or parchment paper and cover the stack with another large piece of wax paper. Put the whole pile on top of the ironing board.





Step 4 Set your iron to a medium heat. Test the heat setting by ironing one corner of your pile of bags to make sure they don't burn. If they do, turn the iron heat down. Once you have the correct setting, slowly iron over the top of your wax paper, always keeping the iron moving. Run the iron over the bags a few times, but never touch the hot iron directly to the plastic. This technique joins the plastic bags together so they become a solid piece of plastic. Turn off your iron and set it to one side.

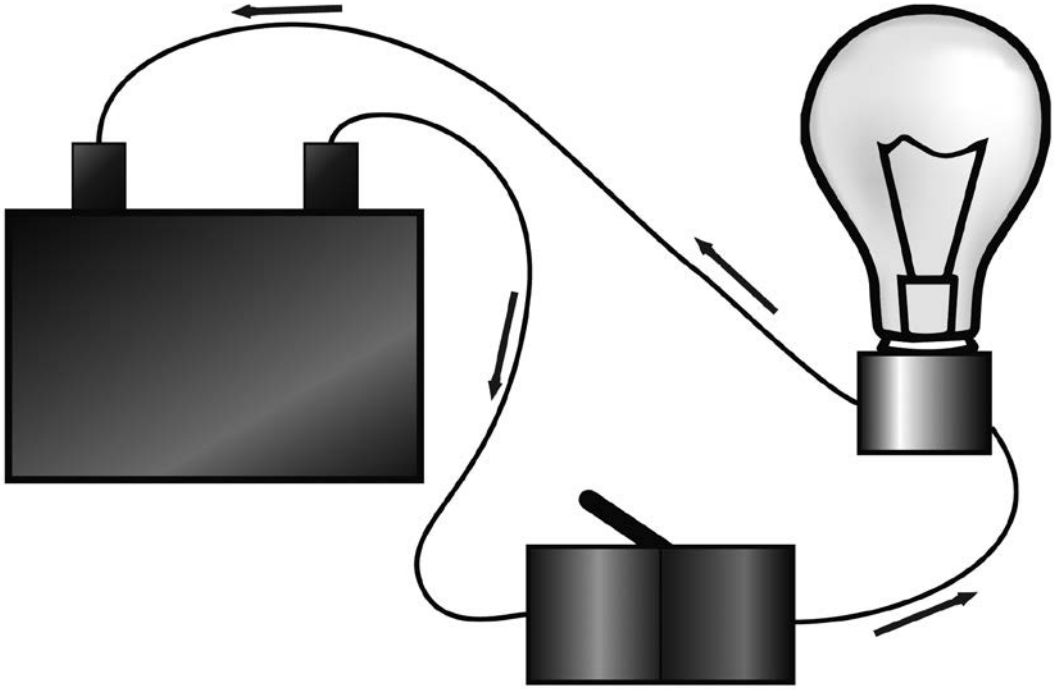
© You may photocopy this page for use with *Smart Basic Science & Technology Primary 5 Teacher's Guide.*

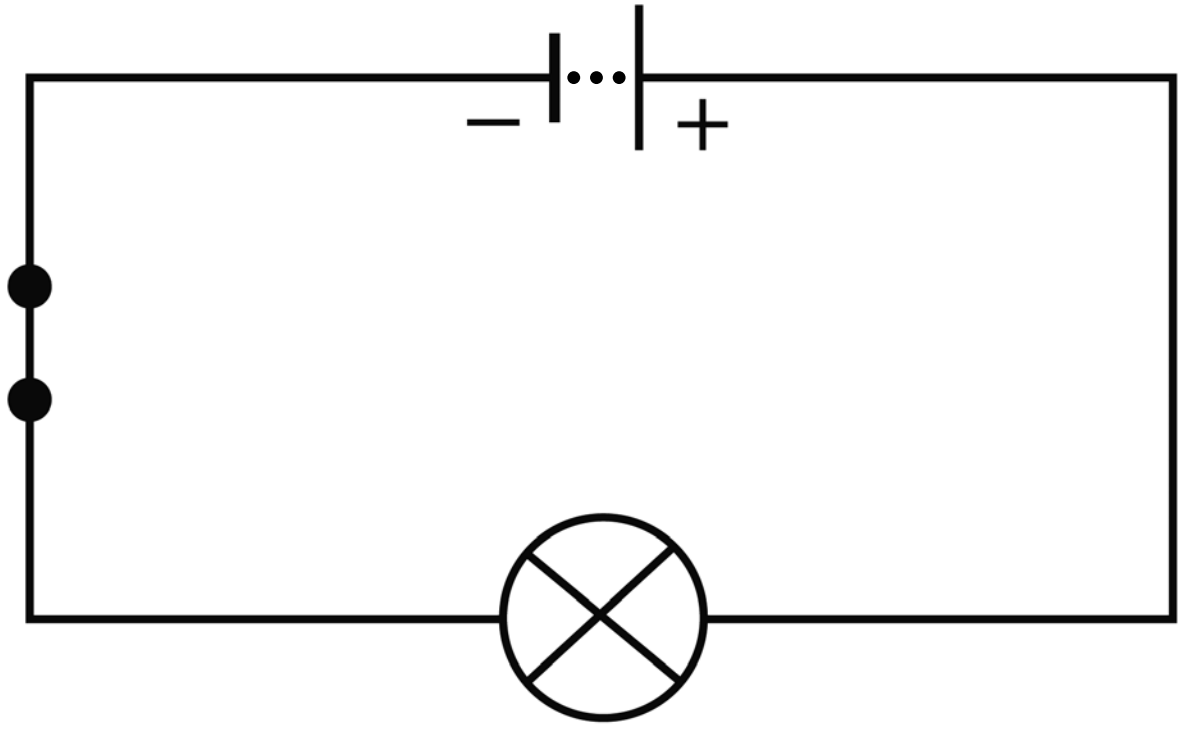


Step 5 Take the joined plastic bags out from the layers of wax paper.
Using a ruler, mark and cut out a rectangle on the joined plastic that is 42 cm by 27.5 cm. Round out the corners of the bags with your scissors. Make as many placemats as you would like. Use these fun placemats at your next meal.

© You may photocopy this page for use with *Smart Basic Science & Technology Primary 5 Teacher's Guide.*

Electric circuits





© You may photocopy this page for use with *Smart Basic Science & Technology Primary 5 Teacher's Guide.*

Glossary

acid: a solution that contains many hydrogen ions

addictive: people's bodies and minds keep wanting more and more of the drug

aerosols: any substance stored under pressure in a can and that sprays from a nozzle

alcohol: fermented drinks such as wine and beer that people can become addicted to

alloy: mixture of metals

anti-inflammatory: something that reduces inflammation/swelling

antioxidants: substances in some foods that clean the body and protect it from disease

antivirus software: used to prevent, detect and remove harmful software

application: a computer program designed to perform a group of coordinated functions or tasks

ball-and-socket joint: a ball at the end of one bone fits into a socket in the other, allowing a circular movement, or movement in all planes

base: a solution that contains many hydroxide ions

bimetallic: two metals joined together

biodegradable: something which breaks down naturally

carbohydrates: made of carbon, oxygen and hydrogen and provide energy for the body

carbon dioxide: a colourless, odourless gas produced by burning carbon and organic compounds and by respiration (breathing). Humans breathe it out and plants "breathe" it in

carbon monoxide: a colourless, odourless toxic flammable gas emitted by all fuel-burning vehicles

cartilaginous joints: joints that are slightly movable

chemical energy: energy released by combining certain chemicals

chemicals: substances used in chemistry or produced by a chemical process

communicable disease: a contagious disease, which can spread from one person to another or from an animal to a person either directly or indirectly by different agents

computer games: computer programs that allow users to play different electronic games on a computer, mobile phone or tablet

computer software: sets of instructions given to a computer to make it function and to let it do different types of tasks

computer virus: software program that effects the functioning of the computer

conduction: transfer of heat or electricity through a substance

convection: movement of heat through gases and liquids

dermatitis: a disease of the skin that causes redness, swelling, and pain

detergent: a chemical substance you use to break up and remove grease and grime

disease: an abnormal condition of a part, organ or system of an organism, due to various causes

disorder: a physical or mental condition that is not normal or healthy

dynamo: a small machine that turns power into electricity

ecosystem: a community of living organisms and their environment

eczema: a disease that makes the skin red and dry so that you want to scratch it

electron: negatively charged particles whose movement creates electric current

email: short for electronic mail; allows people to send and receive messages to and from anyone with an email address, over the internet

entrepreneur: a person who makes money by starting and running businesses

ferrous metal: metal containing iron

fertilisation: when a male gamete fuses with a female gamete to form a zygote

fertilisers: chemicals manufactured to make plants and crops grow better

fibrous joints: immovable joints

food pyramid: a tool that helps us to eat the right types and amounts of food

fossil fuels: a natural fuel found inside the layers of the Earth and formed long ago from the remains of dead animals and plants

fruit: an ovary of a flower after fertilisation, containing the seeds

glycerine: a thick, sweet, transparent liquid made from fats and used in medicines and foods

grime: a thick layer of dirt

herbal medicine: medicine made from plants

hinge joint: the bones can only move in one plane, like a door on hinges

hyperlink: a word, phrase or image that you can click on to jump to a new document or a new section within the same document

igneous rock: rock formed when magma cools and turns solid

illegal drugs: substances that are so addictive that they are banned by the law

illness: the state of a person suffering from some long-term or short-term disease or ailment

industrial: connected with making things in factories

information: processed facts; data that has been organised in some way to present us with useful information

inorganic: not made from living organisms

insulator: prevents transfer of heat or electricity through it

internet: sometimes called simply "the Net" or "the Web"; a worldwide system of computer networks that enable a computer to connect to any computer in the world

joint: the junctions between bones

keyboard: a typewriter-style device that has an arrangement of buttons or keys used to input text, characters, and other commands into a computer

kwashiorkor: a disease in growing children who have a lack of protein in their diet

legal drugs: substances that may be used without breaking the law

light energy: photons radiated by a natural or manufactured source

maintenance: preserving and protecting objects so that they last as long as possible

medicines: drugs that we use to treat different types of diseases or health problems

metamorphic rock: rock that was originally igneous or sedimentary, but was changed due to movement of the Earth's crust

monitor: a device that displays information in graphic form

mouse: used to move the on-screen cursor to different items on the screen

nicotine: substance in tobacco that people become addicted to

non-communicable disease: a disease that is not spread from person to person; so, it is non-contagious

non-ferrous metal: metal not containing iron

nuclear energy: energy created by splicing the nuclei of uranium atoms

nutrition: taking in useful substances by the human body

obesity: when a person is very fat

ore: rock containing a metal

organic: made from living organisms

***ose dudu*:** African black soap

over-nutrition: when people eat too many energy-rich foods, their bodies will take in too many nutrients such as fats and sugars

over-the-counter (OTC) medicines: can be bought without a prescription

pellagra: a disease caused by a deficiency of vitamin B3

pesticides: chemicals manufactured to kill insects and diseases of plants

petals: the brightly coloured leaves of a flower with lines that run from the top to the bottom

pH scale: measures how acidic or basic a liquid is

pistil (or carpel): the female part of the flower, consisting of a style, stigma and ovary

plantain: a type of banana that is cooked before it is eaten

pollination: the transfer of pollen from the anther of a plant to the receptive stigma of the same plant or another plant of the same species

prescription medicines: can only be bought from a pharmacy with a doctor's prescription

proteins: made up of carbon, oxygen, hydrogen and nitrogen; it helps the body to grow

psoriasis: a skin disease that causes rough red areas where the skin comes off in small pieces

radiation: transfer of heat energy by projecting it from a source to another destination

recreational drugs: legal drugs such as alcohol and tobacco

resource: something such as useful land, or minerals such as oil or coal, that exists in a country and can be used to increase its wealth

rickets: a bone disorder caused by a deficiency of vitamin D, calcium or phosphate in the diet

rock: a natural substance that is made up of two or more minerals that have been fused together into a solid lump

saponification: the process that produces soap, usually from fats and lye

scurvy: a disease caused by a severe vitamin C deficiency in the diet

search engine: a software program that searches for and identifies items in a database that correspond to keywords or characters specified by the user

sedimentary rock: rock formed by layers of little bits of rock, sand and mud at the bottom of lakes compressed back into rock by the weight of overlying materials

sepals: protect the flower while it is a bud

skeleton: the internal framework of a human around which the body is built

stamens: the male parts of the flower; each consisting of a long filament with an anther

surge protector: device designed to protect electrical devices

symptom (of illness): experienced by the individual affected by the disease

synovial joint: movable joint

tepals: the sepals and petals of monocotyledonous flowers are fused to form only one whorl

thermal energy: involves transfer and/or conversion of heat

undernutrition: when a person does not have enough energy in his or her diet

vertebral column: a stack of vertebrae, separated by discs of cartilage

vitamins: substances our bodies need so that they can work properly; vitamins are known by the letters A, B, C and D; a shortage of any vitamins in the diet causes a deficiency disease

web browsers: programs for searching the internet for information (such as Google Chrome and Mozilla Firefox)

website: a specific location on the World Wide Web with a URL address

World Wide Web: an information-sharing system on the internet