BIOZONE

CLASSROOM GUIDE

QCE | BIOLOGY UNITS 1&2

Contents

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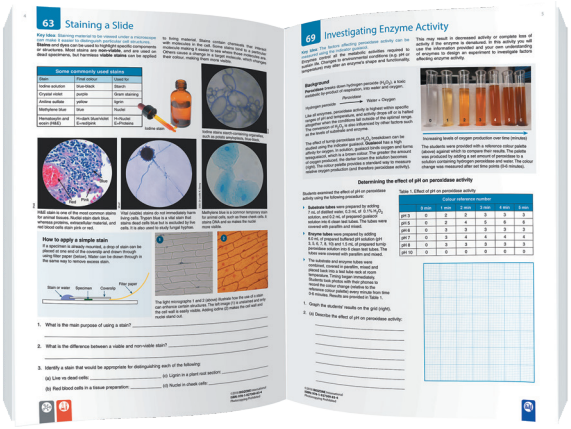
FAQs
ABOUT QCE BIOLOGY UNITS 1& 2

BIOZONE's Pedagogy

A worktext approach

BIOZONE's delivery method is a departure from a traditional textbook. We combine the very best features of a textbook with the utility of a workbook, producing a **worktext** resource. Importantly, the worktext is owned by the student: it is their own resource to utilise. Whether they are using the print or digital version, students customise their worktext with notes and annotations, check off their progress in the contents pages and chapter introductions, and input their answers on the pages as they work through the activities.

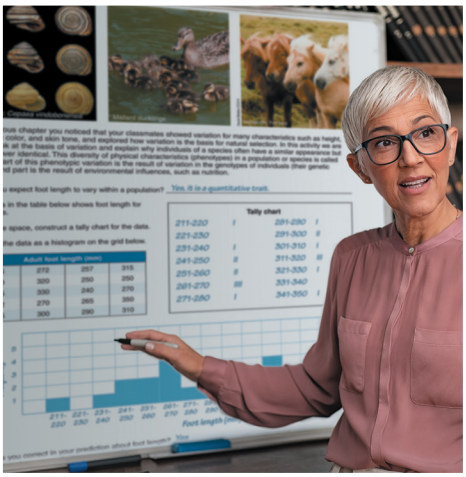


Using a highly graphical approach and short blocks of text, we deliver textbook quality information in an accessible and engaging way, ensuring students are not overwhelmed by large amounts of reading. As students interact with the stimulus material and work through activities, they are encouraged to input their answers directly onto the page. This simple act reinforces the learning moment and forms a **record of work** as they progress through the material. Revision is simplified because the stimulus material, questions, and student answers are in one place.

The material in *QCE Biology* is varied and includes case studies, data analysis, practical investigations, research activities, and assessment tasks. The variety of activity types provides flexibility in the way teachers can assign them. For example, work can be set as homework, completed in class, or set for revision. Teachers can assign students to work on activities individually or set work as a group. The activity based approach simplifies assigning work, and teachers can utilise this to set work for substitute teachers in their absence.

Not all answers need to be graded!

Within the activities, there are plenty of opportunities for students to record answers to the questions in the spaces provided. This approach reinforces the learning moment and allows students to use the resource as a revision tool when they are preparing for assessments. This approach does not mean that teachers are expected to review or grade all student responses. We suggest that only key activities or questions are graded. This might be assessment tasks at the end of each chapter. You may also choose to grade activities with content that students have traditionally found challenging, or where there is often a misunderstanding of the topic. Teachers can also choose to share answers with students. Sharing the model answers via a shared screen allows students to self report grades, an exercise known to be a powerful pedagogical learning tool (Hattie, 2009). Having access to model answers also allows students to refine their initial response if needed. This provides a **powerful second learning moment** to consolidate and extend understanding.



Features to accelerate student learning

Student learning can be influenced by many factors. A synthesis of more than 1,400 meta studies by Hattie (2009) involving over 80,000 individual studies and 300 million students has revealed some of the major influences to student learning. Some factors negatively influence student learning (red, right) while others have positive effects (yellow, green, and blue, right).

BIOZONE's approach incorporates many of the factors shown to positively influence student learning which are underlined in red on the diagram (right). These factors are organically incorporated into our content and enhance the teacher and learner experience.

Hattie, J. (2009). Visible Learning. Routledge

Research supporting BIOZONE's pedagogical approach

BIOZONE's pedagogical approach empowers students to take charge of their learning journey by providing engaging, interactive resources designed to inspire curiosity and foster independent learning skills. Our resources provide a student-centred educational experience. We have purposefully designed the resources to include a number of pedagogical tools proven to enhance learning outcomes for students. Some key pedagogical features are listed below.

Highly graphical delivery of science concepts and short blocks of text.
BIOZONE is committed to providing textbook quality information, but in a way that is engaging and accessible to students. We have deliberately structured activities so they have a highly graphical component. This approach not only engages visual learners and supports varied cognitive learning preferences, but research shows visual aids enhance comprehension and long term memory retention [1]. Incorporating visual elements (photos, illustrations, icons, symbols, figures, and concept maps) into learning materials helps make abstract concepts more tangible, breaking ideas down into digestible and easily understood components.

The use of short blocks of text and generous use of white space ensure students are not overwhelmed by dense information and large blocks of reading material. This encourages both capable and striving learners to interact confidently and regularly with the text components.

Audio visual support through the Resource Hub
Our collection of audio-visual materials (e.g. videos, simulations, models) on the BIOZONE Resource Hub has several purposes:

1. They support delivery of the activity content, providing alternative ways for students to engage with the science concepts being covered.
2. They provide resources for students who like to learn through visualisation or listening.
3. The material provided engages and extends students of all abilities.
4. Audio-visual materials have been shown to have a positive influence on developing critical thinking, problem solving, and analytical skills [2].

Inputting answers aids retention and learning
Our print and digital formats require students to interact directly with the resource. Students engage with the stimulus material then input their answers directly onto the page. The record of work formed from this approach is a powerful pedagogical tool for several reasons:

Firstly, actively inputting answers significantly reinforces student understanding and aids retention of the material. Brain studies show this approach encourages engagement and helps students grasp new concepts [3].

Secondly, forming a record of work simplifies revision because the stimulus material, questions, and the student's own answers are all in one place. This format encourages students to review and test themselves on the material at any time. Research shows that actively self testing (commonly called the testing effect or active recall) has been shown to improve results when compared to simply reading and reviewing material. By regularly recalling information through the testing effect, students strengthen their memory and improve their ability to retrieve information in the future [4]. This approach allows students to identify gaps in their understanding and begin to address them pro-actively.

Thirdly, students are able to modify their own responses (either because teachers have shared BIOZONE's model answers with students, or the student has gained more understanding independently). Self-marking and answer refinement have been shown to be highly effective strategies for enhancing student achievement [5].

Inbuilt pedagogical tools to enhance student learning
John Hattie's meta-analysis studies identify a number of factors which can positively influence student achievement. A summary of some of the most significant factors is provided in the graphic on the previous page [5]. While some are outside of a teacher's control, many of the most effective tools are supported through the use of BIOZONE's innovative worktext approach and student-driven resources. These are underlined in red on the graphic (previous page).

REFERENCES

1 Derek Bok Center for Teaching and Learning (ND). How memory works. Harvard Education. Retrieved July 04, 2024 from https://bokcenter.harvard.edu/how-memory-works

2 LIS Education Network (December 17, 2023). Visualizing Knowledge: The impact of audio-visual materials on education excellence. Retrieved July 04, 2024 from https://www.lisedunetwork.com/visualizing-knowledge-the-impact-of-audio-visual-materials-on-educational-excellence/

3 Hu, C (2024). Why writing by hand is better for memory and learning. Scientific American. Retrieved July 03, 2024 from https://www.scientificamerican.com/article/why-writing-by-hand-is-better-for-memory-and-learning/

4 New England Journal of Medicine (May 03, 2023). What is the testing effect, and how does it affect learning, knowledge, and retention? Retrieved July 04, 2024 from https://knowledgeplus.nejm.org/blog/what-is-the-testing-effect-and-how-does-it-affect-learning-knowledge-and-retention/

5 Hattie, J.A.C. (2009). Visible Learning: A synthesis of over 800 meta-analyses relating to achievement. Routledge. https://inspirasifoundation.org/wp-content/uploads/2020/05/John-Hattie-Visible-Learning_-A-synthesis-of-over-800-meta-analyses-relating-to-achievement-2008.pdf

The Teacher Toolkit

The *QCE Biology* worktext is supported by the Teacher Toolkit: a suite of resources specifically developed to help teachers plan and deliver an engaging program. A brief description of the tools available is provided below and on the following page.

BIOZONE WORLD

BIOZONE WORLD, our **science digital platform**, brings our digital worktexts and rich collection of digital resources together in a single location for easy use. Educators can easily plan lessons, assign work, and grade student responses using BIOZONE WORLD. Click on an activity to access the additional resources provided. These include presentation slides, interactive 3D models, and curated videos and weblinks.

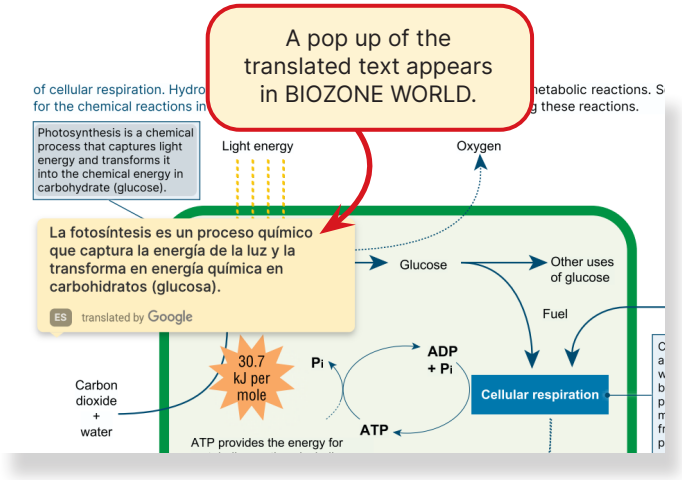
- The **translation tool** within BIOZONE WORLD translates the content into over 150 languages.
- **Students' access** to BIOZONE WORLD allows them to use tools to mark-up, highlight, and bookmark content. They can also answer questions online and submit their work for review or grading. Students have access to the embedded collection of digital resources (presentation slides, 3D models, and curated videos and weblinks).
- Full **teacher access** to BIOZONE WORLD includes the features available to students plus additional teacher-only features, including:
  - Managing class and student enrolments.
  - The ability to view, grade, and give feedback on submitted student work.
  - Force hand-in feature.
  - Ability to display the content on a shared screen or projector to introduce or review an activity, or highlight areas of particular importance (e.g. an important step in a practical investigation).
  - Model answers are in place. Use the show/hide buttons to toggle answers on and off; ideal for sharing data or answers with students.
    Students do not have access to model answers on BIOZONE WORLD.

Find out more: https://biozone.com/au/biozone-world/

Translation function

BIOZONE WORLD, our digital platform, provides a translation feature to support students who have English as a second language. The content can be translated into 150 languages.

Simply activate the translation feature, select the language for translation, and roll the cursor over the text to be translated. A pop up box of the translated text appears on the page. The English text is still visible. Having both languages visible supports students with their English language development while having the reassurance of their first language being accessible.

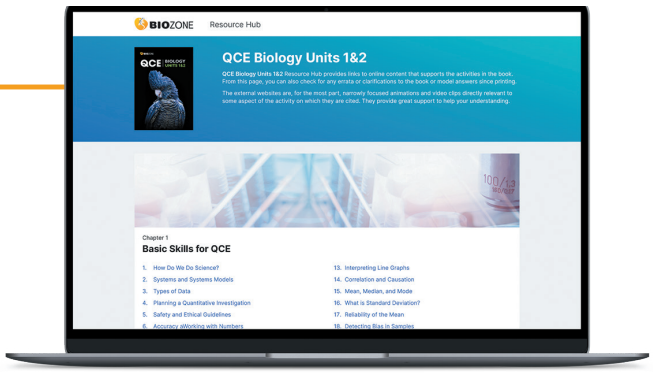


RESOURCE HUB

The **BIOZONE Resource Hub** is a free resource, available to both students and teachers. It offers a curated collection of Open Educational Resources (OER) specifically chosen to support the content of the worktext. Resources include videos, animations, games, 3D models, spreadsheets, and source material.

Content on the **BIOZONE Resource Hub** can be accessed by both print and digital users. Print users can access the material using the QR code in the worktext or bookmark the link provided (right). For BIOZONE WORLD users, these same resources are ingested into the platform and automatically appear with the selected activity.

The **BIOZONE Resource Hub** is an effective tool to engage students of all abilities within a differentiated classroom. Most resources can be used by students of all abilities. 3D models, videos, games, and simulations are great tools for engaging students in a topic, or supporting striving students in their learning journey.



Step 1: Navigate to the BIOZONE **Resource Hub**

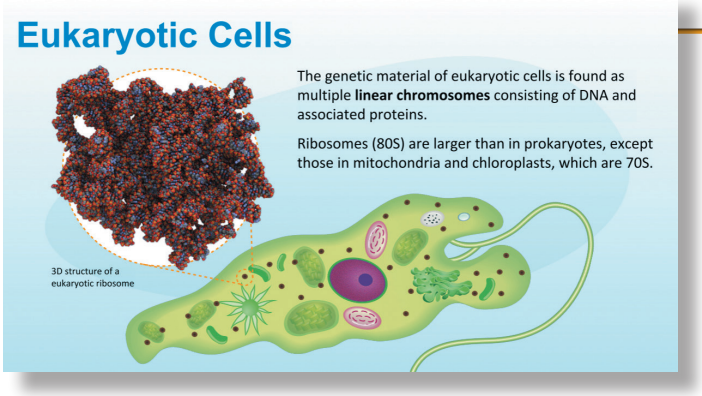
www.BIOZONEhub.com

Step 2: Enter this code in the box displayed.

QCE11-2-4351

Or scan this QR code

https://bit.ly/3zocOuL



PRESENTATION SLIDES

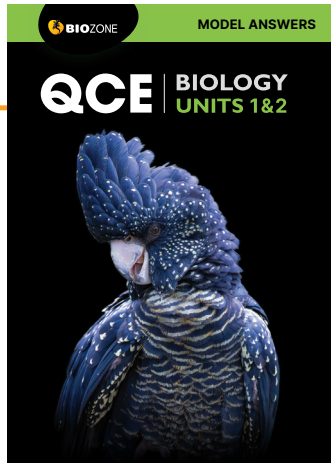
Presentation Slides are a very popular way for teachers to deliver a lesson in a presentation style format. Presentation Slides are a useful delivery tool in both face to face or remote teaching.

The Presentation Slides are a collection of slides specifically designed to support and enhance the content of the worktext.

The Presentation Slides are fully ingested into BIOZONE WORLD and automatically appear with the selected activity.

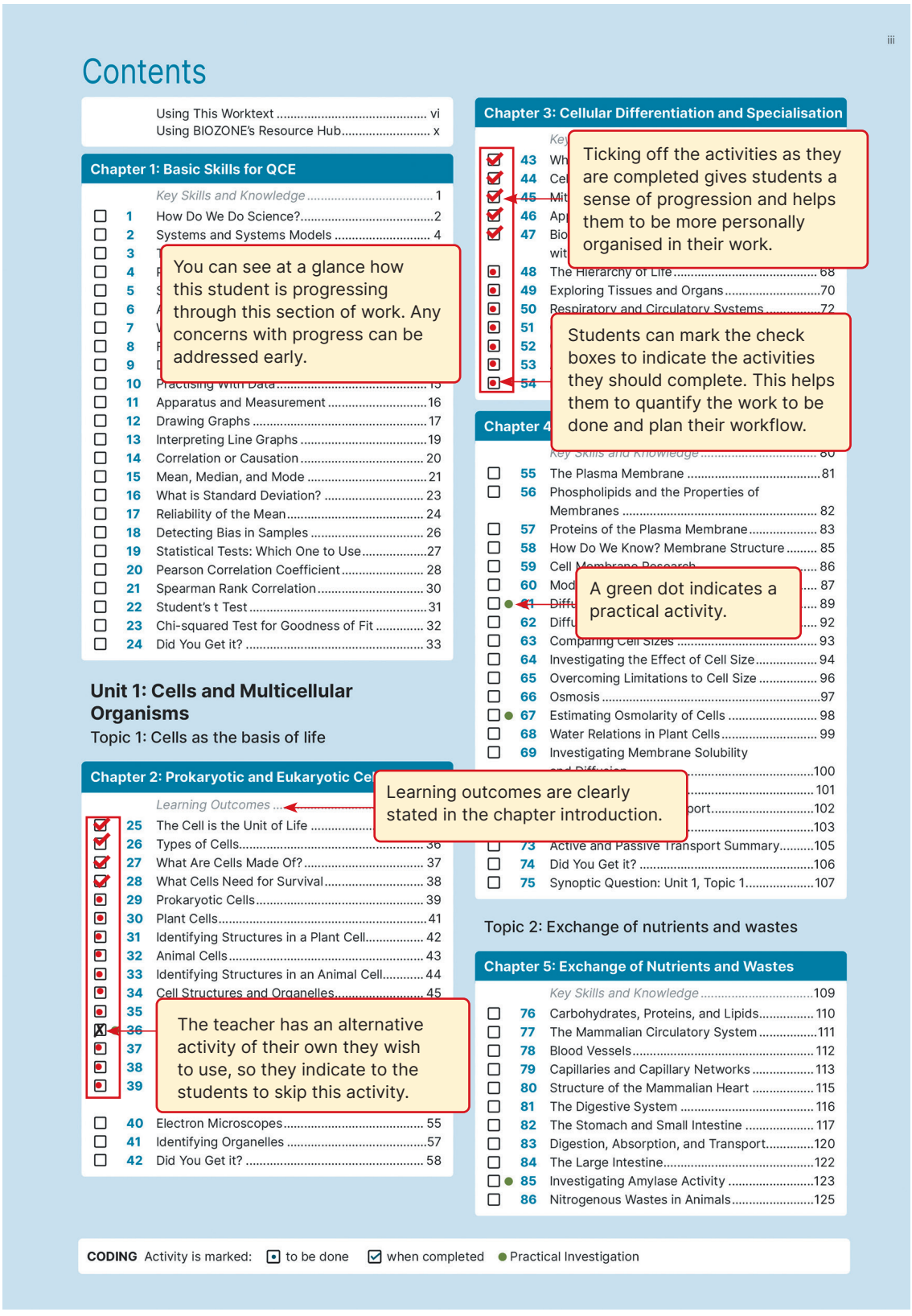
MODEL ANSWERS

A Model Answer booklet provides suggested answers to each of the activities, including working where appropriate (e.g. calculations).



The Contents: A Planning Tool

The contents pages are not merely a list of the activities. Encourage your students to use them as a planning tool for their program of work. Students can identify the activities they are to complete and then tick them off once completed. Ticking off the activities as they are finished gives students a sense of progression and helps them to be more personally organised in their work and time management. Teachers can see at a glance how a student is progressing through the set work. Any concerns with progress can be addressed early.



Structure of the Units and Chapters

This edition of Biology for QCE Units 1 & 2 has been specifically written for the Queensland (QCE) Biology general senior syllabus (2025 version). The worktext follows the structure outlined in the syllabus. It consists of 14 content chapters and one chapter to provide support for the science and math skills for QCE Biology. The next few pages provide information about this resource and how to get the best use from it.

Structure of a Unit and Chapter

Chapter introduction

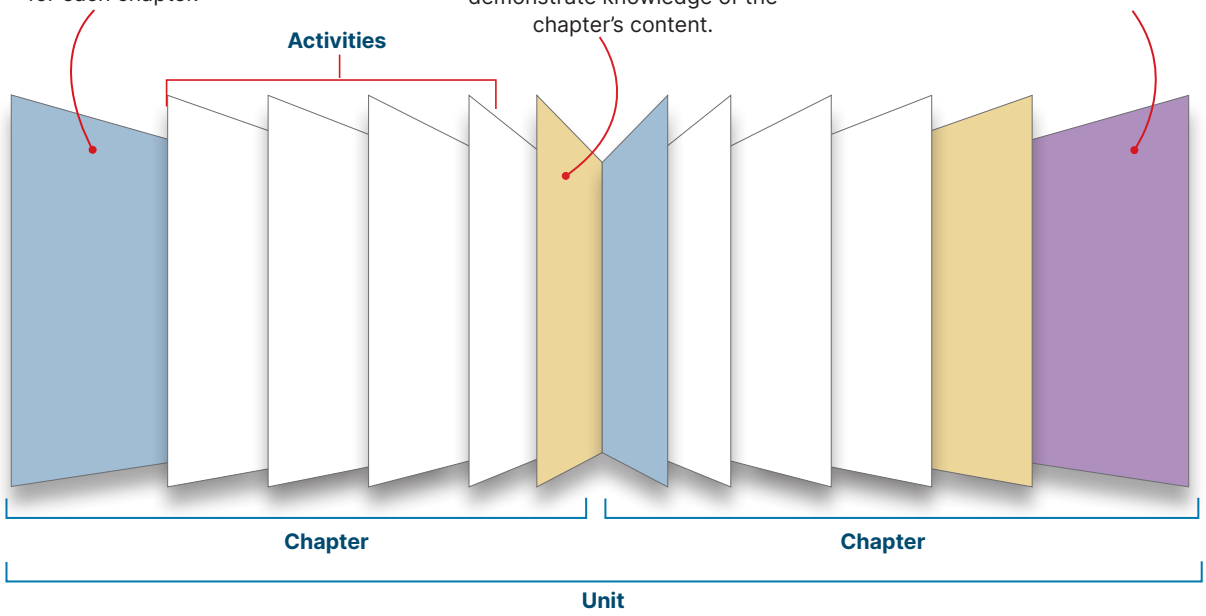
Contains important information about what students need to know for each chapter.

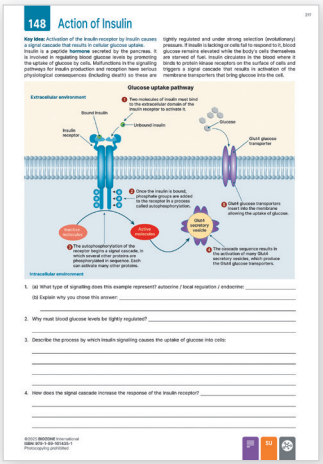
Did You Get It?

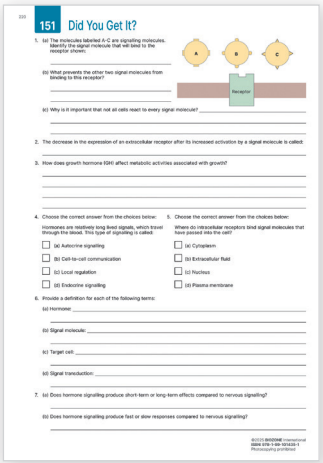
An end-of-chapter assessment task allows students to demonstrate knowledge of the chapter's content.

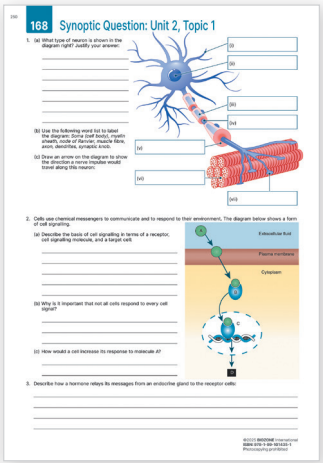
Synoptic Questions

This assessment task allows students to demonstrate knowledge of the unit and topic content.









Introduction

- Provides a list of important key concepts for the chapter.
- Lists important key terms (vocab) for the chapter.
- Provides a check list of unit objectives for the chapter.
- Activities with SHE and SI components are identified.

Activities

- The KEY IDEA provides the focus for the activity.
- Annotated diagrams and photographs help students understand the content.
- Answering the questions helps consolidate understanding of the content.
- Material can be used to revise for tests and exams.

Chapter test

- End-of-chapter assessment tasks test understanding of the biological terms and concepts covered within the chapter.
- Reviewing the answers can help students study for tests and exams.

Synoptic question

- Synoptic questions conclude each unit and topic of study covered in the book.
- Use them to see how well students understand the content.
- Reviewing the answers can help students study for tests and exams.

Chapter Introductions

Encourage students to interact with the chapter introductions as they work through the material as this will help them to understand key learning points for the course. The chapter introductions provide a concise list of learning outcomes that students should be able to demonstrate knowledge of by the time they complete the chapter. The chapter introduction also contains key concept and key term panels (see the example page below).

The key concepts provide a summary of the main points that students should take away from this chapter. Students can elaborate on the key concepts using the knowledge they have gained from completing the activities. The key terms draw student attention to the language they should be using when studying QCE Biology. Encourage your students to use these terms regularly in their writing and oral communications to build scientific literacy. Definitions for the key terms can be found in the glossary section of both the student and teacher edition.

As students complete each activity in a chapter, they can mark off their progress by ticking the relevant check box on the chapter introduction page.

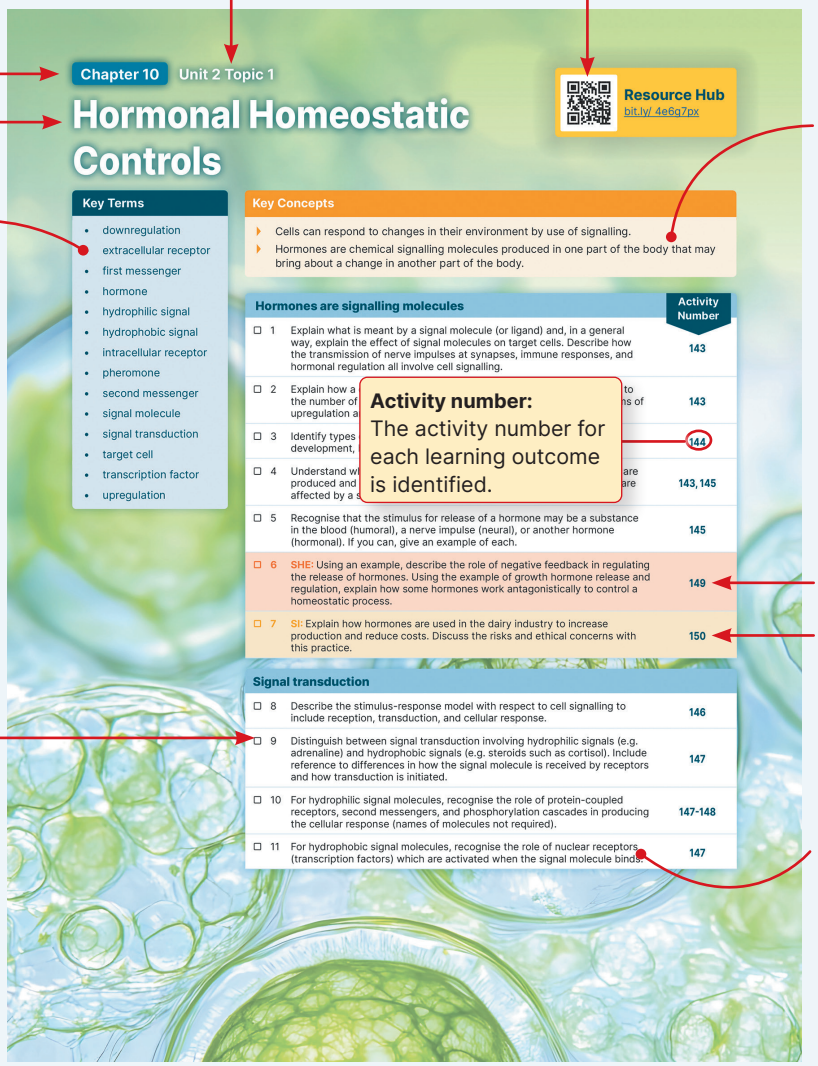
The unit and topic are identified for easy navigation.

QR code allows quick access to helpful videos and models on BIOZONE's **Resource Hub.**

Chapter number and chapter title are identified for quick navigation.

Key terms
Important vocabulary students should understand and use during the course. Definitions are provided in the glossary at the back of the book.

Check boxes
Encourage students to use the check boxes to identify activities to be done (•) and to tick them off (✔) when the learning outcome is completed.



Key concepts
These are the important key ideas for the chapter. Direct students to these and ensure they understand the concepts summarised here.

Component coding
Colour panels and codes identify where Science as a Human Endeavour (SHE), Science Inquiry (SI), occur in the chapter.

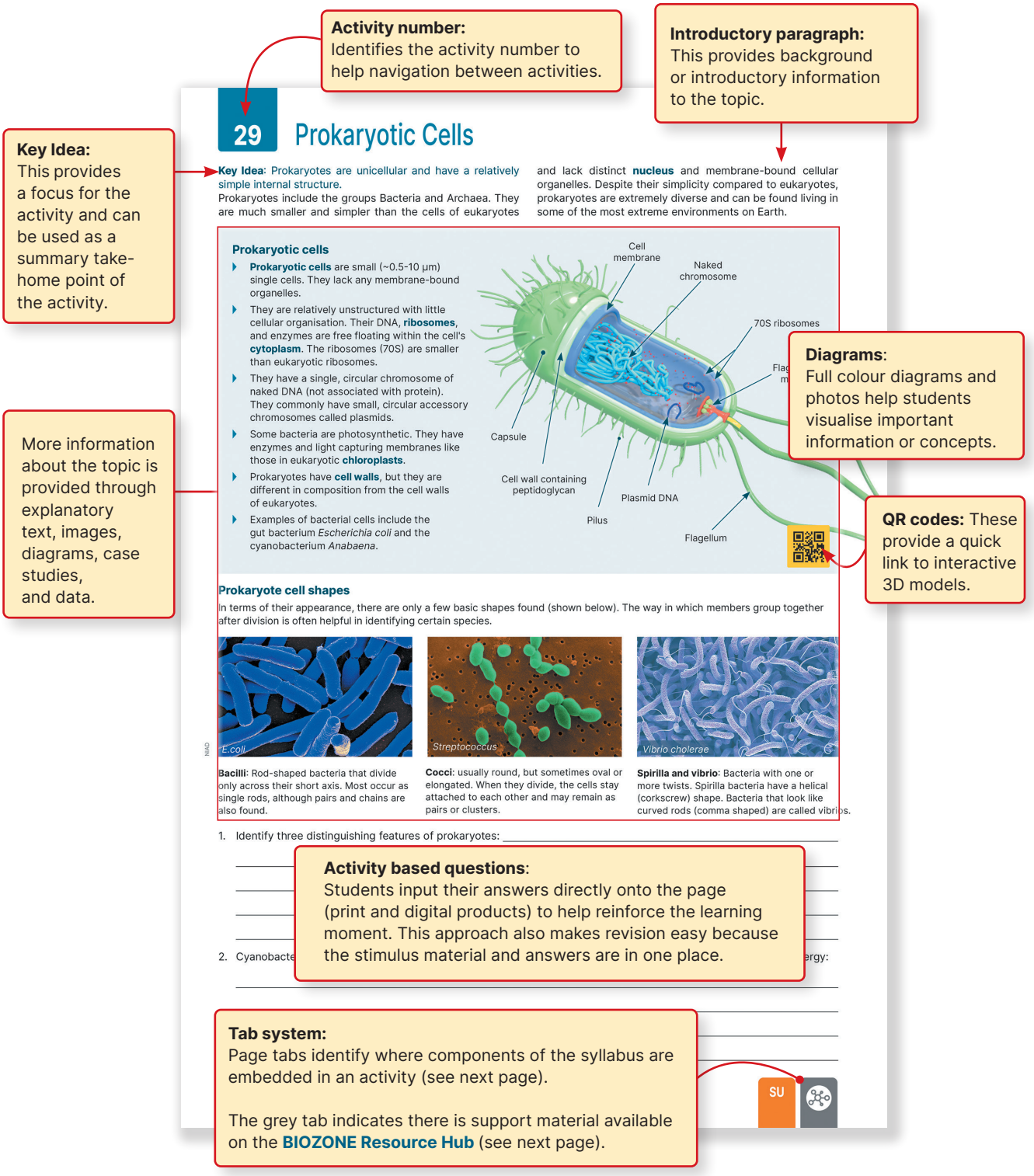
Learning outcomes
These provide a point by point summary of what students need to know or do by the end of the chapter.

Features of the Activity Pages

The activity pages have been carefully designed to provide high quality information in an easily accessible format. They include a number of features designed to engage students and help them unpack and understand the information. Guide students through the features of the activity pages to ensure that they make the most of the material.

Key features:

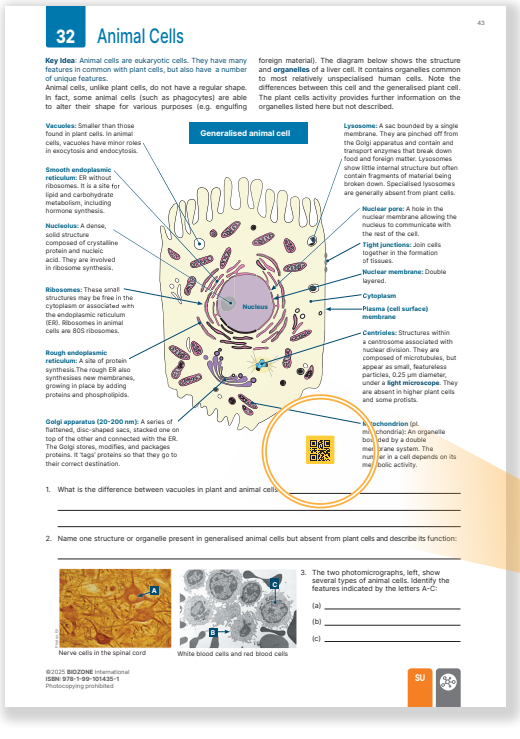
- Short blocks of text so that students do not feel overwhelmed with too much reading.
- High quality, informative graphics.
- QR codes link directly to 3D models (following page). These provide fun engagement and learning moments.
- Question and answer sections allow students to demonstrate their understanding of the content. By having the stimulus material and their answers in one place, students can easily revise for assessments.
- The tab system identifies when there is support material on the **Resource Hub**. Tabs also identify the presence of specific syllabus components (see following page).



QR codes link to 3D models

Some activities have QR codes on the pages (circled, below). These link directly to informative and engaging 3D models. If your school does not allow students to access phones in class time, students can still access the models through the **Resource Hub** and via BIOZONE WORLD. Students can either bookmark the Resource Hub (right) or quickly access it using the bit.ly tag found on each chapter introduction.

https://bit.ly/3zocOuL


32 Animal Cells

Key Idea: Animal cells are eukaryotic cells. They have many features in common with plant cells, but also have a number of unique features.
Animal cells, unlike plant cells, do not have a regular shape. In fact, some animal cells (such as phagocytes) are able to alter their shape for various purposes (e.g. engulfing foreign material). The diagram below shows the structure and organelles of a liver cell. It contains organelles common to most relatively unspecialised human cells. Note the differences between this cell and the generalised plant cell. The plant cells activity provides further information on the organelles listed here but not described.

Generalised animal cell

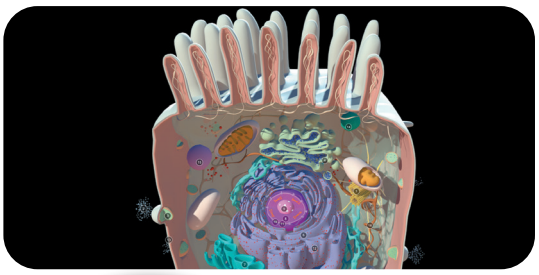
Vacuoles: Smaller than those found in plant cells. In animal cells, vacuoles have minor roles in exocytosis and endocytosis.
Smooth endoplasmic reticulum: ER without ribosomes. It is a site for lipid and carbohydrate metabolism, including hormone synthesis.
Nucleolus: A dense, solid structure composed of crystalline protein and nucleic acid. They are involved in ribosome synthesis.
Ribosomes: These small structures may be free in the cytoplasm or associated with the endoplasmic reticulum (ER). Ribosomes in animal cells are 80S ribosomes.
Rough endoplasmic reticulum: A site of protein synthesis.The rough ER also synthesises new membranes, growing in place by adding proteins and phospholipids.
Golgi apparatus (20–200 nm): A series of flattened, disc-shaped sacs, stacked one on top of the other and connected with the ER. The Golgi stores, modifies, and packages proteins. It 'tags' proteins so that they go to their correct destination.
Lysosome: A sac bounded by a single membrane. They are pinched off from the Golgi apparatus and contain and transport enzymes that break down food and foreign matter. Lysosomes show little internal structure but often contain fragments of material being broken down. Specialised lysosomes are generally absent from plant cells.
Nuclear pore: A hole in the nuclear membrane allowing the nucleus to communicate with the rest of the cell.
Tight junctions: Join cells together in the formation of tissues.
Nuclear membrane: Double layered.
Cytoplasm
Plasma (cell surface) membrane
Centrioles: Structures within a centrosome associated with nuclear division. They are composed of microtubules, but appear as small, featureless particles, 0.25 µm diameter, under a light microscope. They are absent in higher plant cells and some protists.
Nucleus

1. What is the difference between vacuoles in plant and animal cells?
2. Name one structure or organelle present in generalised animal cells but absent from plant cells and describe its function:
3. The two photomicrographs, left, show several types of animal cells. Identify the features indicated by the letters A–C:
(a)
(b)
(c)

Nerve cells in the spinal cord
White blood cells and red blood cells

ISBN: 978-1-99-101435-1

Scan the QR codes on the activity pages. These link directly to 3D models. All models can be rotated and zoomed, and some contain informative annotations.



Understanding the Tab System

A simple tab system identifies where key syllabus components: Science as a Human Endeavour (SHE), Science Understandings (SU), and Science Inquiry (SI) are integrated into an activity. Unit objectives are also identified within the tab system.

Science as a human endeavour (SHE): This indicates an activity contains a SHE component, and promotes appreciation of the nature and development of science and its use and influence on society.

Resource Hub: The grey Resource Hub tab indicates there is material to support this activity on **BIOZONE's Resource Hub** (page CG6 for more information).

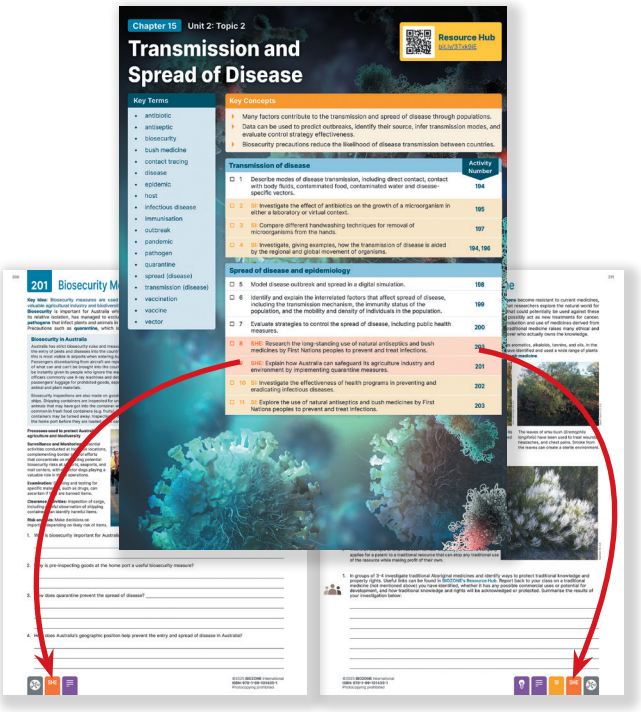
Syllabus objectives (left to right):
Investigate phenomena
Evaluate conclusions, claims, and processes
Interpret evidence
Analyse data
Apply understanding
Describe ideas and findings

Science Inquiry: This tab indicates an activity contains material to support the science inquiry components of the syllabus.

Science understanding: This tab indicates an activity covers a science understanding component.

Identifying Syllabus Components

Identifying Science as a Human Endeavour (SHE)

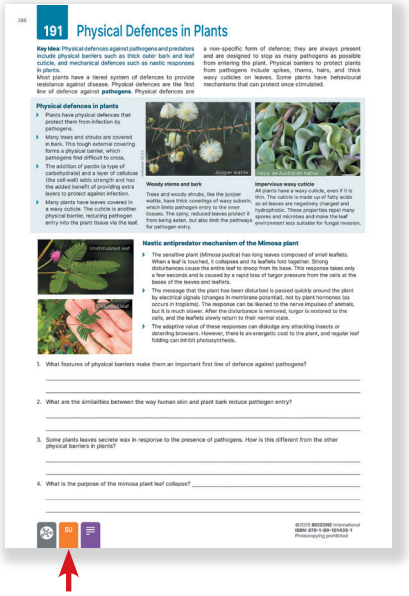


Through **Science as a Human Endeavour** contexts, students develop an appreciation about the nature and development of science, how science is used, and how it influences society. SHE components are identified in the chapter introduction and on an activity page.

Identifying Science Inquiry (SI)

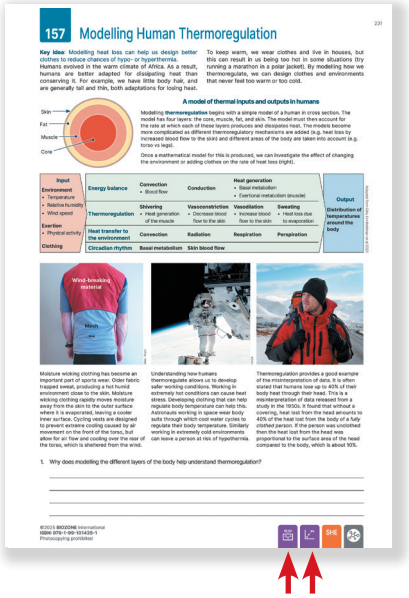
QCE Biology provides ample opportunity for students to practise the skills necessary to work like a scientist (**Science Inquiry**). Integration of science inquiry skills helps students prepare for the Unit 3 and 4 assessments. SI components are identified in the chapter introduction and on an activity page.

Identifying Science Understanding (SU)



The **Science Understandings** (SU) form the framework for the delivery of content in QCE Biology. As students work through the activities, they develop deeper understanding of the key concepts, models and theories that underpin the syllabus. Orange SU tabs on an activity page identify a SU objective is covered. Science Understandings are not identified in chapter introductions.

Identifying Unit Objectives



The **Unit Objective**s for QCE Biology outline the core knowledge, skills, and capabilities students are expected to develop throughout the course. Purple tabs on an activity page identify when an objective is covered. Unit objectives are not identified in chapter introductions.

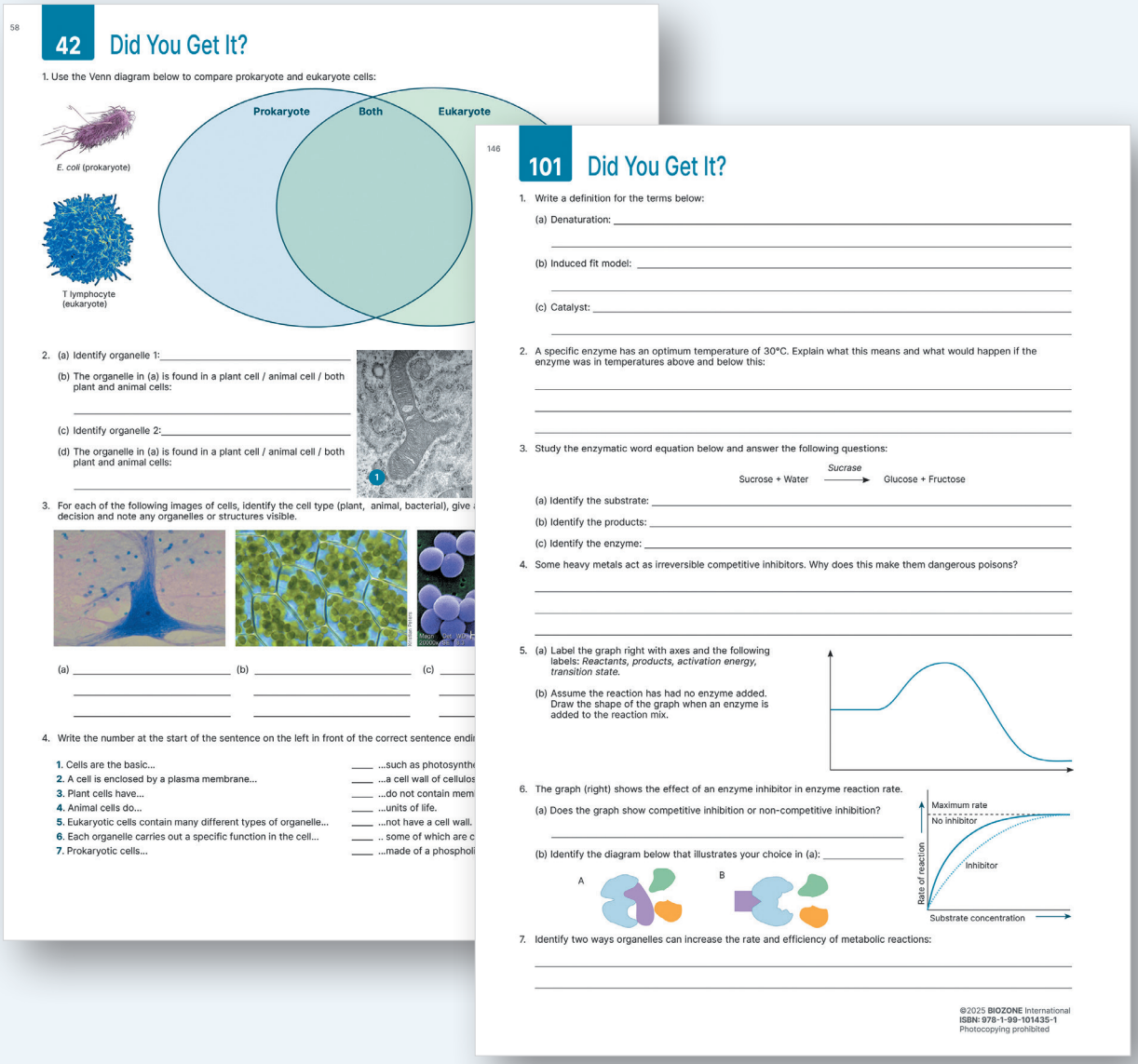
Evaluating Student Performance

While most activities require students to record a response (answer the questions provided), we do not recommend that every question is graded. In most instances, the activities have been designed so that student answers form an individual record of work, allowing students to review their answer within the context of the activity at any time.

We recommend teachers are selective about activities or questions they choose to review or grade to avoid assessment fatigue. Focus on content that students typically find challenging or on activities that cover essential material for the course. We highly recommend that end of chapter assessments and the synoptic assessment tasks are graded. Both of these provide formal opportunities to test student understanding of the content. Find out more about the formative and summative assessment tasks below, and on the following page.

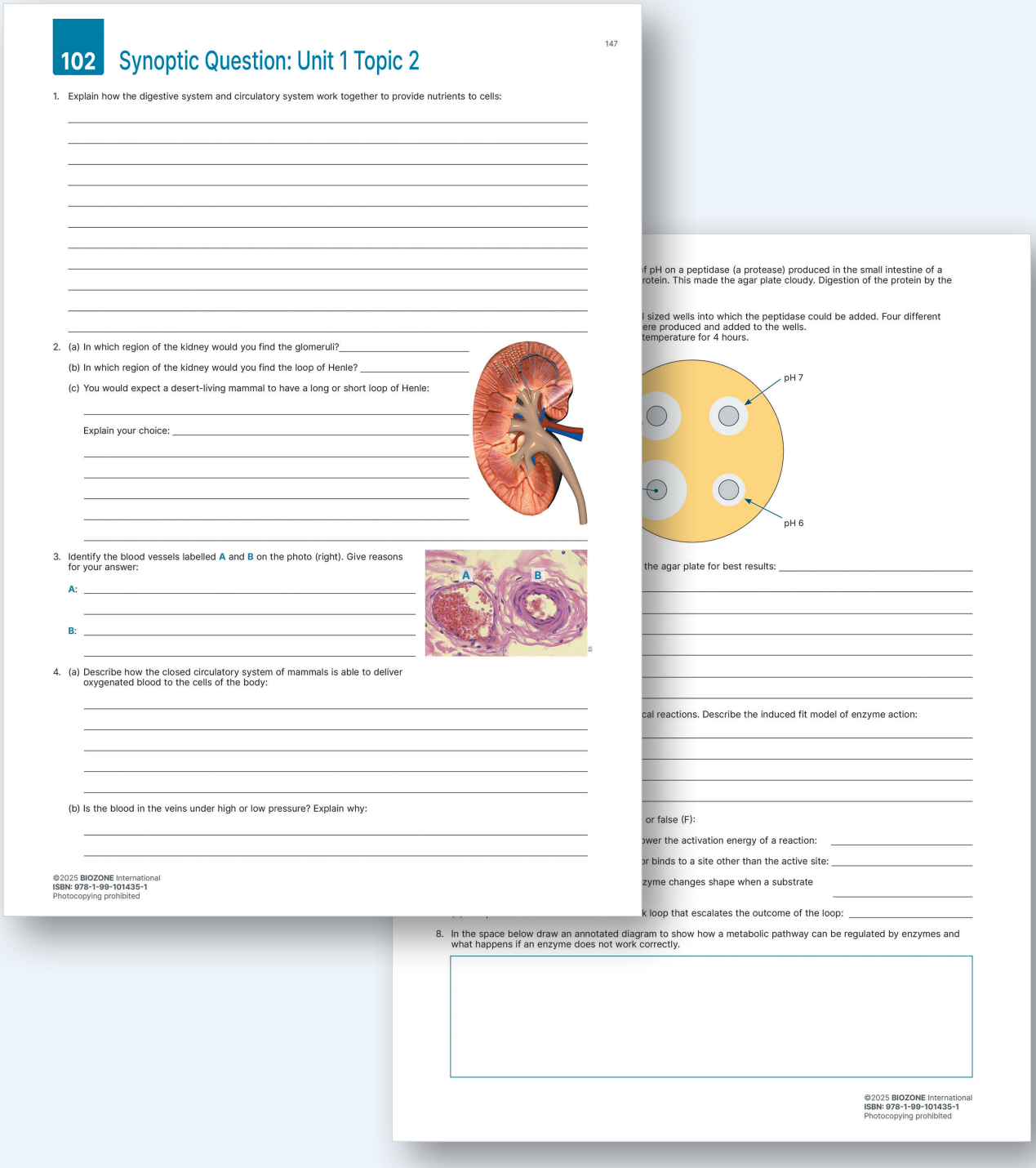
Chapter assessments: Did You Get It?

Each chapter concludes with a *Did You Get It?* assessment task. These have been designed to test student understanding of the chapter content, and can be used to help identify any gaps or misconceptions which still need to be addressed before moving on. You may wish to use the chapter assessment as a practise test before asking students to complete the summative assessment task (see more information on the next page).



Unit assessments

- Synoptic questions at the end of a unit bring together related content of the worktext. These require students to draw on the knowledge gained in a range of activities to answer the questions. Use these as formal grading moments or as preparation for a test or exam.
- The synoptic questions are written in a similar way to the questions in an exam. Students are given introductory information and asked to discuss certain aspects of the topic relating to the information. The examples used in the questions may not directly relate to examples in the workbook, but the ideas and concepts required to answer the question will have been covered in the preceding activities. This makes the synoptic questions suitable for formative assessment.
- Sometimes students will need to interpret the information given in the question's introduction and integrate their interpretation into their answer.



102 Synoptic Question: Unit 1 Topic 2

147

1. Explain how the digestive system and circulatory system work together to provide nutrients to cells:

2. (a) In which region of the kidney would you find the glomeruli?
   (b) In which region of the kidney would you find the loop of Henle?
   (c) You would expect a desert-living mammal to have a long or short loop of Henle:
   Explain your choice:

3. Identify the blood vessels labelled A and B on the photo (right). Give reasons for your answer:
   A:
   B:

4. (a) Describe how the closed circulatory system of mammals is able to deliver oxygenated blood to the cells of the body:
   (b) Is the blood in the veins under high or low pressure? Explain why:

f pH on a peptidase (a protease) produced in the small intestine of a rotein. This made the agar plate cloudy. Digestion of the protein by the

l sized wells into which the peptidase could be added. Four different ere produced and added to the wells.
temperature for 4 hours.

pH 7
pH 6

the agar plate for best results:

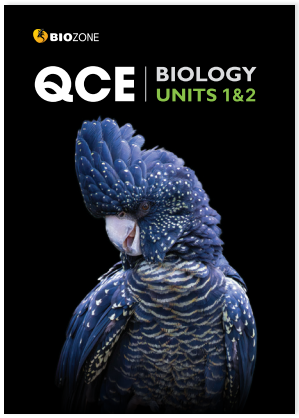
cal reactions. Describe the induced fit model of enzyme action:

or false (F):
ower the activation energy of a reaction:
r binds to a site other than the active site:
zyme changes shape when a substrate
k loop that escalates the outcome of the loop:

8. In the space below draw an annotated diagram to show how a metabolic pathway can be regulated by enzymes and what happens if an enzyme does not work correctly.

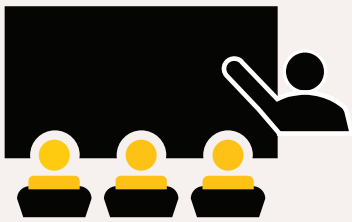
Suggestions for Planning, Delivery, and Assessment

Use the features of the worktext and the BIOZONE Teacher Toolkit resources to help you streamline your course preparation and delivery. Some suggestions are provided below, but there are many other ways you can use the resources for your planning, delivery, and assessment.



Lesson planning

- The structure of *QCE Biology Units 1 & 2* follows the structure specified in the **Queensland (QCE) Biology general senior syllabus** (2025 version). Teachers can be assured that all of the essential components of the syllabus are covered, ensuring easy and efficient lesson planning with no content gaps.
- Use the chapter introductions to assign students work for each lesson.
- Add interest to your lessons by utilising the FREE, curated resources on **BIOZONE's Resource Hub** in your planning. Resources for specific activities are identified on the Resource Hub, saving you time, and extending your range of tools. You can use these to prepare students for upcoming topics, or consolidate understanding after lessons.
- Use the contents pages to help with lesson planning too. A bullet next to an activity in the contents pages identifies where there is a practical investigation. Incorporate these activities into your schedules.



Teaching

- The content is organised to follow the delivery order presented in *QCE Biology General senior syllabus*. Following the order allows for development of the content ideas and knowledge as prescribed in the syllabus document.
- Have students refer to *Chapter 1: Basic Skills for QCE*, as the need arises, or before attempting an activity that addresses a specific skill (e.g. drawing a line graph). These activities can be assigned as homework, or they can be completed in class.
- Encourage peer-to-peer learning by assigning students to groups of mixed abilities when carrying out group research projects or practical investigations.
- Extend students' scientific vocabulary by encouraging them to look up unfamiliar words in the **glossary** (Appendix 2).
- Use BIOZONE WORLD to introduce an activity and give any direction required. It can be used to review answers in class or on-line quickly and efficiently. Choose when and how you reveal the answers. To promote student discussion, reveal answers only once the students have shared their ideas. Reveal all the answers if you want the students to self mark their own work.

Assessment

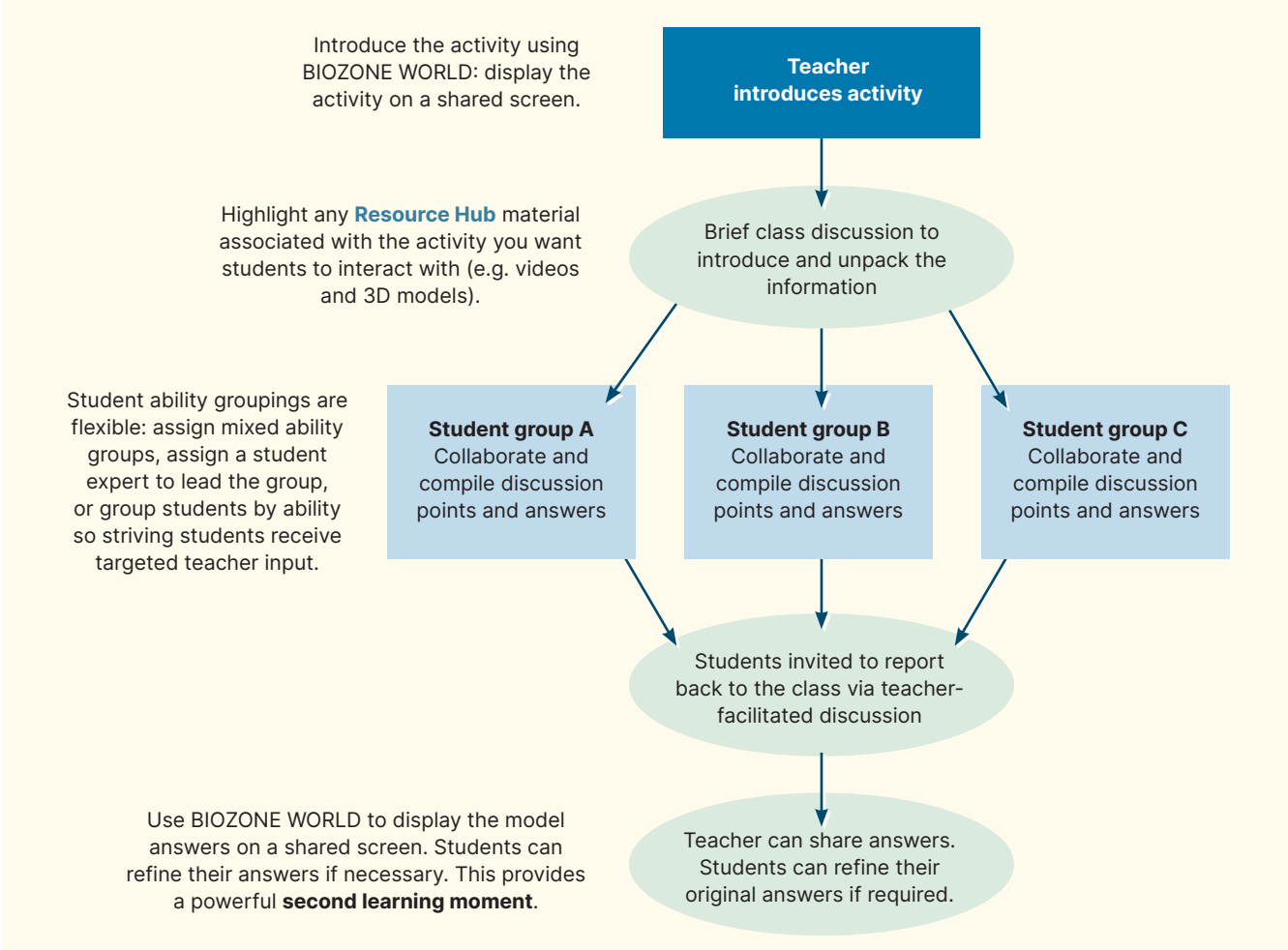
- Provide feedback (formative and summative) to students to update them on their progress. This can highlight areas of strength or areas needing work.
- Use formative assessment to identify areas the class needs to revisit before progressing to the next topic or unit. Methods of formative assessment include reviewing student answers on the Did You Get It? chapter reviews, observing students carrying out practical work, or evaluating their contribution and understanding in practical or research work.
- Use the **Synoptic Assessments** at the end of each unit to assess student understanding. This could be carried out as a test in class. Alternatively, you can set them as homework or open book assessments if you wish.

Teaching Strategies for Classroom Use

Achieving effective differential instruction in classes is a teaching challenge. Students naturally have mixed abilities, varying backgrounds in the subject, and different language skills. Used effectively, BIOZONE's worktexts and supporting resources can make teaching a mixed ability class easier. Here, we suggest some approaches for delivering content.

Making a start

Regardless of which activity you might be attempting in class, a short introduction to the task by the teacher is a useful orientation for all students. For collaborative work, the teacher can then divide the class into appropriate groups, with ability levels chosen at your discretion. Depending on the activity, the class may regroup at the end of the lesson for discussion or to present their findings, and you may choose to share model answers with the class for marking purposes.



The teacher introduces the topic. They provide structure to the session by providing background information and setting up discussion points and clear objectives. Collaboration is emphasised to encourage participation from the entire group. If necessary, students in a group can be assigned specific tasks.

Students work in small groups so that everyone's contribution is heard. They collaborate, share ideas, and engage in discourse. The emphasis is on sharing ideas, discussing questions, and formulating answers. Students may even come up with additional questions and discussion points.

Students report back on their findings. Each student should have enough knowledge to report back on the group's findings. Reporting consists primarily of providing answers to questions, but may involve presenting a report, model, or slide show, or contributing to a debate. Students can revise their original answers, providing a powerful second learning moment.

Using collaboration to maximise learning outcomes

- The structure of *QCE Biology* allows for a flexible approach to unpacking the content with your students.
- The content can be delivered in a way to support collaboration, where students work in small groups to share ideas and information to answer and gain a better understanding of a topic, or design a solution to a problem.
- By working together to ask questions and evaluate each other's ideas, students maximise their own and each other's learning opportunities. They are exposed to ideas and perspectives they may not have come up with on their own.
- Collaboration, listening to others, and voicing their own ideas is valuable for supporting English language learners to become confident in using English. It also builds and develops English and scientific vocabularies in all students.
- Use a short, informal, collaborative learning session to encourage students to exchange ideas about the answer to a question.
- A collaboration icon (right) indicates where there is an opportunity for students to work together.

Peer to peer collaboration and support

- Peer-to-peer learning is emphasised throughout the worktext, and is particularly valuable for more challenging activities in which the content is more complex or the questions require students to draw on several areas of their knowledge to solve a problem.
- Stronger students can assist their peers and, in doing so, both groups benefit from verbalising their ideas. Students for whom English is an additional language can ask their classmates to explain unfamiliar terms or ideas, and this benefits the understanding of both parties.
- Students are encouraged to think about, and share, what they already know and then build on this knowledge by exploring and explaining new content. For example, have pair, think, share activities or assign groups to work together to complete an activity, to research questions, or design a solution to a problem.

Student A is capable. He helps to lead the discussion and records the discussion in a structured way.

Students B and C are also capable but less willing to lead discussion. They will add ideas to the discussion but need a little direction from A to do so.

Student D is less able but gains ideas and understanding from the discussion of students A, B, and C. She may add to the discussion as she gains confidence in the material being studied.

Reviewing work and providing answers

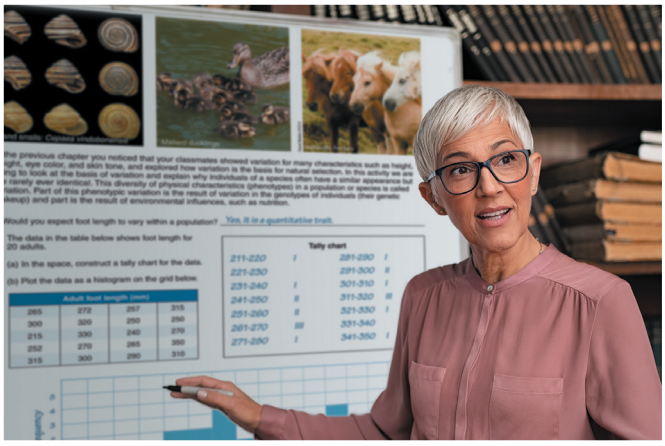
Our worktext approach encourages students to demonstrate their understanding of the content by inputting their answers on the activity page, either by writing it into the printed book or typing answers onto the digital version in BIOZONE WORLD. This approach makes it easy for students to record and share their answer and ideas with other students and their teacher. They can also review their own work or peer-review the work of others. Teachers can easily review an individual's work and see how they are progressing through the content. Model answers are provided for each activity and these can be shared with students at the teacher's discretion. Self reported grading is a powerful tool for accelerating learning and should be encouraged where possible. Students should also be encouraged to refine their answers (if needed) and deepen their level of understanding. This enhances the learning moment.

Peer feedback

Dividing students into small groups allows them to share their answers and ideas and receive immediate peer feedback. Sharing ideas and discussing alternative perspectives and solutions can broaden each student's understanding or perspective. Students may or may not come to a consensus answer through this process. Some students may wish to refine their original answer after the discussion.

Class discussion to review answers

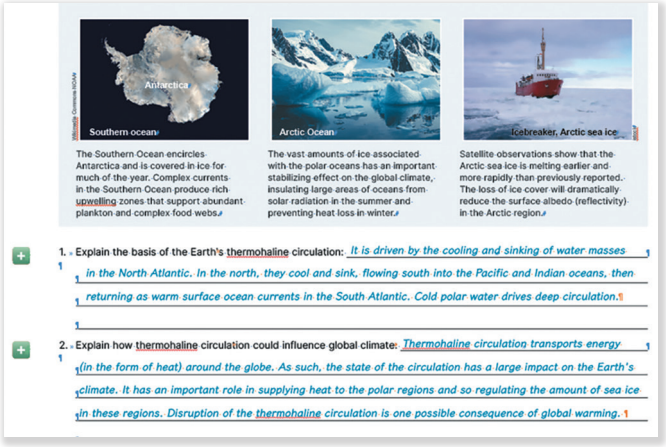
Small groups can partake in collaborative summarising when brought together as a larger group or class. Students can share ideas and answers through structured discussion, either as a class or within larger groups. The class benefits from hearing a range of ideas, and teachers can guide the discussion to ensure efficient use of time. At the end of the discussion, the teacher may wish to share the model answer with the class.



Review answers in class via BIOZONE WORLD

The teacher view in BIOZONE WORLD has model answers which can be toggled on and off using the show/hide buttons on an activity page. View activities in BIOZONE WORLD on a shared screen and reveal the answers as required. This is ideal for:

- Providing a concise model answer after a group or class discussion.
- Self marking by students. Students can amend their answer if necessary, providing a powerful secondary learning moment.
- Providing a quick review of answers if time is short.



Teacher review of student work

Students using the print version of *QCE Biology* write their answers directly into the space provided on the page. Teachers can revise or grade student responses as required.

Students using the digital version of *QCE Biology* input and submit their answers via the digital platform, BIOZONE WORLD. Teachers can revise or grade activities as required.

How are Language Skills Supported?

BIOZONE has several support mechanisms in place to support the development of language skills. These include collaborative tasks to build communication and listening skills, and writing answers to provide practice in written skills. The inclusion of a glossary helps to develop the scientific literacy of all students. In the digital version of the worktext (BIOZONE WORLD), a translation function supports ELLs in their learning journey. More information on these supports is provided below.

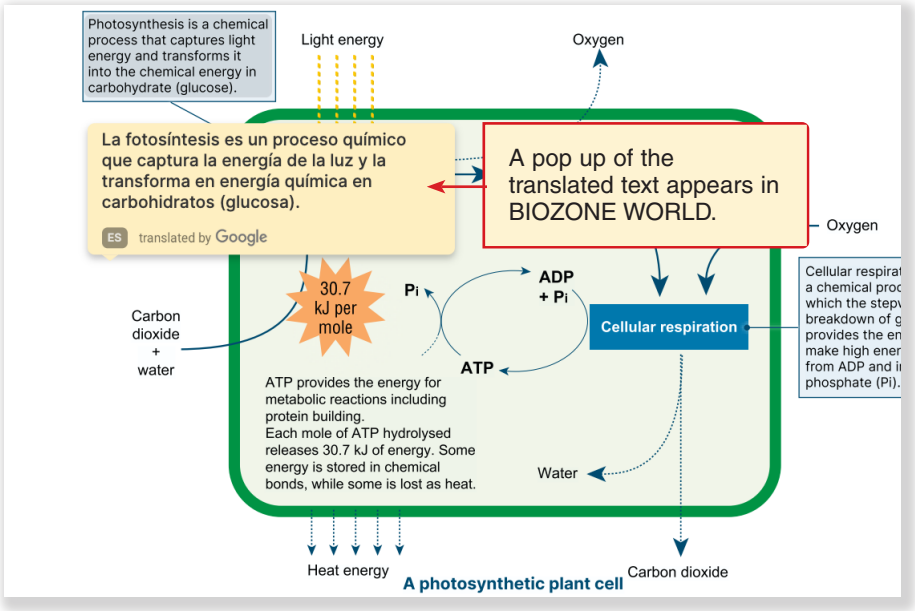
Glossary

Key terms within an activity are highlighted in **blue bold** on their first appearance and are included in the glossary. Encourage students to use the glossary to look up unfamiliar terms and expand their scientific vocabulary. Regular opportunities are provided for students to use key terms in both writing and oral communication to reinforce their use.

Translation function

BIOZONE WORLD, our digital platform, provides a translation feature to support students who do not have English as their native language. The content can be translated into ~150 languages.

Activate the translation feature, choose the desired language, and hover the cursor over the text to translate. A pop-up box with the translated text will appear, while the original English text remains visible. This dual-language view helps students develop their English language skills while providing the comfort of having their first language accessible.



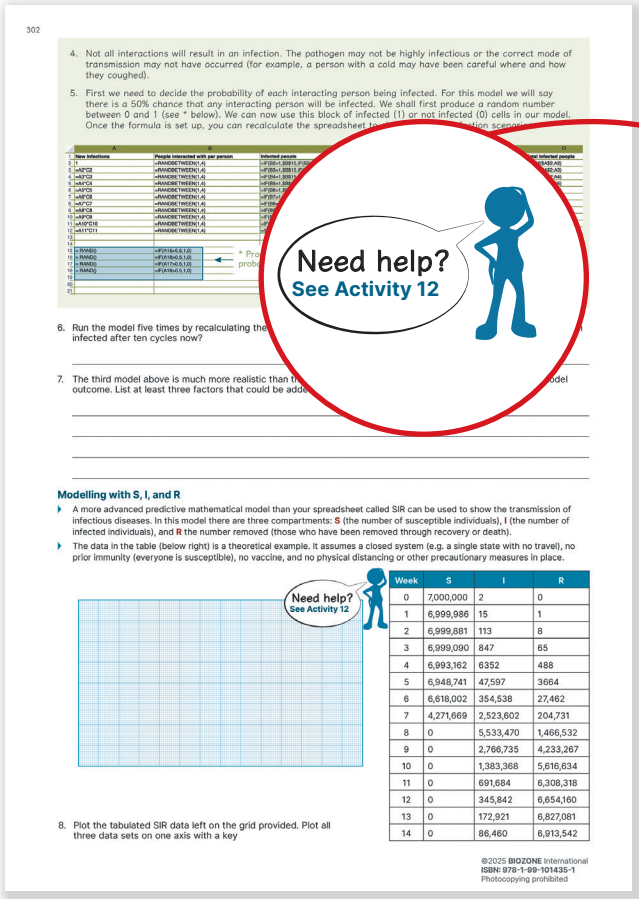
How are Maths and Science Practices Supported?

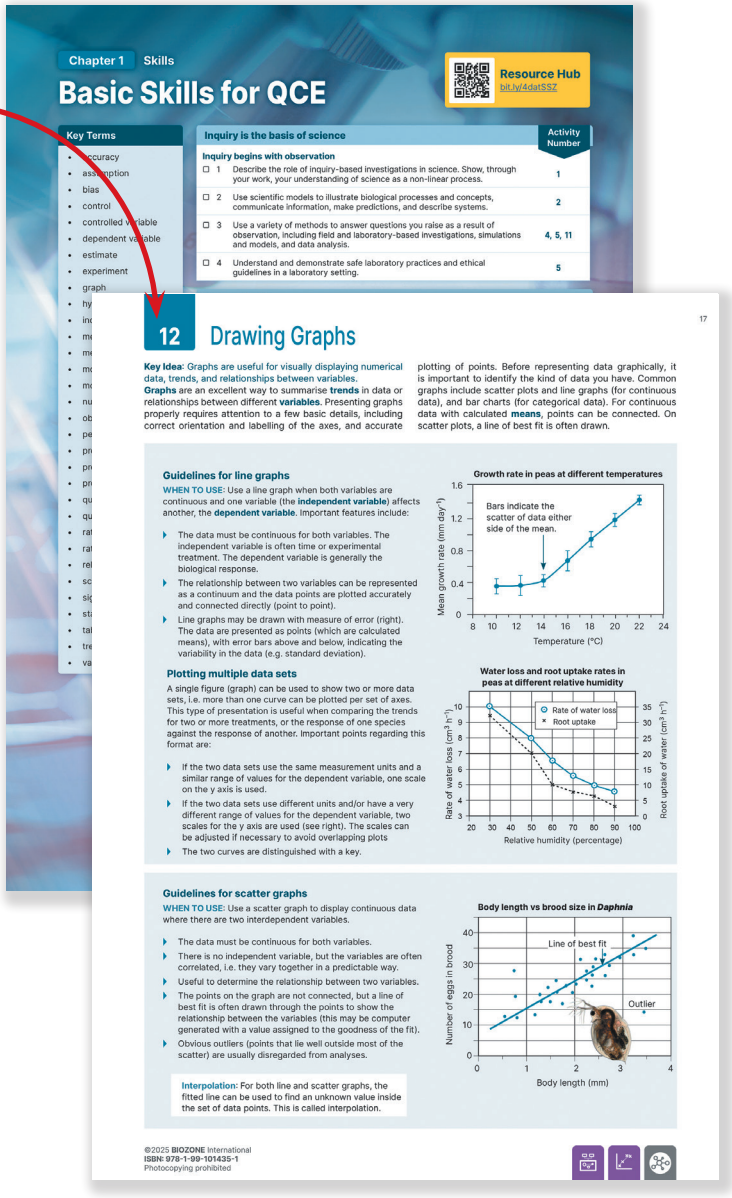
A dedicated Basic Skills for QCE chapter supports students to competently use fundamental maths and science practices needed for their course. Many teachers use this chapter to provide "just in time delivery" of the skills students need to complete a particular activity. For example, students may be encountering graphing for the first time in the course. They can be directed to the Basic Skills chapter to revise the skills needed to select and draw an appropriate graph. The activities in the Basic Skills chapter can be set as homework or as a pre-activity in class so students have the skills to progress confidently through the activities.

The Need help? icon (right) alerts students and teachers that support for a skill on the activity page is provided in the Basic Skills chapter. The icon will directly reference the activity number for easy navigation.

Encourage students to use the support activities often to build their confidence and skill set.

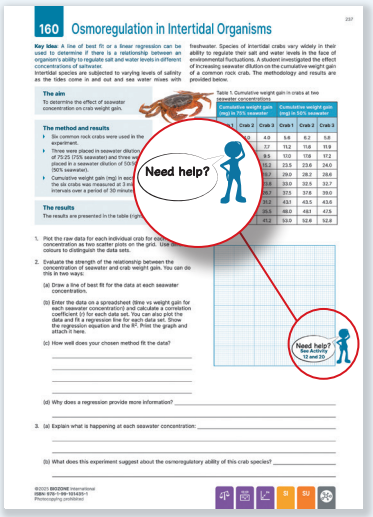
The Need help? icon points directly to the support activity in the Basic Skills for QCE chapter.



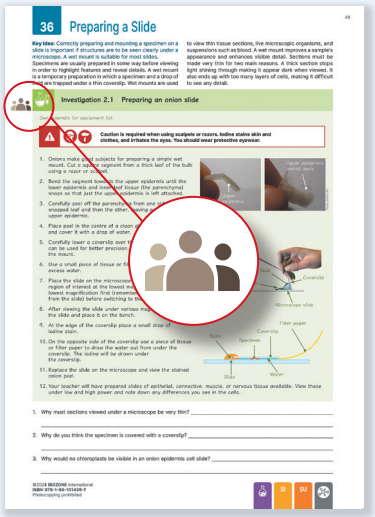


Differentiated Learning Tools

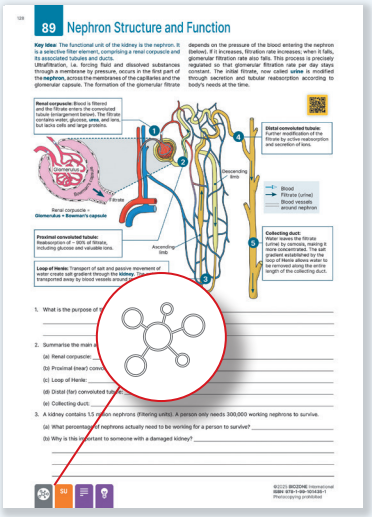
QCE Biology promotes differentiated instruction and has been designed to cater for students with a wide range of abilities. There are several ways you can utilise the tools in the program to support differential instruction in your classroom.



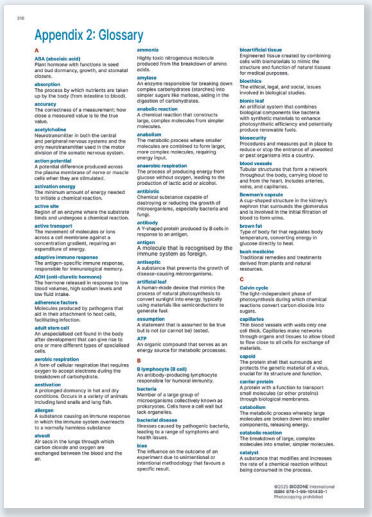
Need Help? Icon:
The NEED HELP? icon identifies where material is available in the Basic Skills chapter to support a particular math skill or science practice. Set these activities as a refresher before the students attempt the activity that requires the skill. Encourage students to refer to the Basic Skills chapter often.



Collaboration Icon:
A group symbol indicates where students can work together. Group work provides opportunities for student collaboration and peer-to-peer support to explore and develop ideas. By speaking and listening to each other, communication skills and scientific vocabulary are extended.



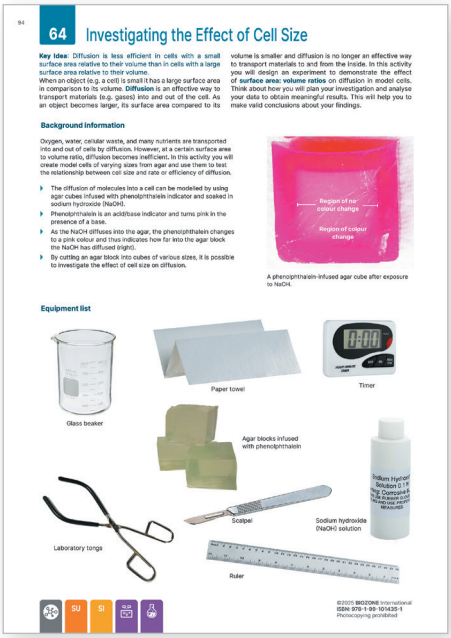
Resource Hub
BIOZONE's **Resource Hub** supports learners of all abilities and also provides teacher support materials. Use the videos, games, and animations to help striving learners with their understanding of content. Some material is specifically tagged for students needing extension, or as teacher resources.



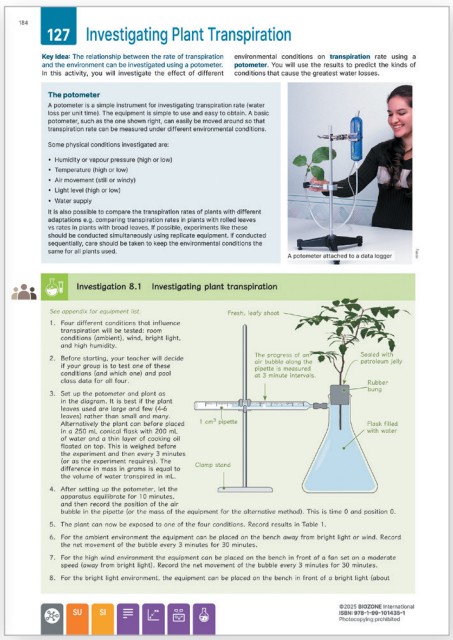
Glossary:
A glossary has been provided to help improve scientific literacy. Encourage students to refer to the glossary whenever they are unsure about the meaning of a key term. Key terms are identified by **bold blue text** the first time they appear in an activity. The are also listed in the chapter introductions.

Practical Investigations in Context

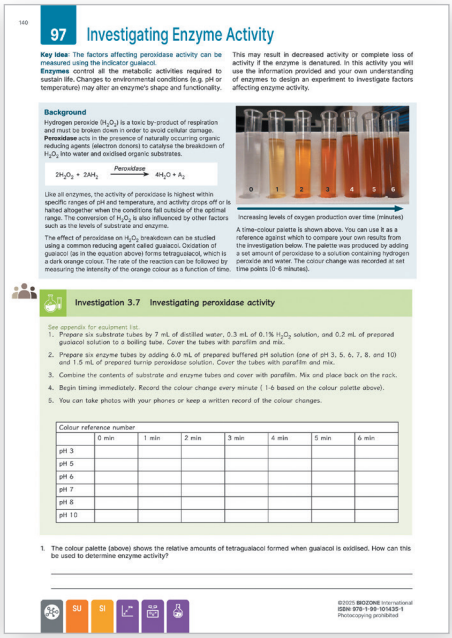
Practical investigations form an important component of the QCE Biology syllabus. Practical work provides opportunity for inquiry and investigation, and allows students to develop manipulative skills. Practicals encourage the use of 21st century skills (collaboration and teamwork, communication, critical thinking) and provide opportunities to apply skills in literacy and numeracy.



Some "practical" activities are not investigations in the true sense, but give students a place to develop their skills in planning and designing an experiment.



Almost all investigations require students to use a number of science skills. They encourage collaboration, problem solving and attention to detail, as well as the analysis and evaluation of data.



The practical investigations may involve setting up and carrying out an experiment (above), or could involve a paper practical or modelling activity (e.g. making a model of the plasma membrane).

Equipment lists are provided

No special kits are needed, the activities have been designed using equipment and materials commonly found in high school laboratories and classrooms. A list of equipment needed for each investigation is provided in Appendix 1. The list can be used to plan the equipment needed for the whole year or for each practical activity.