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Cambridge Checkpoint Science

Skills Builder and Challenge

Teacher's Support

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Introduction

Not all students learn the same thing in the same way, or at the same time. Some will need additional support to access a topic; others will require additional challenges that go beyond a lesson's original design.

Labelling students according to their perceived abilities can place obstructions in their learning. Students are more engaged and successful learners if resources and activities are provided that take their level, and learning style into consideration. When more options are available that can meet the diverse needs of individual students, they can take ownership of their learning and become more involved and successful learners.

These Skills Builder and Challenge workbooks have been written to provide this flexibility in teaching and learning, offering content that can support or stretch where and when each student needs it. They can be used to offer teachers and parents different strategies that can be applied to help children progress at times where they find subject matter more difficult or where they are ready to be challenged further in their thinking.

Overview of the Skills Builder and Challenge Workbooks

The Skills Builder and Challenge Workbooks are write-in workbooks designed to support learners who are studying the Cambridge Secondary 1 Science Curriculum Framework. They are intended for use alongside the core material in the Cambridge Checkpoint Science Coursebooks and the Cambridge Checkpoint Science Workbooks.

There are three Skills Builder Workbooks, one each for stages 7, 8 and 9. There are also three Challenge Workbooks, again one for each stage. Within each workbook, the topics are dealt with in the same sequence as in the relevant Coursebook. Topic numbers from the Coursebook are referenced at the top of each exercise, so that you can select suitable exercises to use alongside the core materials.

Who these workbooks are for

The Skills Builder Workbooks have been written to help learners who are finding difficulty with some aspects of their work. The exercises provide simple, highly structured tasks, with clear guidance, that will increase the learner's confidence and understanding. Language is kept simple, bearing in mind that these learners may still be developing their fluency in reading and writing English.

The Challenge Workbooks are designed to motivate and stretch learners who are finding some of the core work easy, and who would benefit from or choose more stimulation and challenge with some aspects of their work. The exercises are not limited to the type of task that might be found on the Progression Tests or Checkpoint Tests. This is because their intention is not to test what learners can do, but to develop skills that will help them in all aspects of their work in science and hence help them to become more confident. Many of the tasks are relatively unstructured or open-ended. Some require implementation of high-level skills such as evaluation or analysis. The tasks do not take the content to a higher level, but rather ask learners to do more difficult things with this content.

Suggestions for how you might use the Skills Builder and Challenge Workbooks with your classes are explained on pages 6 to 7 of this document.

Developing skills

All of these workbooks, like the core Cambridge Checkpoint Science Workbooks, contain exercises that concentrate on the development of skills. Knowledge and understanding of the content-based learning objectives, listed in the Biology, Chemistry and Physics strands of the Curriculum Framework, are not the main focus of the exercises. However, every exercise is firmly placed within the context of one or more of these content-based topics, and so learners will almost inevitably increase their depth and breadth of understanding of this content as they work through any exercise.

The skills covered include many of those described in the learning objectives of the Scientific Enquiry strand of the Curriculum Framework. These have been targeted because learners perform less well in questions testing these skills than in questions focusing on the learning objectives in Biology, Chemistry, or Physics. However, not all of the Scientific

Enquiry learning objectives are dealt with, because some of them can only be addressed successfully with hands-on practical activities, or with direct interaction between teacher and learner. For example, the Stage 7 Scientific Enquiry learning outcome 7Ep1, *Be able to talk about the importance of questions, evidence and explanations*, is best approached through class or group discussion. Ideas for addressing such learning objectives will be found in the many different Activities included in the Coursebook and on the Teacher Resource CD-ROM.

The exercises also include other skills that learners need to develop as they study this course, and as they move on to IGCSE, O level or other Secondary 2 courses. For example, some exercises involve converting information from one form to another – such as using a written passage to construct a flow diagram. Mathematical skills, which learners will be developing in their Cambridge Primary and Secondary 1 Mathematics courses, are frequently addressed, always with support and guidance. Learners often struggle to transfer skills learnt in one subject into another, and these exercises should help them to do this more successfully.

How to use the Skills Builder Workbooks effectively

Effective use of the Skills Builder Workbooks in the classroom will help those students who have difficulty with some topics and skills to make progress and to gain confidence. The key to making the best use of the workbooks is good planning and integrating their use into your teaching, as well as knowing your students well.

In your overall course planning, it will be helpful to use the 'Teaching ideas' section of the Teacher's Resource CD-ROM. Here the possible lessons are set out along with the resources in the core Workbook and the Worksheets (also on the CD-ROM). The Overviews of units will also be helpful. By using your students' previous work, or carefully planning a question or activity that is designed to assess students' understanding you can identify the areas that your students might be finding difficult and look for exercises in the Skills Builder Workbook that reinforce learning or practice skills.

It will mean that every student is not doing the same task at the same time. They may not complete every task. The main point is that you, and they, see that they have achieved.

For example, in Unit 7.6 Investigating acids and alkalis: you may be talking through the ideas about planning an investigation as a class or in small groups. It is often difficult for some students to grasp all the ideas here and they may need more help. You may carry out a demonstration or a class investigation of "Which powder is best at neutralising acid?" and then work through the results in the Coursebook. Some of the class may tackle the core

Workbook exercise 7.6 Planning investigations but those needing more support could do Skills Builder exercise 7.5 which covers some of the ideas of fair testing. They could then move on to the core Workbook exercise, or part of it.

This approach means you need to be flexible, in order to respond to students' different needs, assisting them to learn as well as possible. Good planning in advance can help to ensure co-ordinating the different tasks in class is manageable. A starting point may be to use the different resources to set different homework tasks. The students will soon get used to the idea that not everyone is doing the same thing but you will need to make it clear that it is progress you are looking for.

The Skills Builder Workbooks can also be used as a quick intervention to target particular topics or skills that particular students find difficult. You may, for example, identify that a student has difficulty in drawing a graph; perhaps in devising the scale or in plotting the points. Using one of the Skills Builder exercises that gives a graph already set up with scales and the first point plotted can help to give the student confidence. The Remember boxes and clear instructions will guide them through the practice they need.

How to use the Challenge Workbooks effectively

The Challenge Workbooks can be used to achieve differentiation in similar ways to the Skills Builder Workbook. You could simply set three different levels of homework tasks. But if you can integrate the Challenge Workbook tasks into your lessons, the students who work quickly will avoid becoming bored and will begin to develop the skills they will need for the next stage of their education.

The planning for lessons using the Challenge Workbooks may need careful thought, as many of the tasks are longer. For example, in Stage 7, Unit 7.4 Neutralisation: there is an exercise on reading measuring cylinders in the core Workbook, a similar exercise but with more support in the Skills Builder Workbook, and in the Challenge Workbook task 7.2 asks students to find the mistakes in a practical procedure and in task 7.3 the facts about neutralisation have to be applied in a context involving a spillage of acid from a lorry. The Challenge exercises will take longer than the other tasks, so you could spend more time on the basic skills with the rest of the class.

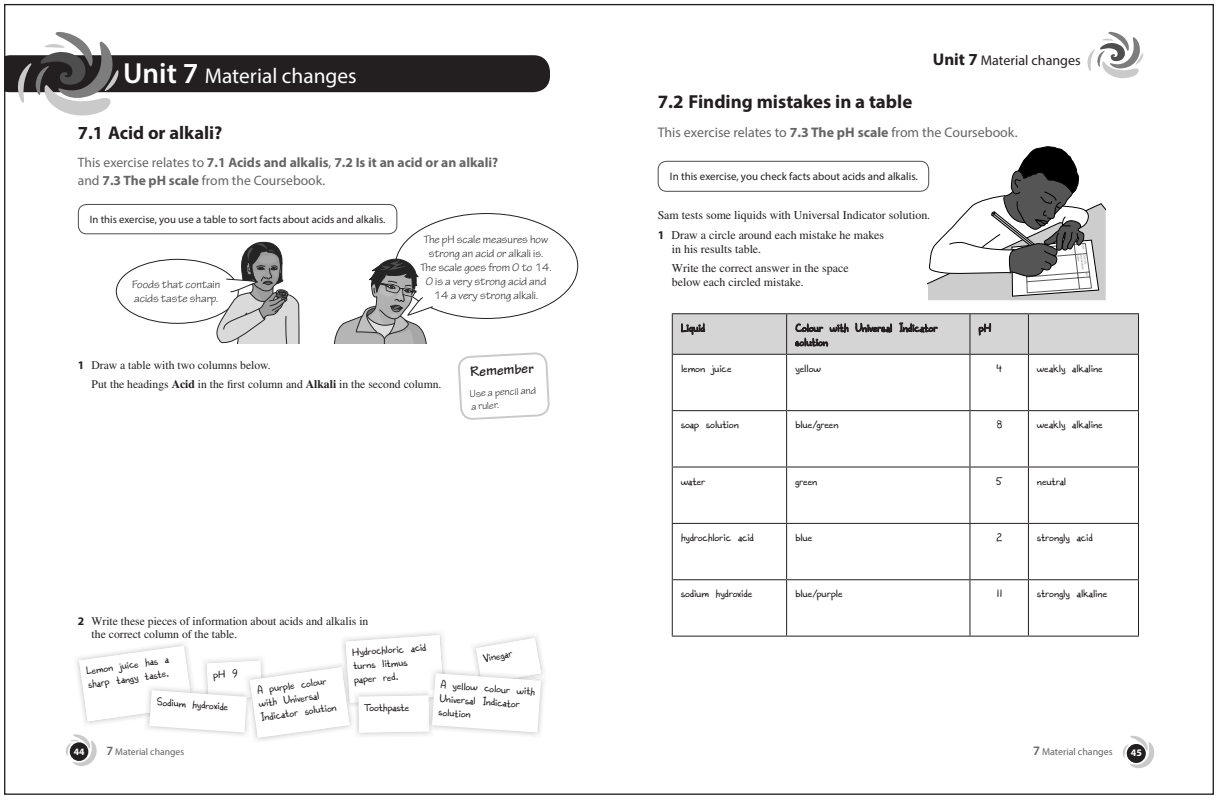
Like anything new, planning and executing good lessons where students are doing different tasks takes practice. By sharing your experiences and techniques with other teachers you will become more skilled at it. Explaining your approach to your students and why you are using it, asking for their feedback will also help you to continue to develop your methods. The benefits to the students and their progress certainly makes it worth the effort.

Look inside… Skills Builder

The Skills Builder Workbooks are written to make them accessible to those students who are struggling with some of the skills and topics in the core Checkpoint Science course. The aim is to make the students successful in each exercise, giving them confidence and building up their skills gradually.

The pages are designed to be clear and uncluttered so that the students do not have to search hard for information and are not overwhelmed by too much information. The questions are direct and only require short answers. Each exercise has clear introductory text which sets the scene and details the topics and or skills they will be working on in the task.

All of the text is presented in the present, active tense. The sentence structures have been kept short and simple so that students can access the information easily. Illustrations are used to avoid lengthy descriptions, to make unfamiliar vocabulary clear or to clarify a practical set-up or procedure.



Unit 7 Material changes

7.1 Acid or alkali?

This exercise relates to **7.1 Acids and alkalis**, **7.2 Is it an acid or an alkali?** and **7.3 The pH scale** from the Coursebook.

In this exercise, you use a table to sort facts about acids and alkalis.

Foods that contain acids taste sharp.

The pH scale measures how strong an acid or alkali is. The scale goes from 0 to 14. 0 is a very strong acid and 14 a very strong alkali.

1 Draw a table with two columns below.
Put the headings **Acid** in the first column and **Alkali** in the second column.

Remember
Use a pencil and a ruler.

2 Write these pieces of information about acids and alkalis in the correct column of the table.

Lemon juice has a sharp tangy taste.
pH 9
Sodium hydroxide
A purple colour with Universal Indicator solution
Hydrochloric acid turns litmus paper red.
Toothpaste
Vinegar
A yellow colour with Universal Indicator solution

44 7 Material changes

Unit 7 Material changes

7.2 Finding mistakes in a table

This exercise relates to **7.3 The pH scale** from the Coursebook.

In this exercise, you check facts about acids and alkalis.

Sam tests some liquids with Universal Indicator solution.

1 Draw a circle around each mistake he makes in his results table.
Write the correct answer in the space below each circled mistake.

Liquid	Colour with Universal Indicator solution	pH	
lemon juice	yellow	4	weakly alkaline
soap solution	blue/green	8	weakly alkaline
water	green	5	neutral
hydrochloric acid	blue	2	strongly acid
sodium hydroxide	blue/purple	11	strongly alkaline

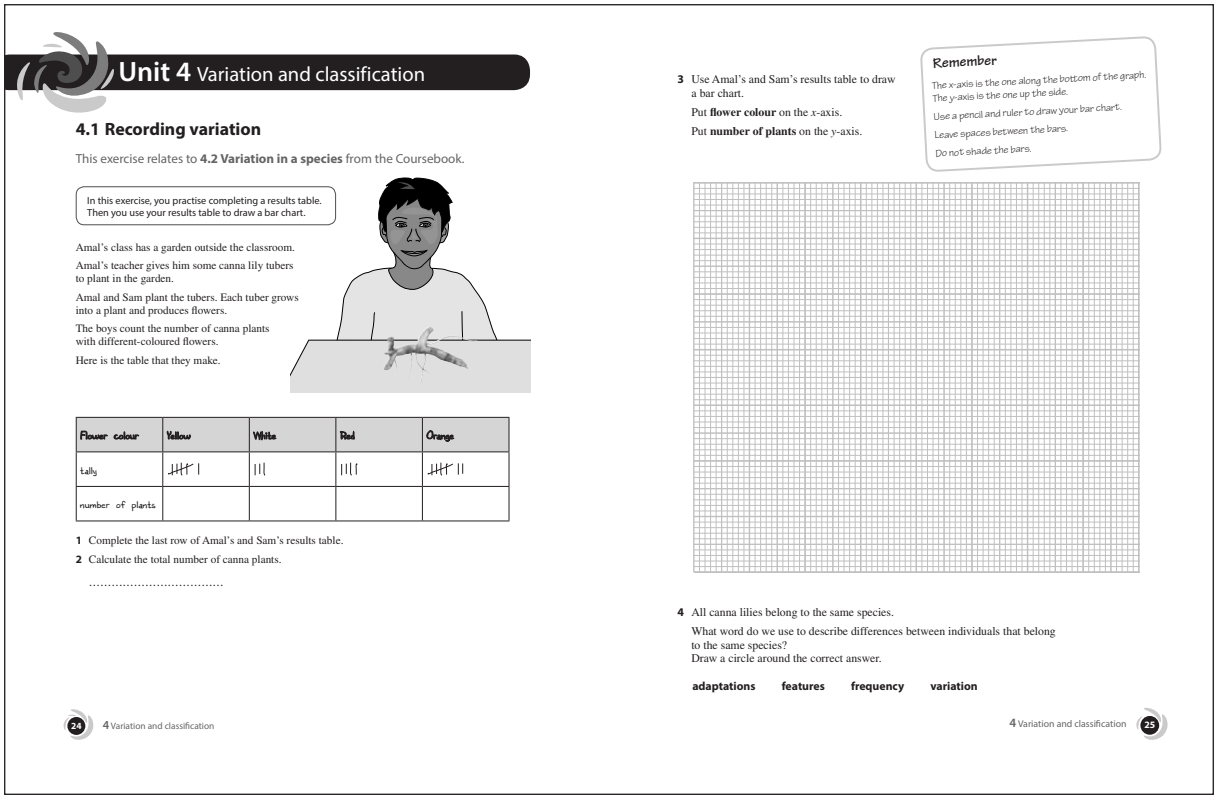
7 Material changes 45

Skills Builder 7, pp 44-45 9781316637180

We have used a group of six fictitious students throughout, to help illustrate the tasks throughout the series of workbooks; these six students are introduced in the stage 7 workbooks. They are often presented discussing the topic of the exercise, with the aim of helping your learners relate to the tasks given.

The questions are structured so that the student is not afraid to attempt an answer. Some questions only require students to tick boxes so that they can concentrate on the science in question, rather than composing an answer. These questions will however require reading and thinking to establish the correct answer. Where an explanation of an answer is required we have given the learners some framework so that they can structure their answers rather than being faced with a large number of writing lines.

Many of the tasks relate to skills that are needed in presenting or analysing data. Tasks are included cover this same broad skill area in all the three sciences to give plenty of practice. Some of these skills are basic: such as labelling a diagram, drawing up a results table or completing a tally chart.



Unit 4 Variation and classification

4.1 Recording variation

This exercise relates to **4.2 Variation in a species** from the Coursebook.

In this exercise, you practise completing a results table. Then you use your results table to draw a bar chart.

Amal's class has a garden outside the classroom.
Amal's teacher gives him some canna lily tubers to plant in the garden.
Amal and Sam plant the tubers. Each tuber grows into a plant and produces flowers.
The boys count the number of canna plants with different-coloured flowers.
Here is the table that they make.

Flower colour	Yellow	White	Red	Orange
tally	𝍸 I	III	IIII	𝍸 II
number of plants				

1 Complete the last row of Amal's and Sam's results table.
2 Calculate the total number of canna plants.
.....

3 Use Amal's and Sam's results table to draw a bar chart.
Put **flower colour** on the *x*-axis.
Put **number of plants** on the *y*-axis.

Remember
The *x*-axis is the one along the bottom of the graph.
The *y*-axis is the one up the side.
Use a pencil and ruler to draw your bar chart.
Leave spaces between the bars.
Do not shade the bars.

4 All canna lilies belong to the same species.
What word do we use to describe differences between individuals that belong to the same species?
Draw a circle around the correct answer.

adaptations **features** **frequency** **variation**

24 4 Variation and classification

4 Variation and classification 25

Skills Builder 7 pp 24-25 9781316637180

We have built up the skills, for example, of plotting a bar chart or a graph over the three stages, 7, 8 and 9, of the Skills Builder Workbooks. At each level we have increased the difficulty and removed some of the help given in the earlier stages. For example in the early stages we have provided the scales for graphs, shown partly completed graphs and/or given very specific instructions.

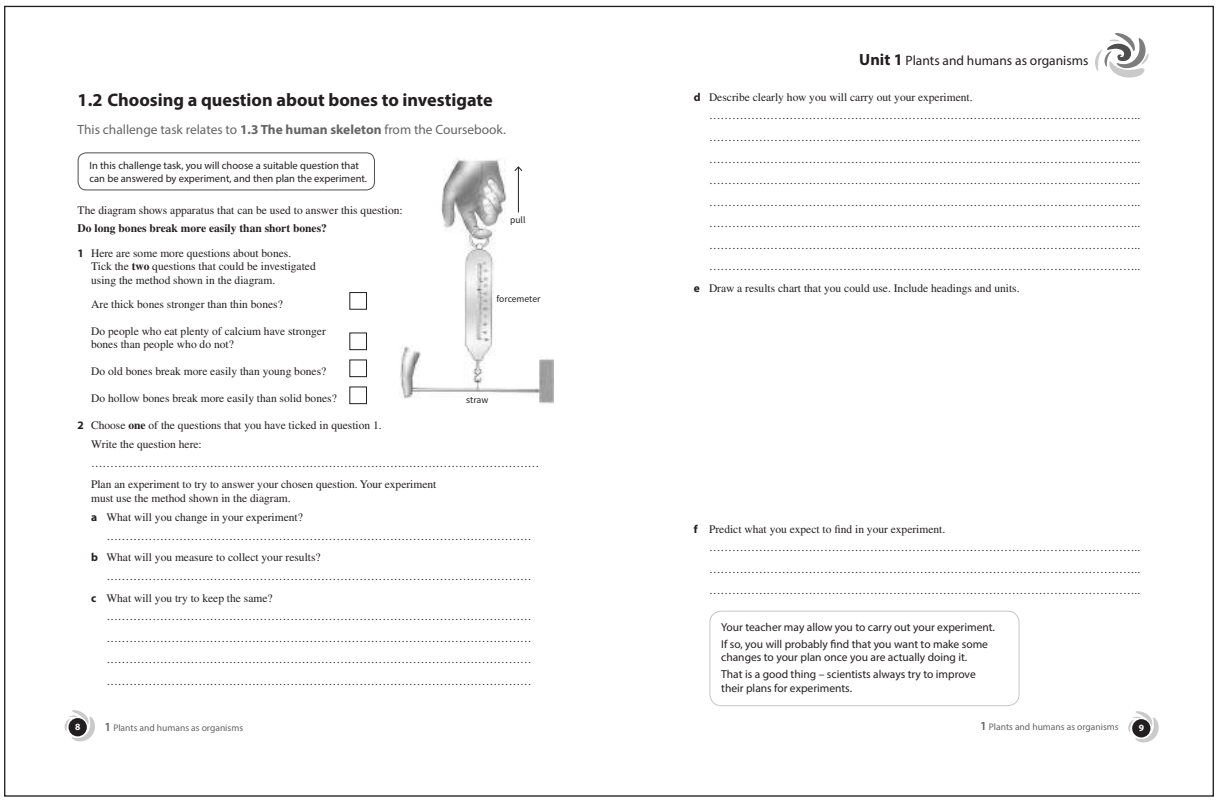
To help the students and to encourage a little self-reliance we have provided 'Remember' boxes with tips or instructions for when they are stuck. This should reduce the number of times they need to ask for help.

The whole purpose of the Skills Builder workbooks is to build the confidence and the skills needed in this course and the books are written so that small steps can be made to guide the students towards success.

Look inside… Challenge

The Challenge Workbooks are written as an extension to the core Checkpoint Science Workbooks and questions in the Coursebooks. The aim, as their name suggests, is to give more demanding questions and hence to further students' progress in higher-order thinking and skills. The progression is in skills rather than content, so each Challenge Workbook stretches the learner within the relevant stage of the Curriculum Framework without requiring coverage of content in the next higher stage.

While the language level has been carefully controlled, the Challenge tasks require a higher level of reading and literacy skills than the Skills Builder exercises. The page layouts cue less visual learning and involve more reading and data, but an open attractive layout has been retained.



1.2 Choosing a question about bones to investigate

This challenge task relates to **1.3 The human skeleton** from the Coursebook.

In this challenge task, you will choose a suitable question that can be answered by experiment, and then plan the experiment.

The diagram shows apparatus that can be used to answer this question:
Do long bones break more easily than short bones?

1 Here are some more questions about bones.
Tick the **two** questions that could be investigated using the method shown in the diagram.

- Are thick bones stronger than thin bones? ☐
- Do people who eat plenty of calcium have stronger bones than people who do not? ☐
- Do old bones break more easily than young bones? ☐
- Do hollow bones break more easily than solid bones? ☐

2 Choose **one** of the questions that you have ticked in question 1.
Write the question here:

.....

Plan an experiment to try to answer your chosen question. Your experiment must use the method shown in the diagram.

a What will you change in your experiment?

.....

b What will you measure to collect your results?

.....

c What will you try to keep the same?

.....

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.....

.....

d Describe clearly how you will carry out your experiment.

.....

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e Draw a results chart that you could use. Include headings and units.

f Predict what you expect to find in your experiment.

.....

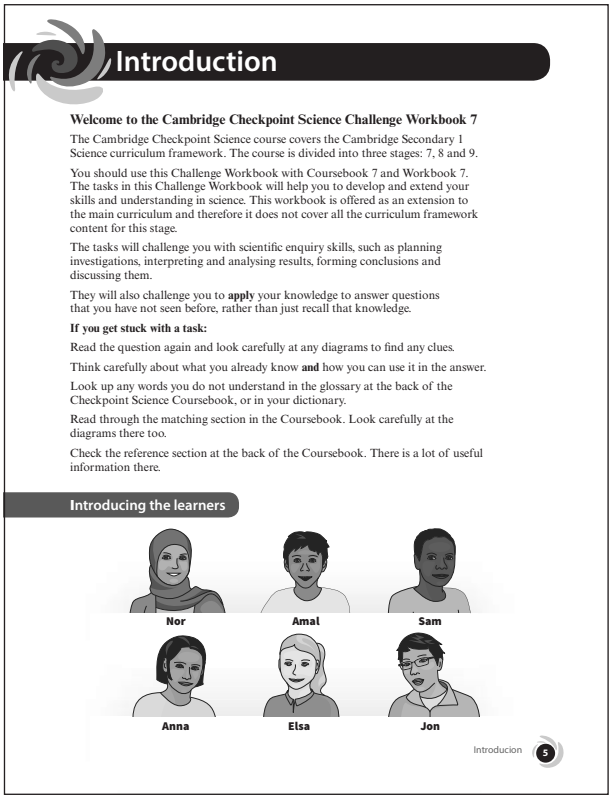
.....

.....

Your teacher may allow you to carry out your experiment.
If so, you will probably find that you want to make some changes to your plan once you are actually doing it.
That is a good thing – scientists always try to improve their plans for experiments.

Challenge 7, pp 8-9 9781316637197

The six learner characters are introduced again in Challenge Stage 7. These characters are used to make the questions more accessible to readers and to give more context to questions that are based upon investigations.



Introduction

Welcome to the Cambridge Checkpoint Science Challenge Workbook 7

The Cambridge Checkpoint Science course covers the Cambridge Secondary 1 Science curriculum framework. The course is divided into three stages: 7, 8 and 9.

You should use this Challenge Workbook with Coursebook 7 and Workbook 7. The tasks in this Challenge Workbook will help you to develop and extend your skills and understanding in science. This workbook is offered as an extension to the main curriculum and therefore it does not cover all the curriculum framework content for this stage.

The tasks will challenge you with scientific enquiry skills, such as planning investigations, interpreting and analysing results, forming conclusions and discussing them.

They will also challenge you to **apply** your knowledge to answer questions that you have not seen before, rather than just recall that knowledge.

If you get stuck with a task:

Read the question again and look carefully at any diagrams to find any clues.

Think carefully about what you already know **and** how you can use it in the answer.

Look up any words you do not understand in the glossary at the back of the Checkpoint Science Coursebook, or in your dictionary.

Read through the matching section in the Coursebook. Look carefully at the diagrams there too.

Check the reference section at the back of the Coursebook. There is a lot of useful information there.

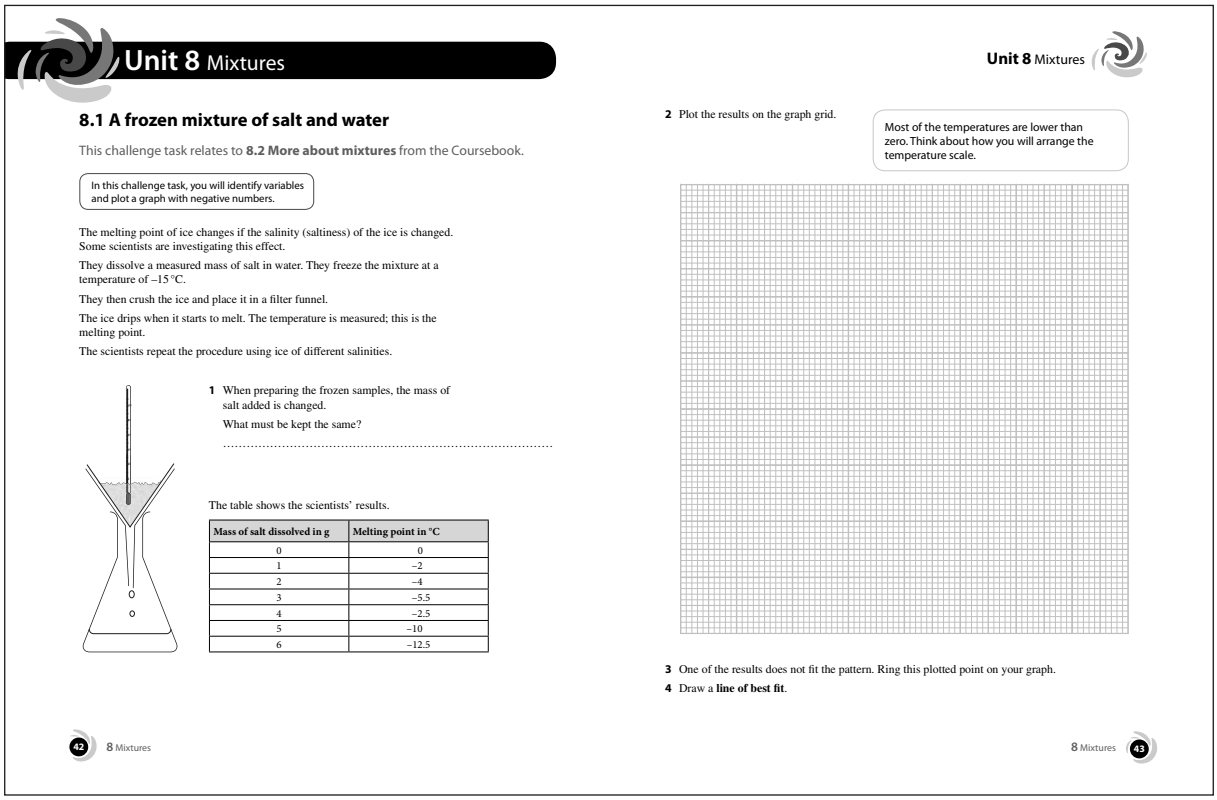
Introducing the learners

Challenge 7, p5 9781316637234

Many of the questions in the Challenge Workbooks focus on the learning objectives in the Scientific Enquiry strand of the Curriculum Framework. The skills required to answer these questions are of a higher level than those required for recall of facts or for the application of factual knowledge. Learners are expected to carry out extended writing, such as investigation plans, carry out calculations, make their own decisions about presentation of data, analyse and compare data, draw conclusions and make evaluations.

There is progression through the three Stages, 7, 8 and 9. At each stage we have increased the level of demand and reduced the level of scaffolding. For example, the trends in some of the graphs become more complex between Stages 7 and 8.

The purpose of the Challenge series of workbooks is to provide a valuable teaching tool in your classroom that will extend differentiated learning through challenging, interesting and relevant questions.



Unit 8 Mixtures

8.1 A frozen mixture of salt and water

This challenge task relates to **8.2 More about mixtures** from the Coursebook.

In this challenge task, you will identify variables and plot a graph with negative numbers.

The melting point of ice changes if the salinity (saltiness) of the ice is changed. Some scientists are investigating this effect.

They dissolve a measured mass of salt in water. They freeze the mixture at a temperature of –15 °C.

They then crush the ice and place it in a filter funnel.

The ice drips when it starts to melt. The temperature is measured; this is the melting point.

The scientists repeat the procedure using ice of different salinities.

1 When preparing the frozen samples, the mass of salt added is changed.

What must be kept the same?

.....

The table shows the scientists' results.

Mass of salt dissolved in g	Melting point in °C
0	0
1	–2
2	–4
3	–5.5
4	–2.5
5	–10
6	–12.5

2 Plot the results on the graph grid.

Most of the temperatures are lower than zero. Think about how you will arrange the temperature scale.

3 One of the results does not fit the pattern. Ring this plotted point on your graph.

4 Draw a **line of best fit**.

Challenge 8, pp 42-43 9781316637234

Author biographies

Mary Jones

Mary obtained an MSc in Zoology from the University of Oxford. She has worked as a teacher and a lecturer in different types of educational institution, teaching students of all ages.

Mary's greatest interest is in sharing her love of science with young learners. She has written many textbooks, in which she aims to encourage learners to 'think like a scientist'. Her long involvement in examining and in training has given her insight into the difficulties that learners all over the world have in understanding some topics in science, and this has informed her writing approach. She is passionate about the need to develop skills rather than just accumulating knowledge – skills that are vital for students to be successful as they move into higher education or the world of work.

Diane Fellowes-Freeman

Diane is a graduate of the University of London and of the Centre of Science Education, King's College, London. She has almost 40 years of classroom experience, much of it as Head of Science in large secondary schools in the UK and a short time in the primary sector. She has a record of improving both the quality of teaching and students' achievements in her departments.

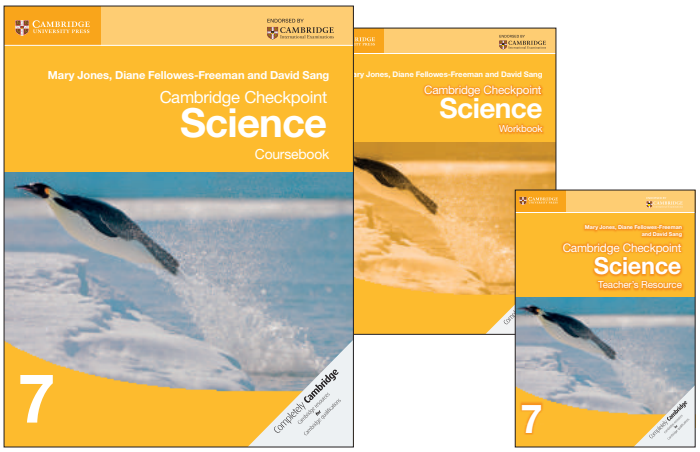
Over many years Diane was involved with training teachers, as a school-based mentor and an assessor, which she regards as a privilege. She has enjoyed speaking at training sessions in the UK and internationally. She hopes these resources will help your students to make progress save you time, help your planning and provide you with some inspiration.

Michael Smyth

Michael graduated with a PhD in Biophysics and began his career in research at the University of Oxford. His enthusiasm for both science and education then led him into full-time teaching. Michael spent most of his teaching career as a Head of Science in a leading UK private school, which taught across the age ranges from kindergarten to A-level. He significantly raised attainment in the sciences at this school.

Michael remains passionate about the sciences and science education, realising that teachers of today are preparing the scientists of tomorrow.

The Checkpoint Science suite



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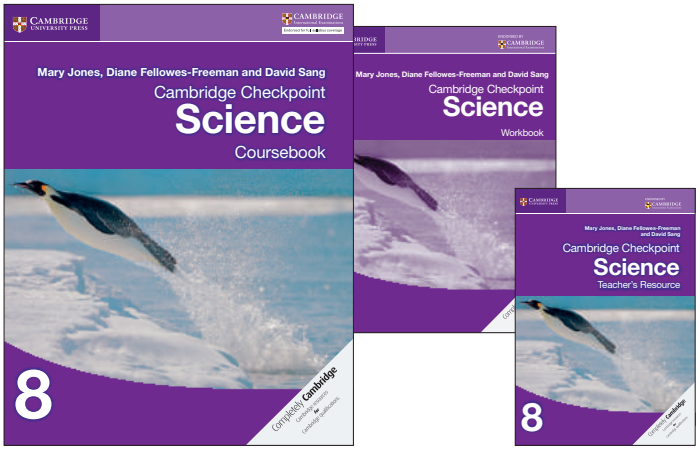

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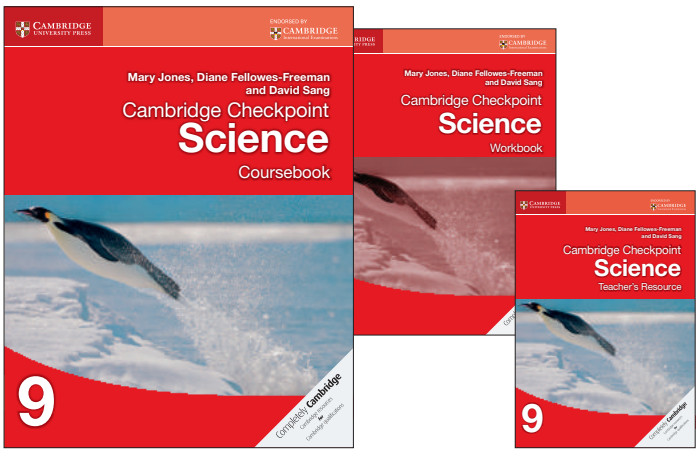

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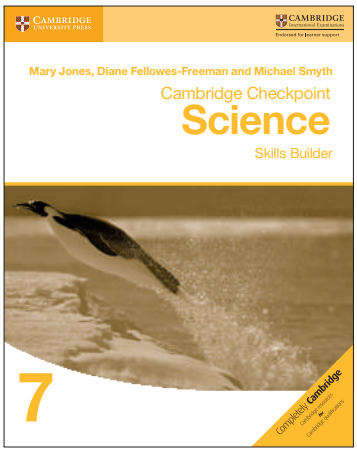

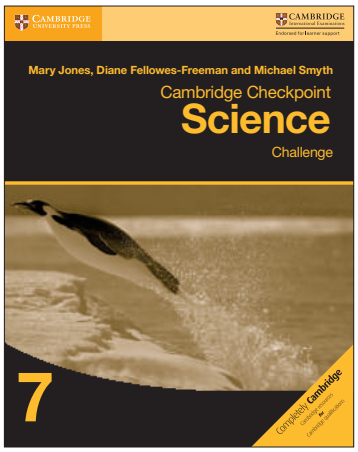

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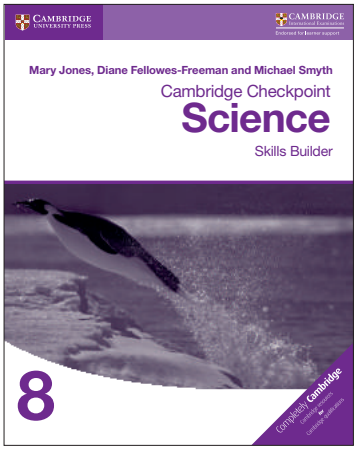

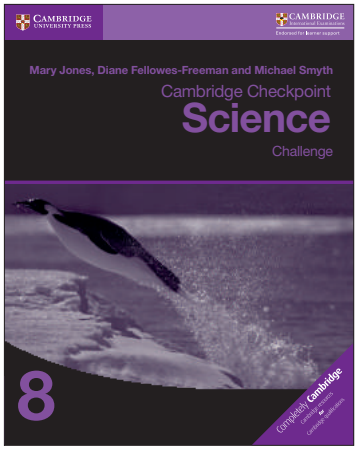

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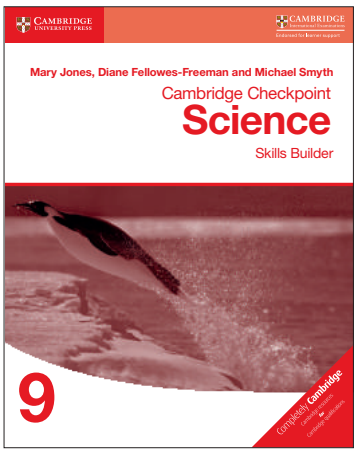

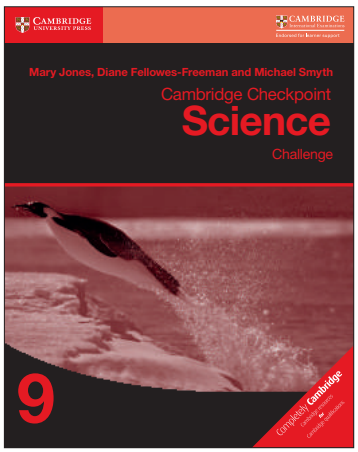

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