marshall cavendish education

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Cambridge IGCSE™ Physics Chemistry Biology

Beyond Basics, Reimagine Education

Marshall Cavendish Education Cambridge IGCSE™ Physics, Chemistry and Biology are comprehensive two-year programmes designed to support learners with their study of the Cambridge IGCSE and IGCSE (9-1) Physics (0625/0972), Chemistry (0620/0971) and Biology (0610/0970) syllabuses.

Developed based on robust research, these series bring Science learning to life by focusing on real-life examples to which learners can relate. They are designed to excite and engage learners to be curious about scientific concepts, and to promote a deep understanding of topics. This is done by giving learners plenty of opportunities to practise learnt skills, reflect on concepts and share, discuss or journal what they have learnt.

Each series consists of both print and digital learning resources that support blended learning. This provides learners with a more complete and flexible learning experience.

Recognising that there is a potentially diverse student population whose first language is not English, these series use simple and clear language with plenty of visual representations and also feature a mix of cultural examples for the international audience.

They also cater to learners at various levels of learning readiness by providing additional support and enrichment resources. Overall, these series will provide learners with scientific skills and knowledge for success, and nurture them into confident critical thinkers who are ready for the future.

What's in Our Package?

Student's Book

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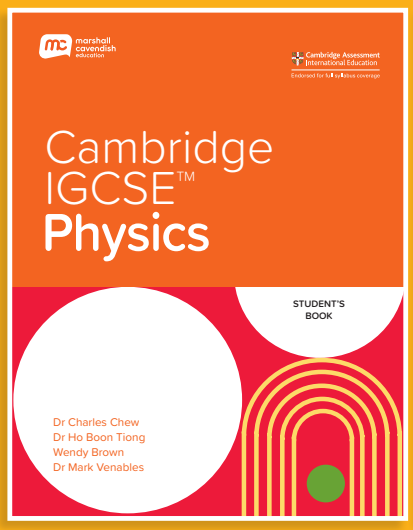

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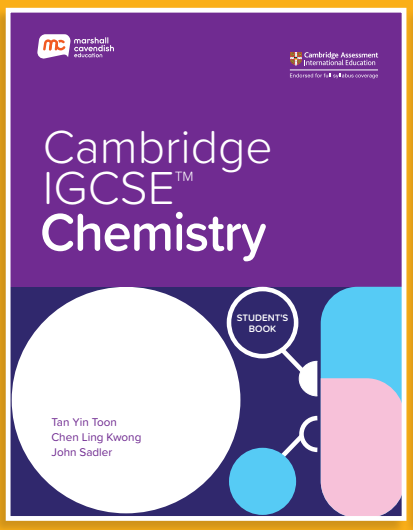

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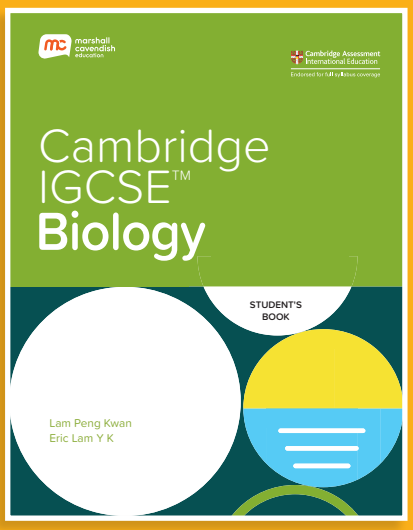

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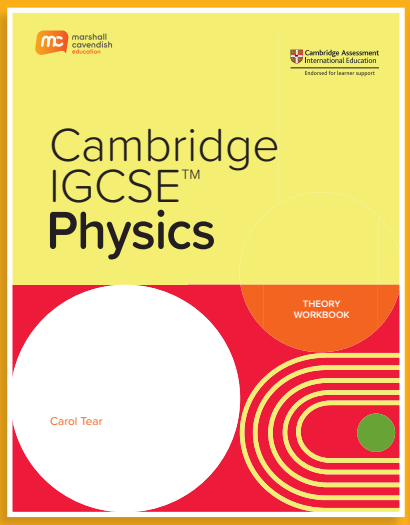

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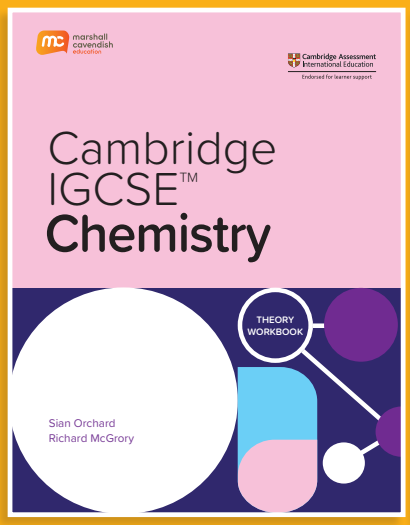

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Practical Workbook

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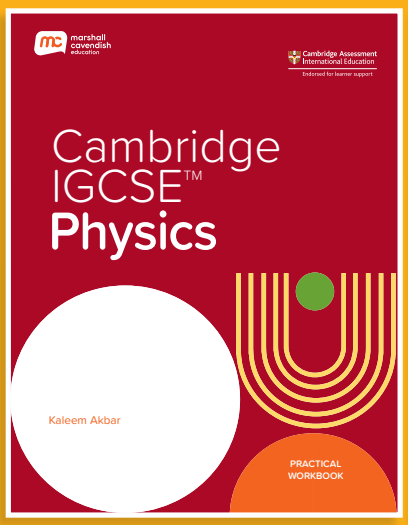

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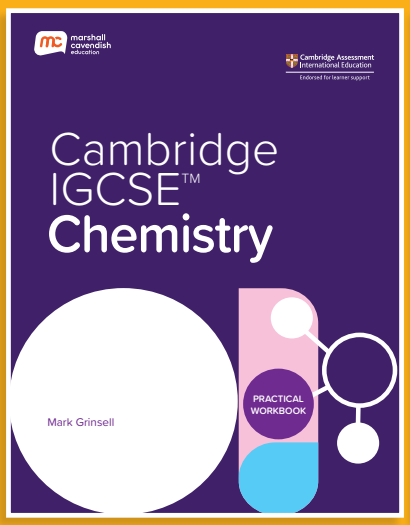

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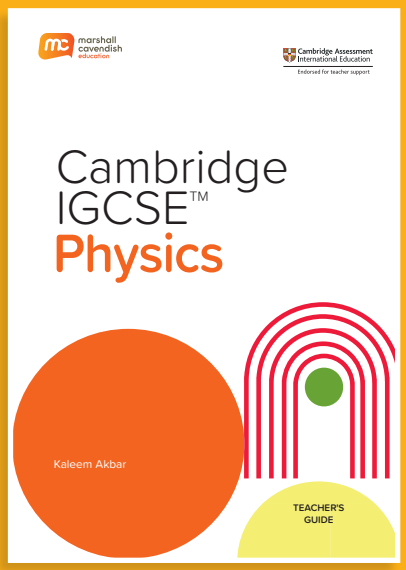

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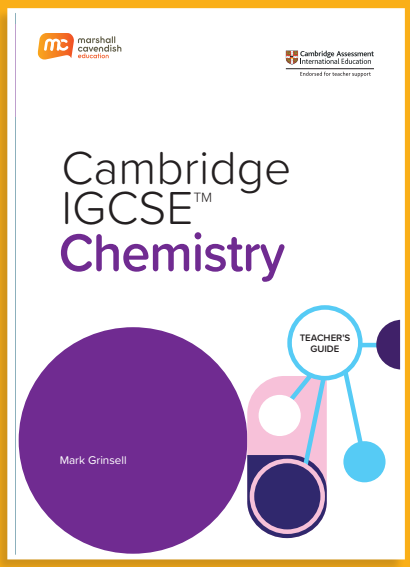


ISBN 9789814927963

Additional Digital Resources*

- Enhanced eBooks
- Full Solutions for Student's Book and Workbooks
- Printable Mind Maps
- Editable Resources:
  - Scheme of Work
  - Lesson Plans
  - Question Bank
  - PowerPoint Slides

**These resources will not go through the Cambridge International endorsement process.*

1 **Reduce Learning Obstacles and Achieve Proficiency in Concepts**

2 **Build Learners' Confidence and Exam-Readiness**

3 **Prepare Learners for the Future with 21st Century Competencies**

4 **Promote Global Awareness with International Context**

5 **Enhance Teaching and Learning Effectiveness with Digital Resources**

Developed based on robust research to cater to learners of different learning readiness, these series will guide and support learners to overcome learning obstacles and foster a deeper understanding of concepts. With its clear and simple language, these series are designed to promote better understanding among international learners whose first language is not English. With the series' engaging content that enriches and enhances learning, learners will learn to appreciate the relevance of Science in their lives.

Visually Engaging Chapter Opener
Creates interest in the topic through real-life examples and thought-provoking questions.

Biology Student's Book

Watch Feature
Engages learners by using relatable examples demonstrated through videos, animations and interactives such as simulations and quizzes.

Real-life Examples
Coupled with rich visuals and information, they help to promote the relevance of concepts.

Questions
Assist educators to assess learners' prior knowledge by asking interesting questions on the topic.

Watch Feature

Presents information in different ways to promote understanding of concepts and offer real-life relevance.

Using MCE Cambridge IGCSE™ mobile application, learners can scan the physical page and view the resources on their mobile devices. Learners can also click and access the Watch feature from the eBooks on MCEduhub and the MCE Cambridge IGCSE mobile application.

Available in Chapter Openers and within some chapters.

Visual correction for short-sightedness

A person is short-sighted when his or her eyeball is longer than normal along the horizontal axis from the lens to the retina. The eye can still focus on near objects, but parallel light rays from distant objects are focused in front of the retina, forming a blurred image (Figure 12.58).

Short-sightedness can be corrected by wearing spectacles with concave lenses to diverge the rays from distant objects before they reach the eye. The diverged rays can then be focused onto the retina and this will enable the person to see distant objects clearly (Figure 12.59).

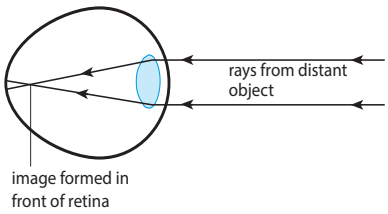


Figure 12.58 *Short-sightedness — image forms in front of the retina*

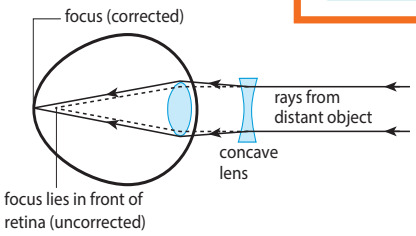
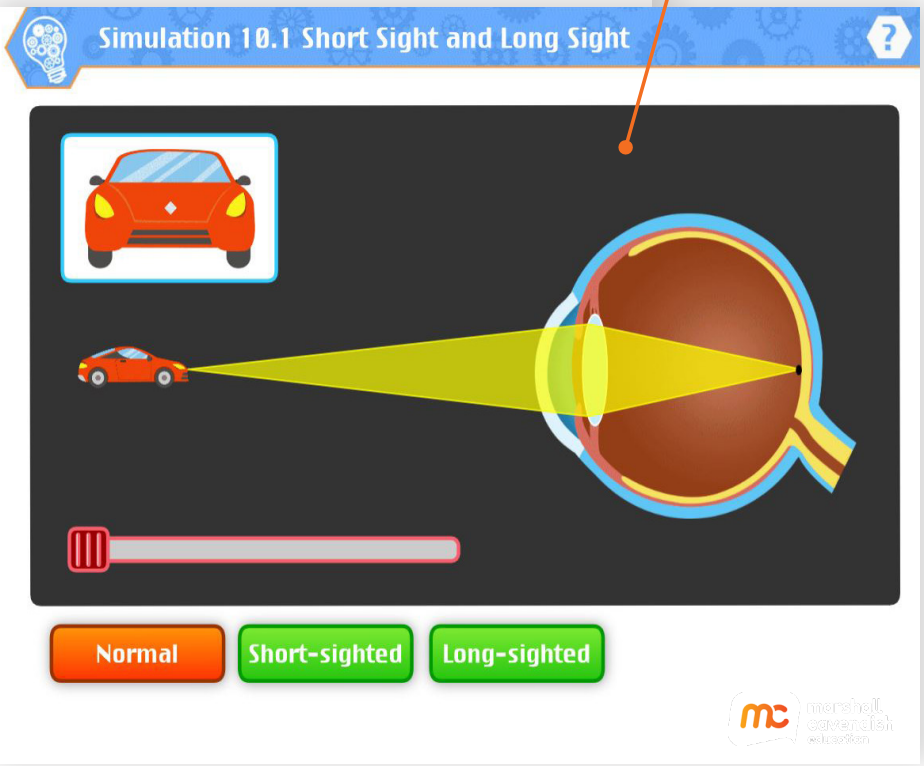


Figure 12.59 *Correcting short-sightedness with a concave lens*

PHYSICS WATCH

Scan this page to explore a simulation on short sight and long sight.



Learning Aims
Identify areas of focus and serve as a checklist for learners.

Enrichment (Info)
Provides interesting nuggets of information that help learners connect with real-life examples and deepen understanding.

Quick Check
A timely checkpoint for learners to assess their understanding of concepts.

Headings and Subheadings
Phrased as questions to encourage curiosity and scientific inquiry in learners.

Word Alert
Provides information on words or explains difficult words in a simpler way for better understanding of content.

Content is presented in highly visual and bite-sized chunks to guide learners' thinking process and enable them to understand difficult concepts.

1.1 States of Matter

In this section, you will learn the following:
- State the properties of solids, liquids and gases.

Matter is a substance that has mass and occupies space. All living and non-living things are matter.

Matter can exist as a solid, a liquid or a gas. These three forms of matter are called the states of matter. The three states of matter have very different properties (Table 1.1).

Table 1.1 Properties of solids, liquids and gases

Property	Solid	Liquid	Gas
Shape	Fixed	Not fixed	Not fixed
Volume	Fixed	Fixed	Not fixed
Compressibility	Cannot be compressed	Cannot be compressed	Can be compressed

Substances can exist in different states of matter under different temperature and pressure conditions. Changes in temperature and pressure can change the states of matter. For example, on freezing, water becomes ice; on boiling, water becomes steam. We will learn more about the changes of state of matter in Section 1.3.

ENRICHMENT INFO

Other States of Matter

Besides solids, liquids and gases, there are two other states of matter — plasma and the Bose–Einstein condensate. Plasma is made of particles that are electrically charged. A Bose–Einstein condensate is a state of matter that has been cooled to a very low temperature.

QUICK CHECK

Gases do not have mass.
True or false?

1.2 Kinetic Particle Theory

In this section, you will learn the following:
- Describe the structures of solids, liquids and gases.

The differences in the properties of the states of matter can be explained based on the kinetic particle theory. The **kinetic particle theory** states that all matter is made up of *tiny particles* that are in *constant random motion.*

The word 'kinetic' refers to motion. Moving particles have kinetic energy, hence the name 'kinetic particle theory'. The kinetic particle theory
- describes the states of matter;
- explains the differences in the properties of solids, liquids and gases;
- explains the changes of state of matter.

Why does a solid have a fixed shape?

According to the kinetic particle theory, the particles of a solid
- are closely packed in an orderly manner (Figure 1.1);
- are held together by very strong forces of attraction;
- have enough kinetic energy to vibrate and rotate about their fixed positions only;
- cannot move about freely.

Hence, a solid has a fixed shape.

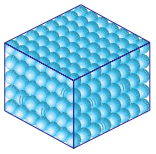


Figure 1.1 Particles are closely packed together in a solid.

Why does a solid have a fixed volume?

A solid cannot be compressed since its particles are already very close to one another. Thus, a solid has a fixed volume.

WORD ALERT

Compressed: squeezed into a smaller space

Chemistry Student's Book

Enrichment (Think)
Poses challenging questions to prompt higher-level critical thinking.

Link
Builds relationships between information in earlier and later chapters, or directs learners to the relevant pages in Theory Workbook or Practical Workbook.

Helpful Notes
Useful bite-sized notes and study tips for learners.

ENRICHMENT *THINK*

At low temperatures, enzymes are inactive but not destroyed.

1 Why do we place meat in the freezer?

2 Why does meat need to be cooked as soon as it is thawed?

ENRICHMENT *THINK*

Do you think denaturation is a reversible process?

LINK PWB

Practical 5A, pp. 39–41

HELPFUL NOTES

The reciprocal of time (T) means $\frac{1}{T}$.

For example:

Time (sec)	10	20	30
$\frac{1}{T}$	0.1	0.2	0.3

Denaturation is the change in the three-dimensional structure of an enzyme or any other soluble protein, caused by heat or chemicals such as acids or alkalis.

Denaturation results in the loss or alteration of the enzyme's active site (Figure 5.8). The substrate can no longer fit into the enzyme's active site, and no reaction will occur. Hence, when an enzyme is denatured, it can no longer act as a catalyst.

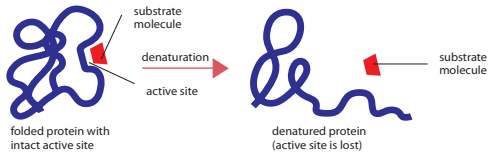


Figure 5.8 At temperatures above 45°C, some enzymes are denatured. Enzymes lose their active sites when they are denatured.

Let's Investigate 5A

Objective

To investigate how temperature affects enzyme action

Procedure

1 Label and fill test tubes A_1, B_1, C_1 and D_1 with 5 cm^3 of starch solution respectively.

2 Label and fill test tube D_2 with 3 cm^3 of distilled water, and test tubes A_2, B_2 and C_2 with 3 cm^3 of diastase solution respectively.

3 Set up the experiment as shown in Figure 5.9 by placing the test tubes into water baths of varying temperatures:
- A_1, A_2: 0°C
- B_1, B_2: 37.0°C
- C_1, C_2: 100.0°C
- D_1, D_2: 37.0°C

4 Pour the contents of test tubes A_2, B_2, C_2 and D_2 into test tubes A_1, B_1, C_1 and D_1, respectively.

5 Test the solution in each test tube (A_1, B_1, C_1 and D_1) for the presence of starch using iodine solution.

6 Observe and record your results.

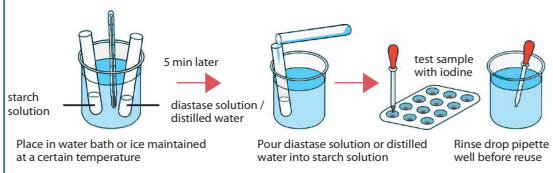


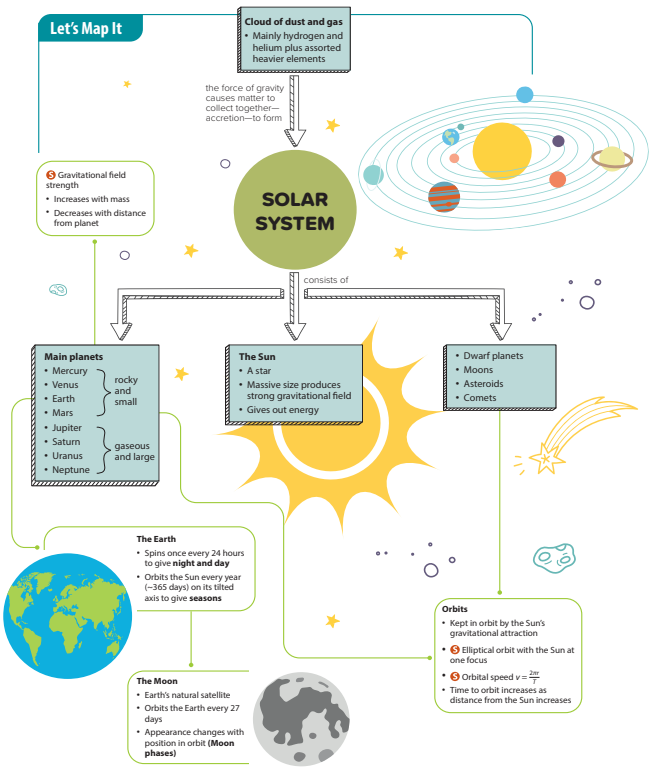
Figure 5.9 Experimental set-up to show how temperature affects enzyme activity

Discussion

The less time taken to digest starch, the more active the enzyme is. In this investigation, enzyme activity is measured by calculating $\frac{1}{T}$ (the reciprocal of the time taken to digest starch). What can you conclude about the effect of temperature on the activity of diastase from the graph of $\frac{1}{T}$ against temperature?

Biology Student's Book

Let's Map It

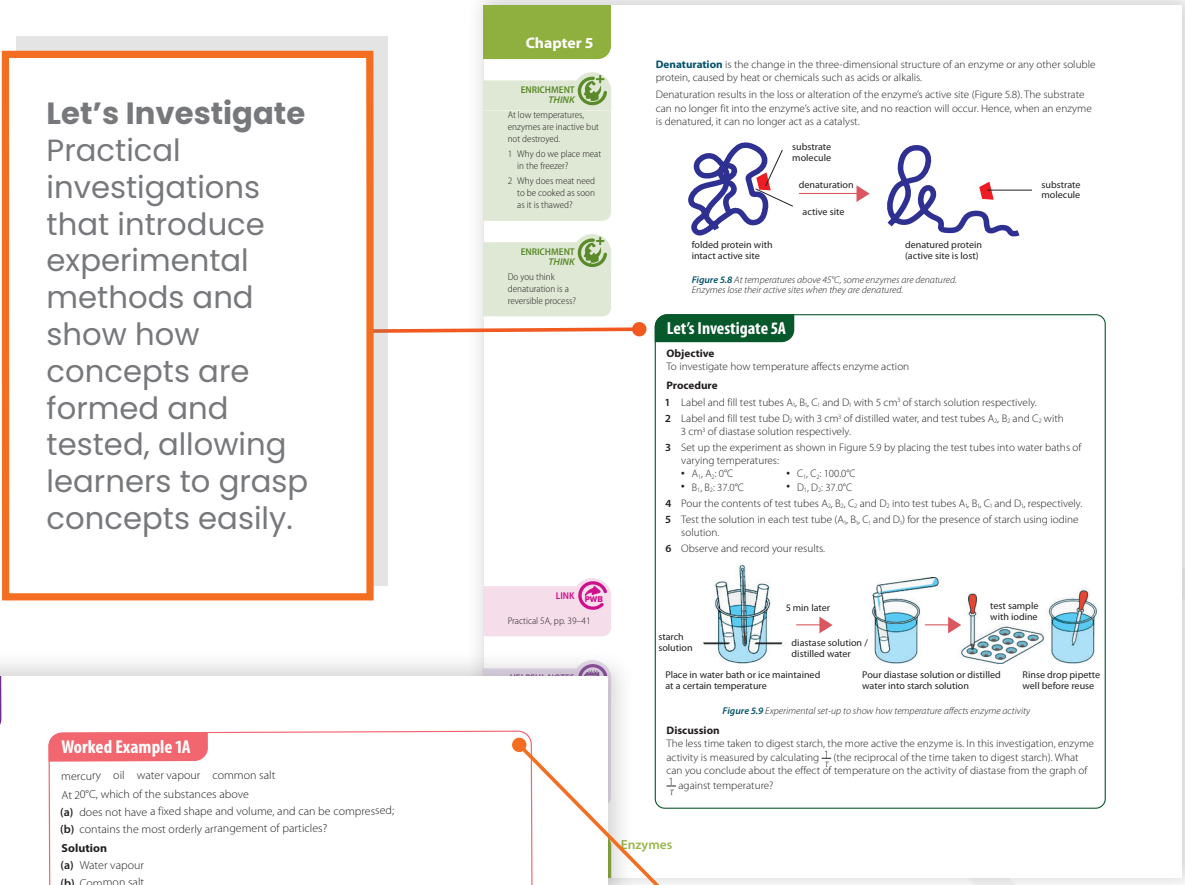


Physics Student's Book

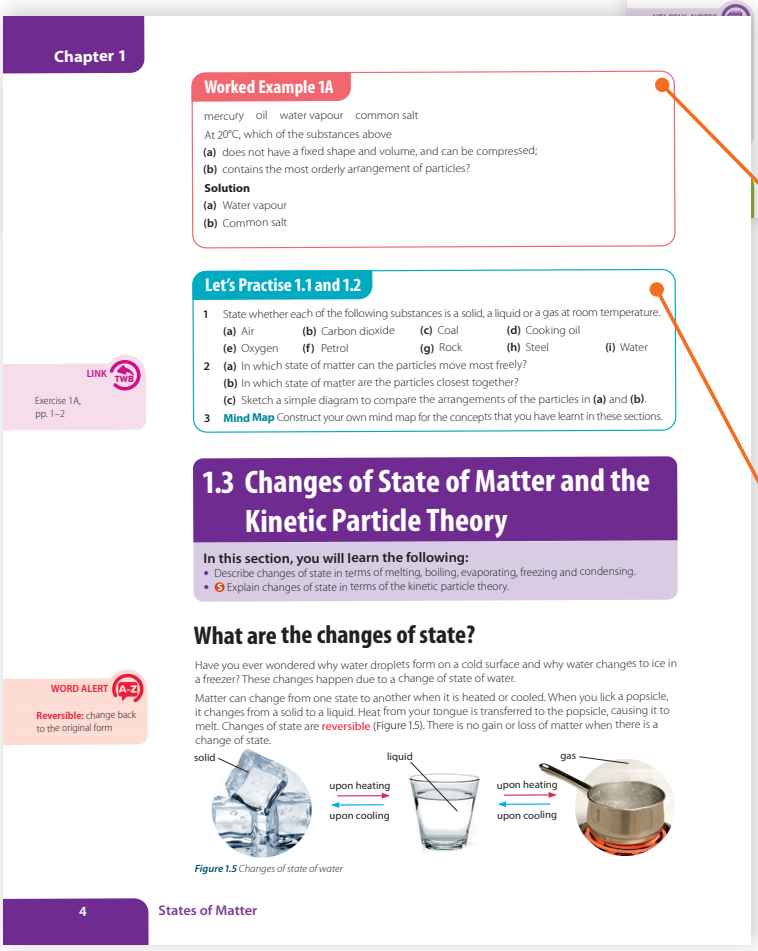
Let's Map It
A visual tool to help learners understand the relationship between concepts and consolidate information covered in the chapter.

Designed to build learners' confidence and exam-readiness, these series are accompanied by ample assessment opportunities to enhance and reinforce learning. Learners are guided to transfer and apply their scientific knowledge to various contexts that can hone their process, practical, and problem-solving skills.

Let's Investigate
Practical investigations that introduce experimental methods and show how concepts are formed and tested, allowing learners to grasp concepts easily.



Biology Student's Book



Chemistry Student's Book

Worked Examples
Demonstrate how to answer questions or work out a problem to guide learners in the application of knowledge.

Let's Practise
Practices that allow for an assessment of how well learners have understood the section.

Let's Review

Exam-style questions at the end of a chapter that act as a form of summative assessment and aim to create confidence in learners that they have mastered the topic.

Let's Reflect

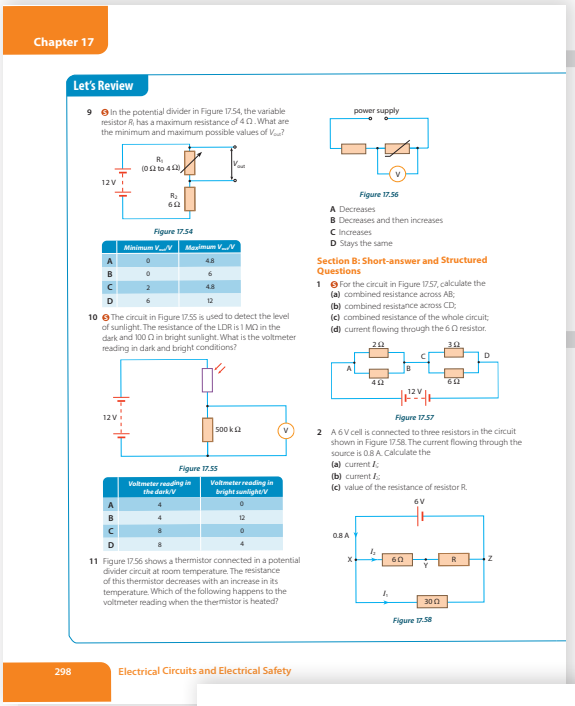
Allows learners to review and reflect on their learning, which helps to identify gaps in learning that they can work on.

Exercises

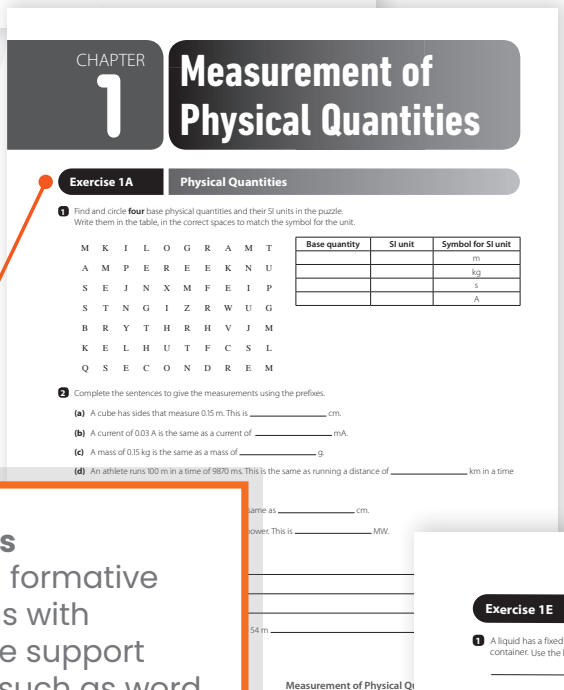
Selected formative questions with language support formats such as word search that help build up learners' vocabulary.

Exam-style Questions

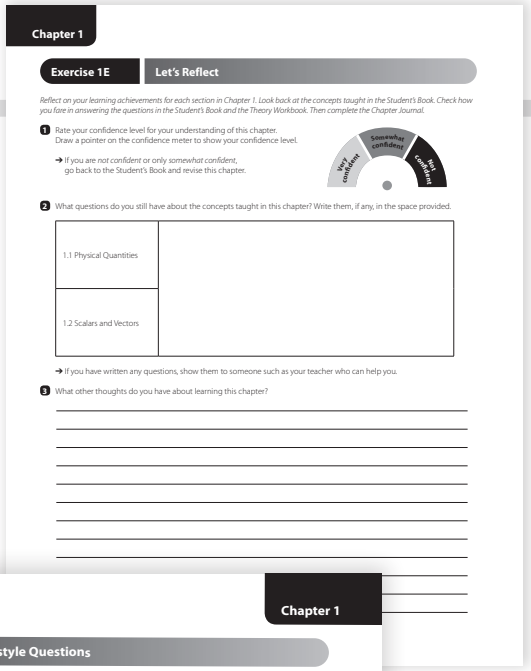
Past paper questions or exam-style questions which provide exposure to different question types to build exam-readiness in learners.



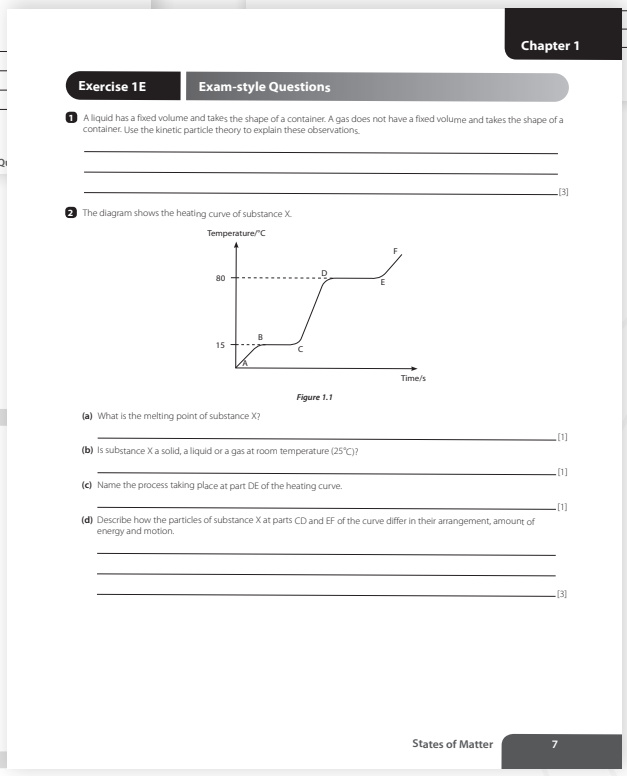
Physics Student's Book



Physics Theory Workbook



Physics Theory Workbook



Chemistry Theory Workbook

Practical Workbook

Practical experiments are structured to promote a deeper understanding of concepts and develop experimental skills and techniques.

Experimental skills
Highlight the practical skills that learners will practise in the experiment.

Practical tips
Warn learners of potential hazards in the laboratory and help them develop good laboratory practices.

Theory
Related background information and concepts are highlighted to introduce the experiment.

Chapter 1

Practical 1B The Evaporation of Propanone

Skills

You will practise how to:
- follow a set of instructions to measure the temperature change over time as propanone evaporates;
- safely use a flammable liquid;
- measure temperature;
- consider the control of variables;
- plot a graph.

Theory:

Propanone is a liquid with a relatively low boiling point. The evaporation of a liquid absorbs energy.

Objective: To measure the temperature change when a liquid evaporates

Materials:
- thermometer
- cotton wool
- elastic band
- dropping pipette
- 1 cm^3 propanone (flammable, moderate hazard)
- retort stand
- stopwatch

Procedure:

⚠ *Put on safety goggles before you start the experiment. Keep propanone away from naked flames.*

1 Wrap some cotton wool around the bulb of a thermometer and use an elastic band to hold it in place.
2 Clamp the thermometer as shown in Figure 1.2.
3 Take 1 cm^3 propanone in a dropping pipette and drip it onto the cotton wool.
4 Start the stopwatch and take the temperature. Record this value in Table 1.1.
5 Measure and record the temperature each minute for six minutes.

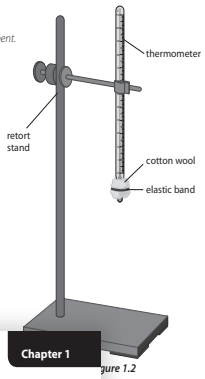


Figure 1.2

Chemistry Practical Workbook

Chapter 1

Observations:

1 Record your results in **Table 1.1**.

Table 1.1

Time / minutes	0	1	2	3	4	5	6
Temperature / °C							

Analysis:

2 Plot a graph of temperature (on the *y*-axis) against time (on the *x*-axis). Draw a smooth curve of best fit through the plotted points.

3 Estimate from your graph:

(a) the minimum temperature reached _____

(b) the time taken to reach the minimum temperature _____

Conclusion:

4 Explain why the temperature at first went down.

_____

_____

_____

States of Matter 5

Chemistry Practical Workbook

Chapter 1

5 Explain why the temperature started to rise at the end of the experiment.

_____

_____

_____

Evaluation:

6 Propanone is flammable and presents a moderate hazard to health. State the safety precautions you should take when using propanone.

_____

_____

_____

7 (a) Why should scientists repeat experiments?

_____

_____

_____

(b) Explain what you would have to control if you wanted to repeat this experiment.

_____

_____

_____

8 Plan an experiment to test how airflow affects the rate of evaporation of propanone.

⚠ *This is a planning exercise but if the experiment is carried out, a full risk assessment will be required.*

_____

_____

_____

_____

_____

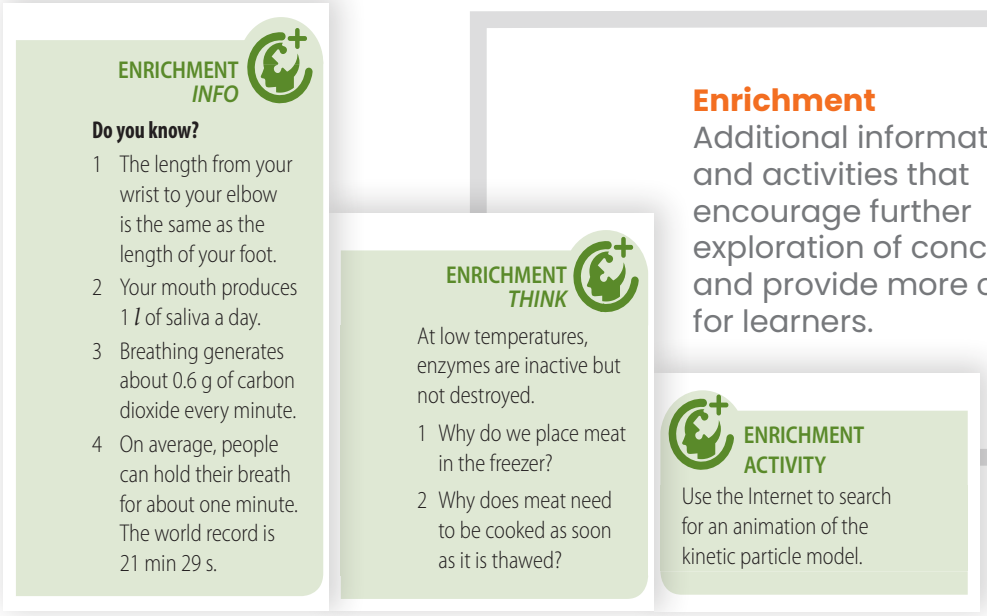
_____

Chemistry Practical Workbook

Analysis and Conclusion
Guiding questions that encourage higher-order thinking that help learners interpret and evaluate results and draw conclusions.

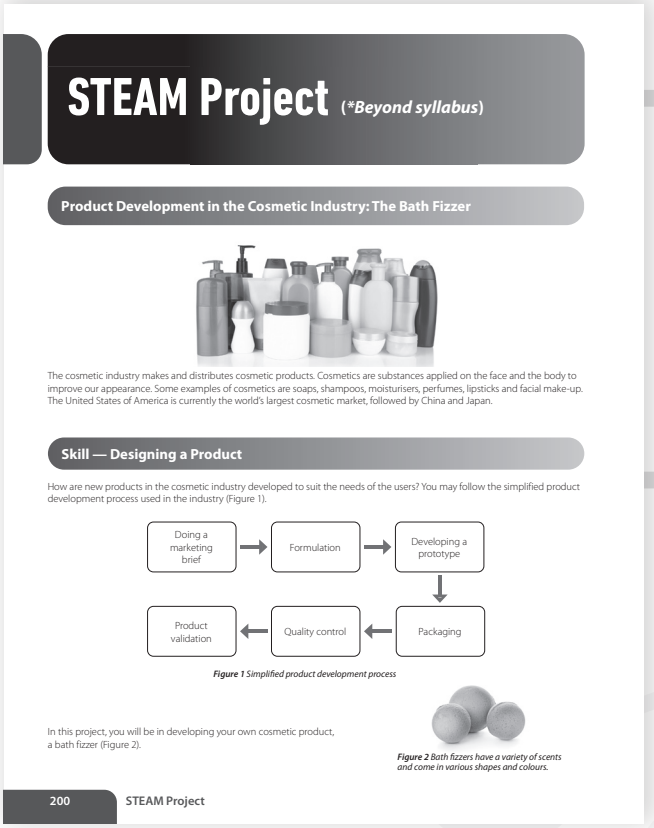
Evaluation
Questions that promote critical thinking by encouraging reflection on the experiments conducted and their rationale.

Additional information and activities related to real-world contexts are present to promote engagement and encourage exploration. These series will help learners expand their knowledge, deepen their understanding and empower them with 21st century competencies essential for the future.



Enrichment
Additional information and activities that encourage further exploration of concepts and provide more context for learners.

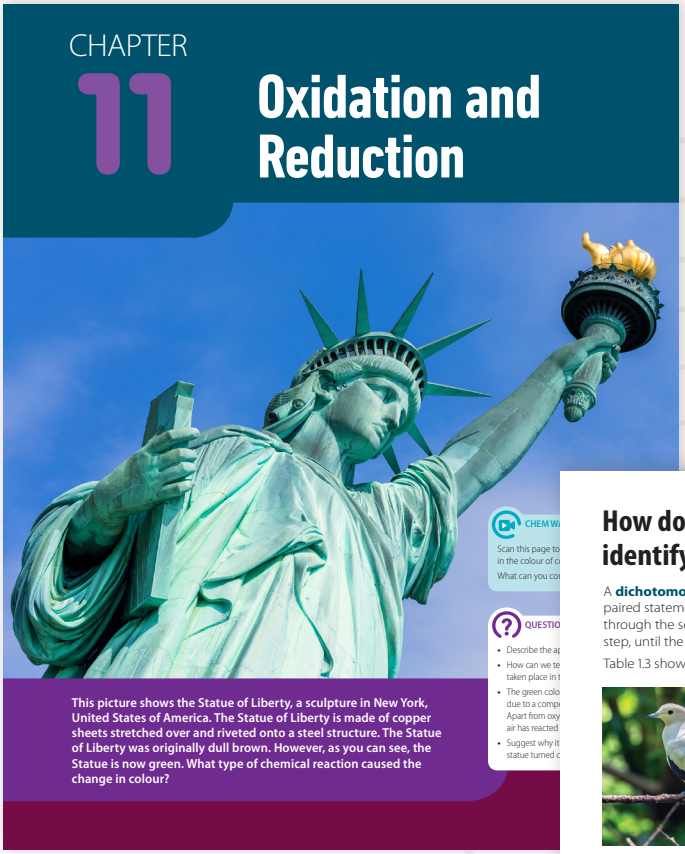
Physics, Biology, Chemistry Student's Book



STEAM Projects
Project-based learning that features real-world situations which allow learners to develop 21st century skills while applying what they have learnt in the course.

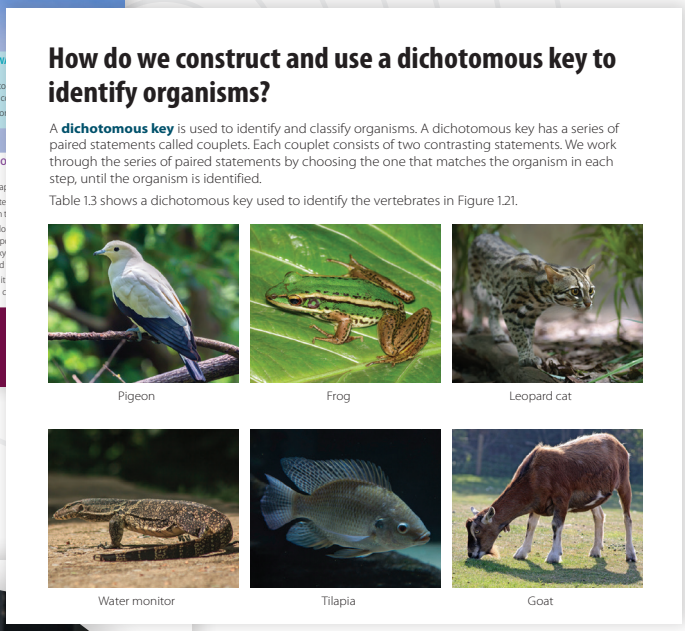
Chemistry Theory Workbook

Featuring a mix of cultural examples, these series aim to provide both an international view and a sense of familiarity in the learning journey. With more relatability in its content, learning becomes more meaningful for the international audience.


CHAPTER
11
Oxidation and Reduction

This picture shows the Statue of Liberty, a sculpture in New York, United States of America. The Statue of Liberty is made of copper sheets stretched over and riveted onto a steel structure. The Statue of Liberty was originally dull brown. However, as you can see, the Statue is now green. What type of chemical reaction caused the change in colour?

Chemistry Student's Book


How do we construct and use a dichotomous key to identify organisms?

A **dichotomous key** is used to identify and classify organisms. A dichotomous key has a series of paired statements called couplets. Each couplet consists of two contrasting statements. We work through the series of paired statements by choosing the one that matches the organism in each step, until the organism is identified.

Table 1.3 shows a dichotomous key used to identify the vertebrates in Figure 1.21.

Pigeon | Frog | Leopard cat

Water monitor | Tilapia | Goat

Biology Student's Book


A force can change the size and shape of dough.

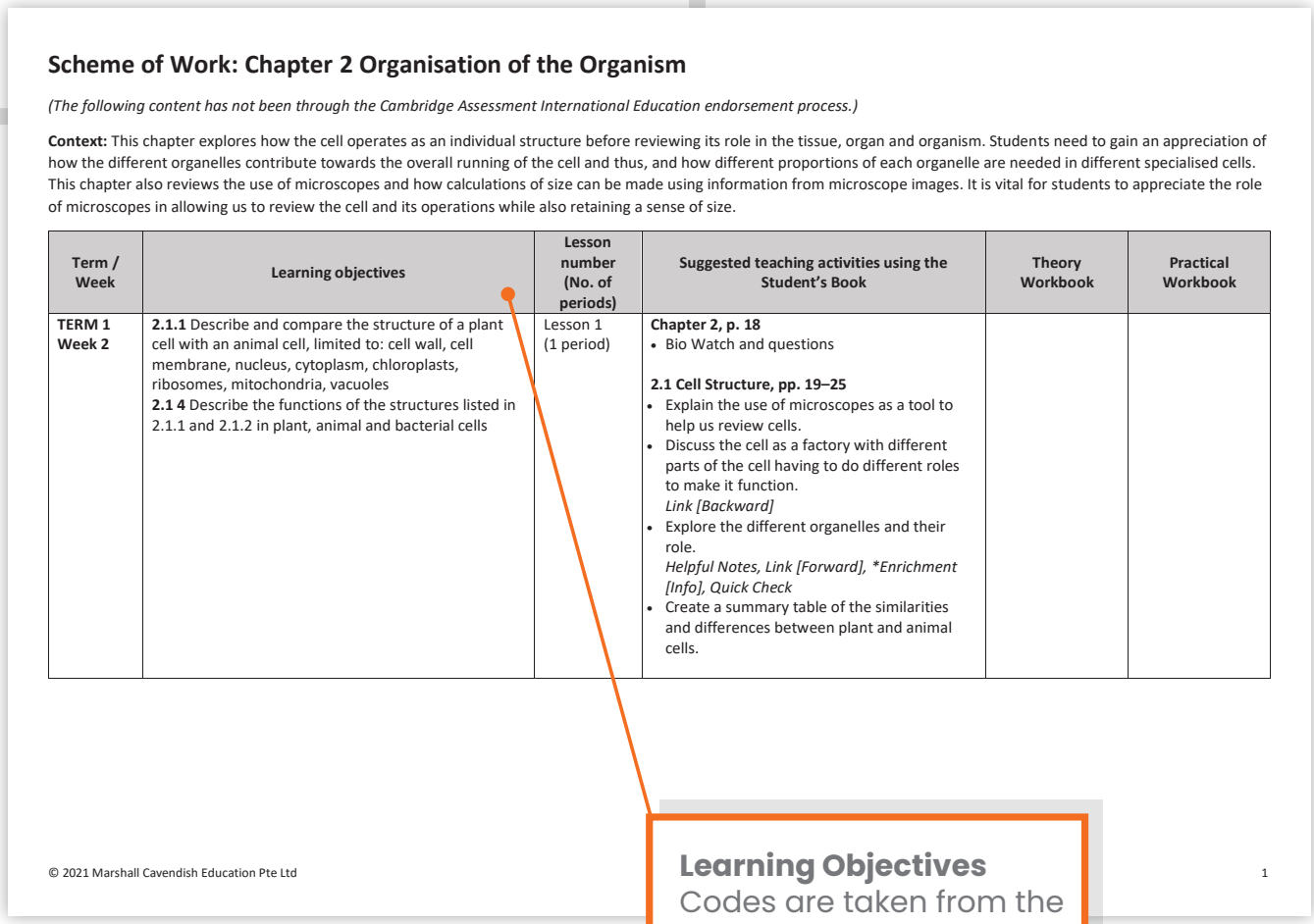
Physics Student's Book

These series are developed with flexibility and convenience in mind to support both new and experienced educators in delivering quality and engaging lessons. The accompanying online digital resources can be used to facilitate real-time learning through online lessons. Learners can enhance their comprehension at their own pace by revisiting the resources on their own.

Scheme of Work* (Editable)

Includes suggested time frame, learning objectives and materials involved to help educators plan and deliver lessons effectively.

**This resource will not go through the Cambridge International endorsement process.*



Scheme of Work: Chapter 2 Organisation of the Organism

(The following content has not been through the Cambridge Assessment International Education endorsement process.)

Context: This chapter explores how the cell operates as an individual structure before reviewing its role in the tissue, organ and organism. Students need to gain an appreciation of how the different organelles contribute towards the overall running of the cell and thus, and how different proportions of each organelle are needed in different specialised cells. This chapter also reviews the use of microscopes and how calculations of size can be made using information from microscope images. It is vital for students to appreciate the role of microscopes in allowing us to review the cell and its operations while also retaining a sense of size.

Term / Week	Learning objectives	Lesson number (No. of periods)	Suggested teaching activities using the Student's Book	Theory Workbook	Practical Workbook
TERM 1 Week 2	**2.1.1** Describe and compare the structure of a plant cell with an animal cell, limited to: cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, ribosomes, mitochondria, vacuoles **2.1 4** Describe the functions of the structures listed in 2.1.1 and 2.1.2 in plant, animal and bacterial cells	Lesson 1 (1 period)	**Chapter 2, p. 18** • Bio Watch and questions **2.1 Cell Structure, pp. 19–25** • Explain the use of microscopes as a tool to help us review cells. • Discuss the cell as a factory with different parts of the cell having to do different roles to make it function. *Link [Backward]* • Explore the different organelles and their role. *Helpful Notes, Link [Forward], *Enrichment [Info], Quick Check* • Create a summary table of the similarities and differences between plant and animal cells.		

Biology Scheme of Work

Learning Objectives
Codes are taken from the syllabus which can used for easy reference.

Lesson Plans* (Editable)
Assist educators to structure and organise the lesson plan for most effective learning.

**This resource will not go through the Cambridge International endorsement process.*

Differentiated Instruction
Suggested teaching ideas to support and engage learners who are at different readiness levels.

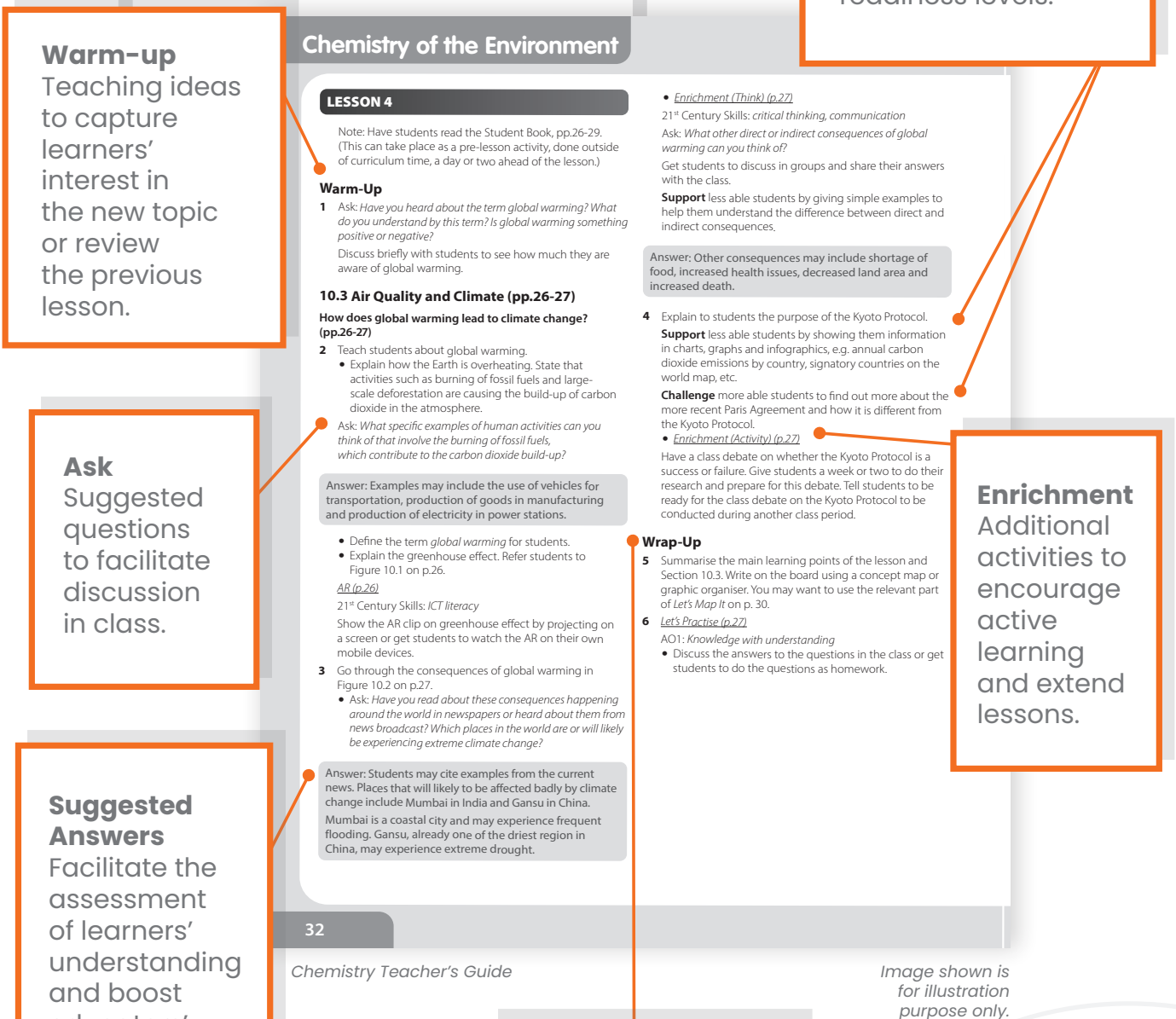
Warm-up
Teaching ideas to capture learners' interest in the new topic or review the previous lesson.

Ask
Suggested questions to facilitate discussion in class.

Suggested Answers
Facilitate the assessment of learners' understanding and boost educators' confidence in teaching.

Enrichment
Additional activities to encourage active learning and extend lessons.

Wrap-Up
Provides ideas for consolidation and evaluation at the end of a lesson.



Chemistry of the Environment

LESSON 4

Note: Have students read the Student Book, pp.26-29. (This can take place as a pre-lesson activity, done outside of curriculum time, a day or two ahead of the lesson.)

Warm-Up

1 Ask: *Have you heard about the term global warming? What do you understand by this term? Is global warming something positive or negative?*

Discuss briefly with students to see how much they are aware of global warming.

10.3 Air Quality and Climate (pp.26-27)

How does global warming lead to climate change? (pp.26-27)

2 Teach students about global warming.
- Explain how the Earth is overheating. State that activities such as burning of fossil fuels and large-scale deforestation are causing the build-up of carbon dioxide in the atmosphere.

Ask: *What specific examples of human activities can you think of that involve the burning of fossil fuels, which contribute to the carbon dioxide build-up?*

Answer: Examples may include the use of vehicles for transportation, production of goods in manufacturing and production of electricity in power stations.

- Define the term *global warming* for students.
- Explain the greenhouse effect. Refer students to Figure 10.1 on p.26.

AR (p.26)

21st Century Skills: *ICT literacy*

Show the AR clip on greenhouse effect by projecting on a screen or get students to watch the AR on their own mobile devices.

3 Go through the consequences of global warming in Figure 10.2 on p.27.
- Ask: *Have you read about these consequences happening around the world in newspapers or heard about them from news broadcast? Which places in the world are or will likely be experiencing extreme climate change?*

Answer: Students may cite examples from the current news. Places that will likely to be affected badly by climate change include Mumbai in India and Gansu in China.

Mumbai is a coastal city and may experience frequent flooding. Gansu, already one of the driest region in China, may experience extreme drought.

- *Enrichment (Think) (p.27)*

21st Century Skills: *critical thinking, communication*

Ask: *What other direct or indirect consequences of global warming can you think of?*

Get students to discuss in groups and share their answers with the class.

Support less able students by giving simple examples to help them understand the difference between direct and indirect consequences.

Answer: Other consequences may include shortage of food, increased health issues, decreased land area and increased death.

4 Explain to students the purpose of the Kyoto Protocol.

Support less able students by showing them information in charts, graphs and infographics, e.g. annual carbon dioxide emissions by country, signatory countries on the world map, etc.

Challenge more able students to find out more about the more recent Paris Agreement and how it is different from the Kyoto Protocol.
- *Enrichment (Activity) (p.27)*

Have a class debate on whether the Kyoto Protocol is a success or failure. Give students a week or two to do their research and prepare for this debate. Tell students to be ready for the class debate on the Kyoto Protocol to be conducted during another class period.

Wrap-Up

5 Summarise the main learning points of the lesson and Section 10.3. Write on the board using a concept map or graphic organiser. You may want to use the relevant part of *Let's Map It* on p. 30.

6 *Let's Practise (p.27)*

AO1: *Knowledge with understanding*
- Discuss the answers to the questions in the class or get students to do the questions as homework.

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Chemistry Teacher's Guide

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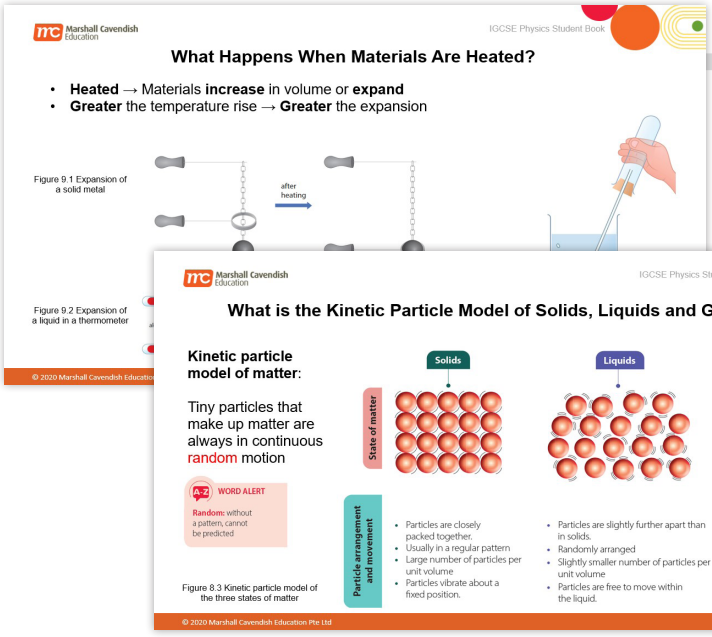

Physics PowerPoint Slides

PowerPoint Slides* (Editable)

PowerPoint slides can be used for frontal or online teaching and help educators save time on lesson preparation, allowing for more interaction with the learners.

**This resource will not go through the Cambridge International endorsement process.*

Question Bank* (Editable)

Provides extra practice for learners and includes higher-order thinking questions to prompt analysis and critical thinking. May be used to generate online quizzes for classroom engagement.

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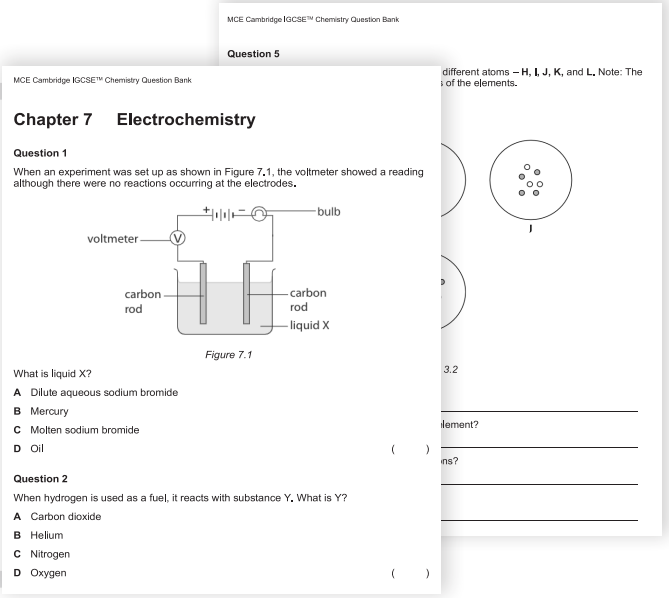
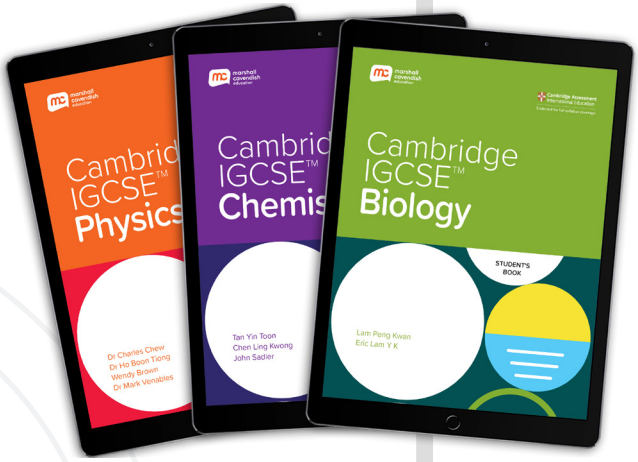


Chemistry Question Bank



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Annotatable Enhanced eBooks*

Student's Book, Theory Workbook, Practical Workbook, Teacher's Guide

Suitable for online learning as learners can annotate and save their work on MCEduHub. Learning can take place in real time and in one's own time.

In addition, learners can easily access the Watch feature in the Student's Book.

**This resource will not go through the Cambridge International endorsement process.*

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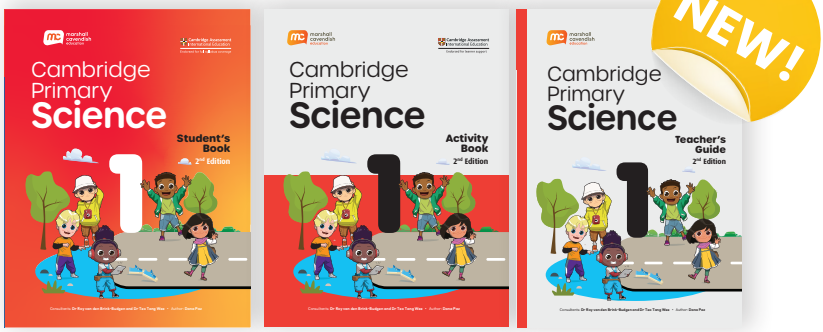
Cambridge Primary Science

Grade 1 – 6 | Age 7 – 12



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