BIOZONE

CLASSROOM GUIDE

VCE | BIOLOGY UNITS 1&2

Contents

CLASSROOM GUIDE

STUDENT EDITION

APPENDIX

ISBN 978-1-98-856676-4

Second Edition 2021

Published by BIOZONE International Ltd

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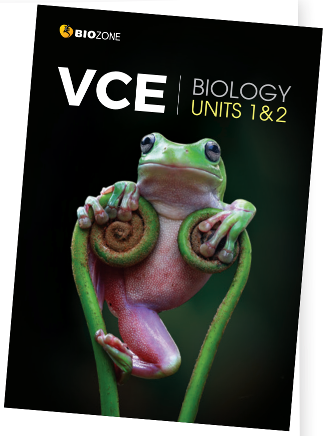
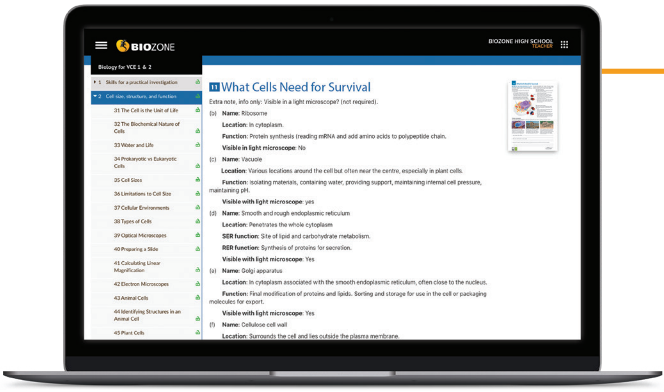
FAQs ABOUT VCE BIOLOGY UNITS 1&2



Teacher Support Materials

BIOZONE's *VCE Biology, Units 1&2* is supported by a suite of resources. These additional resources provide the tools for teaching and learning remotely or in the classroom, support your students in their self-assessment tasks with online answers, and use interactivity to promote class discussion and efficient review. Some features of these supporting resources are described below and you will find further information later in this guide.



ONLINE MODEL ANSWERS

Online Model Answers provide model answers to each of the activities, including working where appropriate (e.g. calculations).

Online Model Answers are accessible via a login that is unique to your school. Your access as a teacher means you're able to control how much and when students can view individual answers, making it easier for you to support homework and revision. Controlled access to answers promotes deeper understanding and encourages students to be self critical. The online model answers also provide an effective tool to support your students with remote learning.

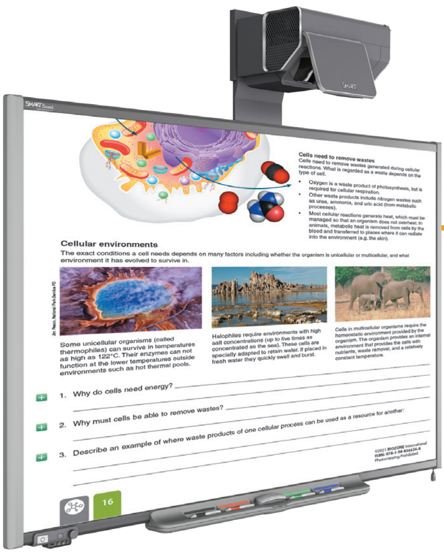
EBOOK VERSION

Our eBooks provide a digital replica of the printed pages.

With our eBook PLUS on a School Managed Licence, students can answer most questions online, although a small number of questions require offline responses or a download. These are mostly associated with key skills, such as plotting and graphical representations.

The eBook TEACHER'S EDITION is also available with answers in place and some additional features.

Visit: **biozone.com.au/ebooks** for more information



DIGITAL TEACHER'S EDITION

This teacher's resource features a non-printable PDF Teacher's Edition, with a useful feature allowing you to hide and display the suggested answers. It is ideal for introducing and reviewing activities using an interactive whiteboard. The Digital Teacher's Edition includes an introductory guide to using *VCE Biology, Units1&2* in the classroom and online, as well as a long answers section. Supplied as a direct download.

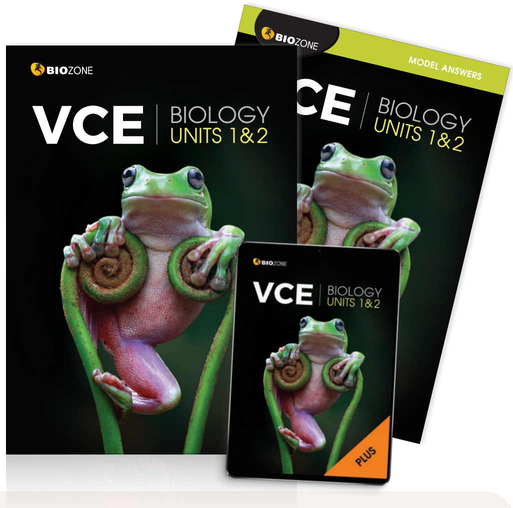
RESOURCE HUB

Be sure to visit BIOZONE's RESOURCE HUB, which is fully accessible and free of charge to you and your students. It offers a curated collection of videos, animations, 3D models, and supporting content for the activities in this book.

Visit: **www.BIOZONEhub.com** Your code is **VCE11-2-6368**

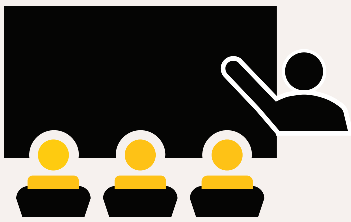
Meeting Key Competencies

We want today's biology students to be self-motivated, lifelong learners, to develop a sound grasp of biological knowledge, to plan and evaluate their work, and to think critically and independently. In developing *VCE Biology*, we have put the aims and structure of the **VCE Biology Study design** (for accreditation 2021-2025) first and foremost. This title fully supports scientific investigation, critical and creative thinking, and individual and collaborative approaches to scientific endeavour. An understanding of ethical behaviours, and acknowledgement of the knowledge and cultures of Aboriginal and Torres Strait Islander peoples, are integral to this title. This guide will highlight some of strategies BIOZONE has used to meet the aims and scope of the study design.



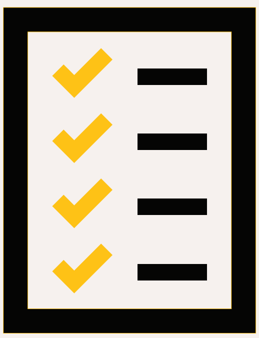
Lesson planning

- The structure of *VCE Biology, Units 1&2* follows the Unit-Area of Study structure specified in the **VCE Biology Study Design**. Teachers can be assured that all of the essential components of the Study Design 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 green bullet next to an activity in the contents pages identifies where there is a practical investigation. A red bullet indicates an assessment. Incorporate these activities into your schedules.



Teaching

- Teach the content in the order presented in *VCE Biology, Units 1&2*. The content and skills covered in Outcomes 1 and 2 of each unit lay the foundation for tackling Outcome 3 with confidence.
- Have students refer to *Chapter 1: Key Science Skills*, 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 into groups of mixed abilities when carrying out group research projects or practical investigations.
- Activities that manipulate data using formulas may be supported by spreadsheets on **BIOZONE's Resource Hub**. You can tailor how you use the spreadsheets and students can analyse the data sets provided (including graphs) to save time.
- Extend students' scientific vocabulary by encouraging them to look up unfamiliar words in the **glossary** (Appendix 3).
- Use the **Digital Teacher's Edition** 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.

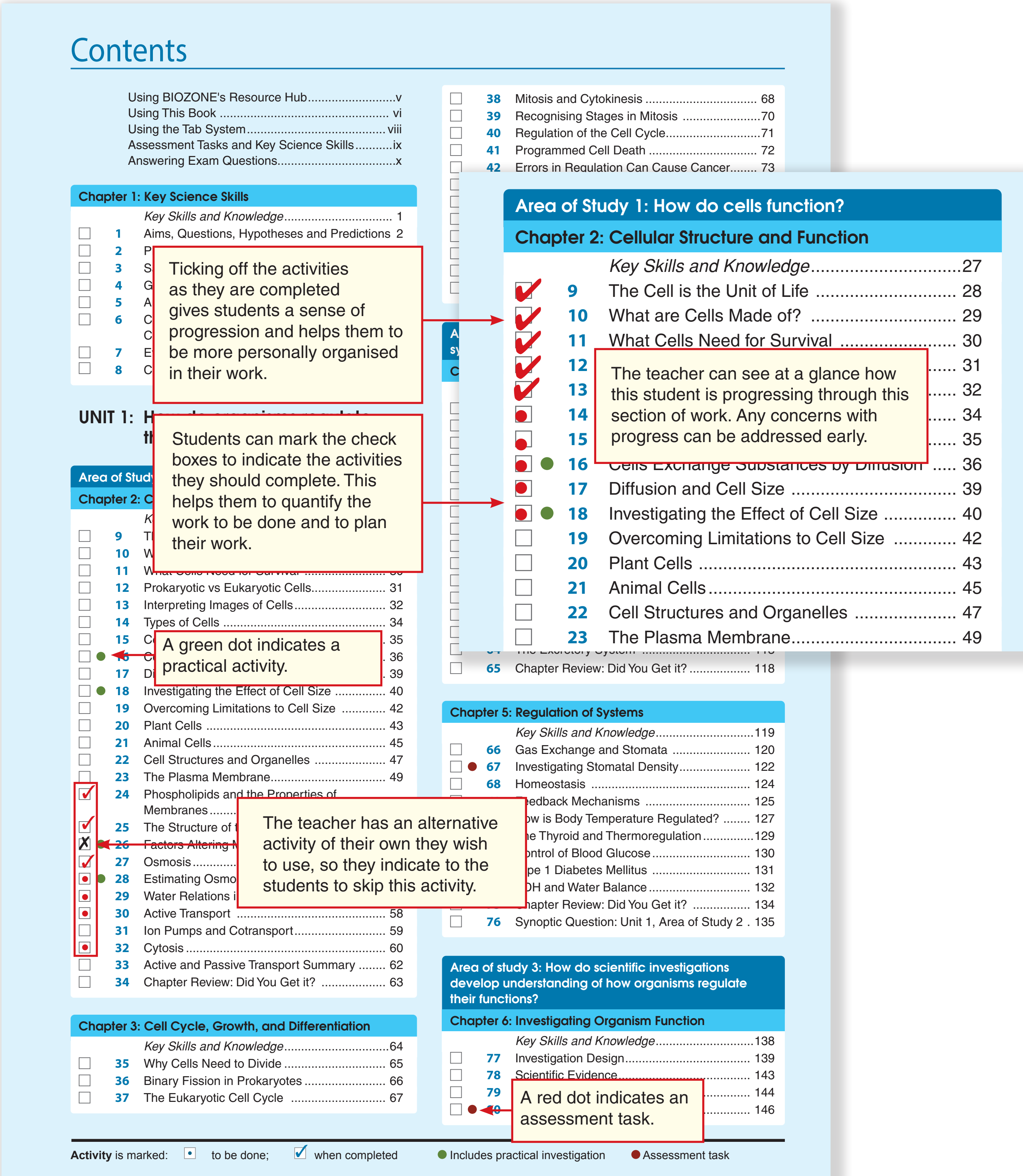


Assessment

- 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 chapter reviews, observing students carrying out practical work, or evaluating their contribution and understanding in practical work.
- Use the **Synoptic Questions** at the end of each Area of Study 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.

The Contents: A Planning Tool

The contents pages are not merely a list of the activities in the book. Encourage your students to use them as a planning tool for their programme of work. Students can identify the activities they are to complete and then tick them off when completed. Teachers can see at a glance how quickly the student is progressing through the assigned material.



Contents

Activity is marked: to be done; when completed Includes practical investigation Assessment task

Introducing the Content

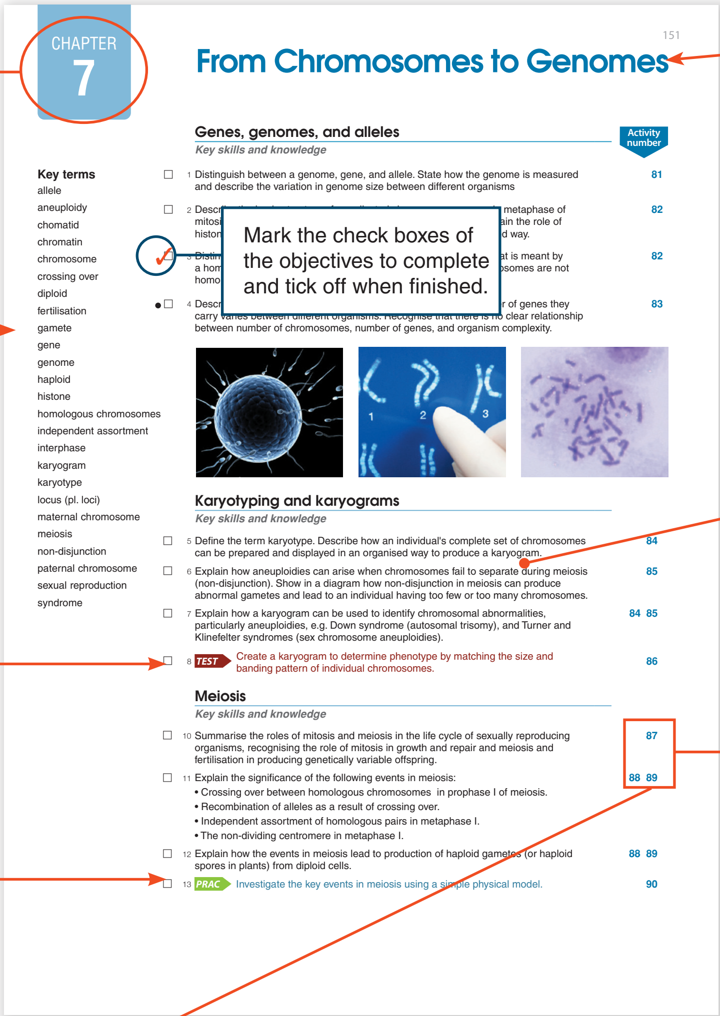
Each chapter in *VCE Biology Units 1&2* is prefaced with a one page introduction, providing students with an overview of the chapter content and organisation. Each of the numbered learning outcomes pertains to a point of key knowledge or a skill, and is matched to one or more activities. A list of key terms for the chapter is also included. The comprehensive, but accessible, list of learning outcomes encourages students to approach each topic confidently. Familiarity with the scientific terms used in each topic is implicit in this. Encourage your students to use the glossary to expand their vocabulary.

For ease of navigation, chapters are numbered sequentially throughout the book, separated by Unit and Area of Study breaks (see following pages).

Students can use the list of **key terms** to create their own glossary, or they can look them up in the glossary at the back of the book. This encourages use of the correct terms when answering questions.

Activities that cover an assessment for the Area of Study are indicated by a red bookmark and text.

Activities that cover practical skills are identified with a green bookmark and blue text.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CHAPTER 7

From Chromosomes to Genomes

Genes, genomes, and alleles

Key skills and knowledge

Activity number

Key terms
allele
aneuploidy
chromatid
chromatin
chromosome
crossing over
diploid
fertilisation
gamete
gene
genome
haploid
histone
homologous chromosomes
independent assortment
interphase
karyogram
karyotype
locus (pl. loci)
maternal chromosome
meiosis
non-disjunction
paternal chromosome
sexual reproduction
syndrome

- ☐ 1 Distinguish between a genome, gene, and allele. State how the genome is measured and describe the variation in genome size between different organisms — 81
- ☐ 2 Desc... metaphase of mitosi... ...in the role of histon... ...d way. — 82
- ☐ 3 Distin... ...at is meant by a hom... ...osomes are not homo... — 82
- ☐ 4 Desc... ...r of genes they carry ... between different organisms. Recognise that there is no clear relationship between number of chromosomes, number of genes, and organism complexity. — 83

Mark the check boxes of the objectives to complete and tick off when finished.

Karyotyping and karyograms

Key skills and knowledge

- ☐ 5 Define the term karyotype. Describe how an individual's complete set of chromosomes can be prepared and displayed in an organised way to produce a karyogram. — 84
- ☐ 6 Explain how aneuploidies can arise when chromosomes fail to separate during meiosis (non-disjunction). Show in a diagram how non-disjunction in meiosis can produce abnormal gametes and lead to an individual having too few or too many chromosomes. — 85
- ☐ 7 Explain how a karyogram can be used to identify chromosomal abnormalities, particularly aneuploidies, e.g. Down syndrome (autosomal trisomy), and Turner and Klinefelter syndromes (sex chromosome aneuploidies). — 84 85
- ☐ 8 TEST Create a karyogram to determine phenotype by matching the size and banding pattern of individual chromosomes. — 86

Meiosis

Key skills and knowledge

- ☐ 10 Summarise the roles of mitosis and meiosis in the life cycle of sexually reproducing organisms, recognising the role of mitosis in growth and repair and meiosis and fertilisation in producing genetically variable offspring. — 87
- ☐ 11 Explain the significance of the following events in meiosis: — 88 89
  - Crossing over between homologous chromosomes in prophase I of meiosis.
  - Recombination of alleles as a result of crossing over.
  - Independent assortment of homologous pairs in metaphase I.
  - The non-dividing centromere in metaphase I.
- ☐ 12 Explain how the events in meiosis lead to production of haploid gametes (or haploid spores in plants) from diploid cells. — 88 89
- ☐ 13 PRAC Investigate the key events in meiosis using a simple physical model. — 90

The chapter title corresponds to the *Key Knowledge* headings under each *Outcome* for each *Area of Study*.

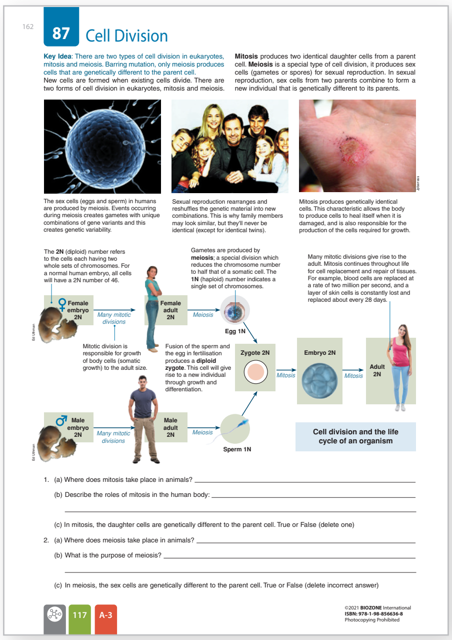
For students:

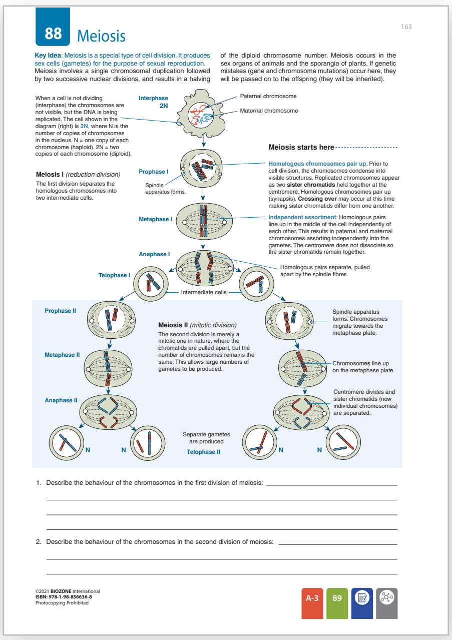
Key knowledge and skills are drawn from the study design. They are purposefully brief, with enough information to provide a framework, but not so much that students are overwhelmed.

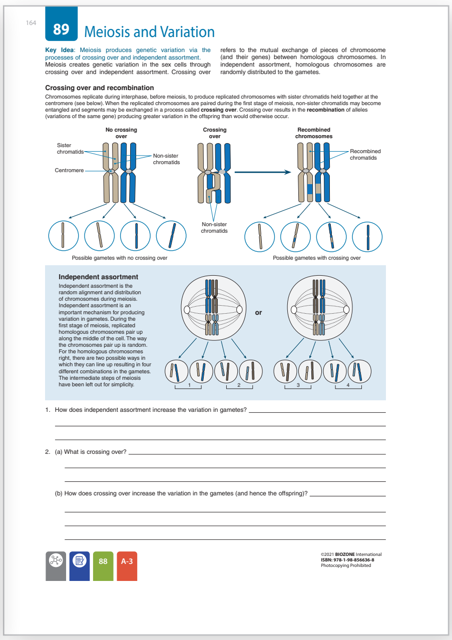
The activities relating to these key knowledge outcomes.

Introduce the concept with a grounding activity

Follow with activities exploring that concept



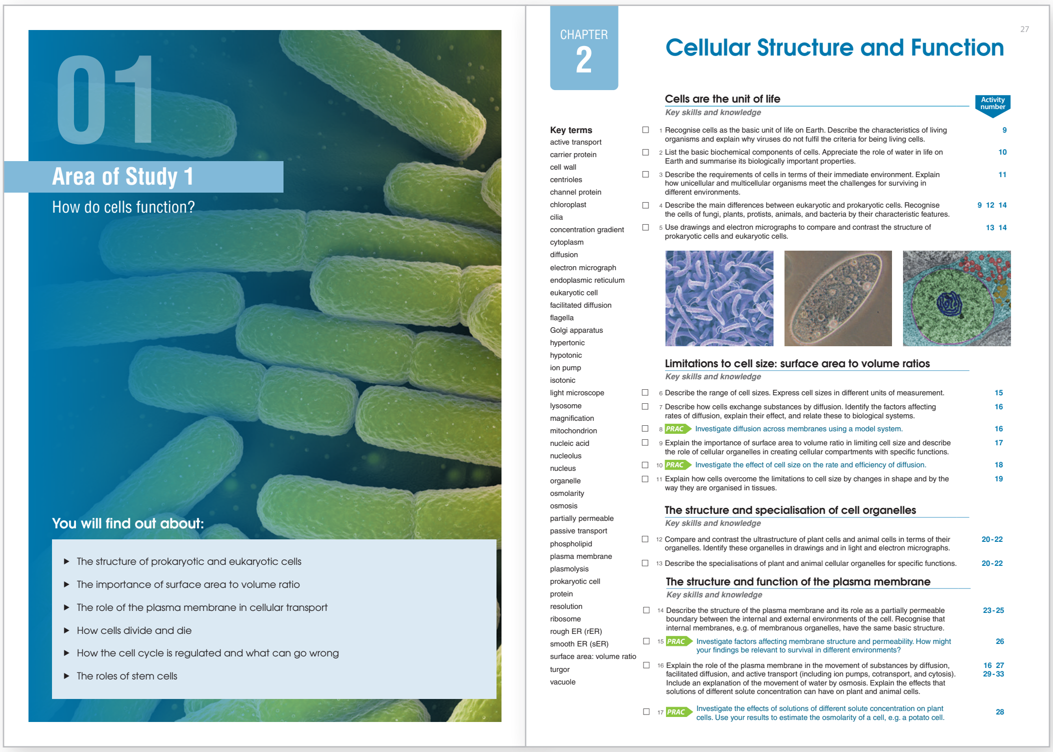




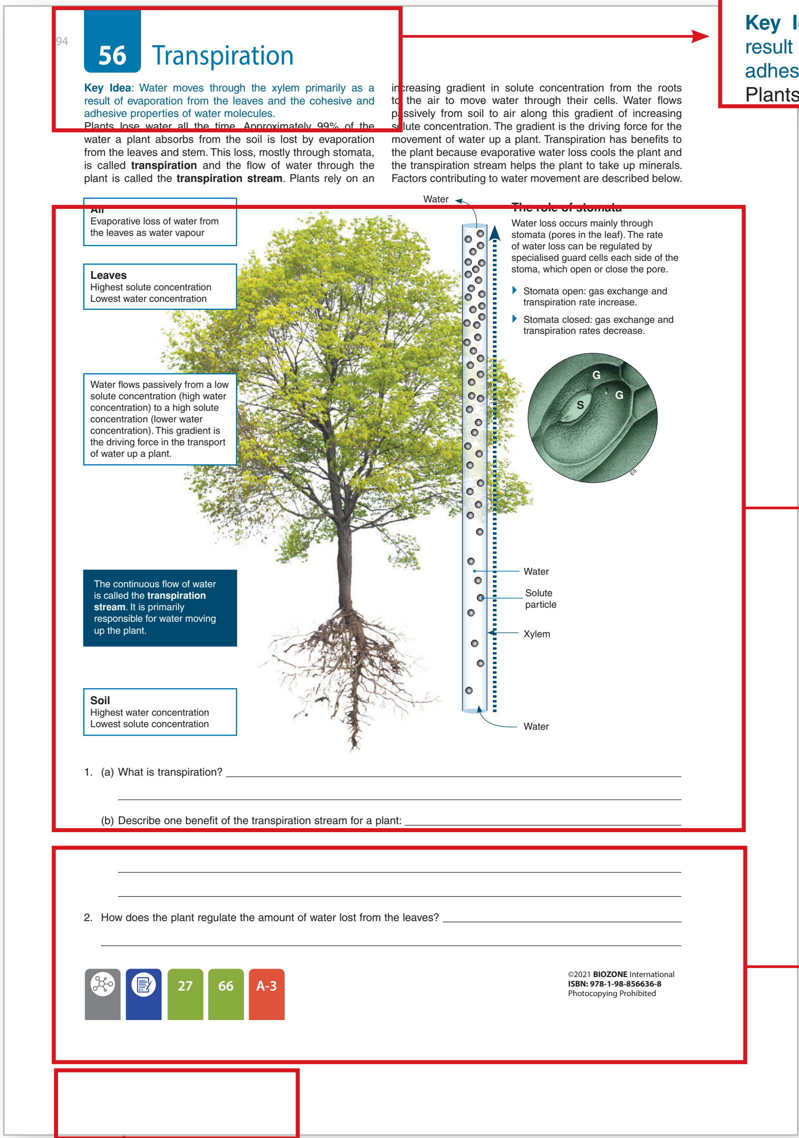
Finding Your Way Around

The content of the *VCE Biology Units 1&2* is organised into 12 chapters, numbered sequentially and nested within their Unit and Area of Study (below). Each chapter begins with an introduction and most conclude with a student's self-test of understanding and vocabulary. Inviting, concept-based activities make up the bulk of each chapter, with each activity focussing on the student developing an understanding of a concept, applying that understanding to another scenario, and/or developing an essential skill, such as graphing or data analysis. The tabs for each activity identify the nature of the activity, and identify related material and external supporting resources. These features are explained further on the opposite page.

The two *Unit* breaks divide the book into two halves, providing students with a clear indication of where they are in the course. Each unit break summarises the topics to be covered in each *Area of Study*, so students have a clear idea of what is coming up.



The *Area of Study* breaks demarcate each group of related topics within the Study Design. Each one provides a short list of what the student will find out about in that section, which helps to prepare them for the upcoming content. An *Area of Study* may include anything from one to three chapters (*Key Knowledge* areas).



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56 Transpiration

Key Idea: Water moves through the xylem primarily as a result of evaporation from the leaves and the cohesive and adhesive properties of water molecules.

Plants lose water all the time. Approximately 99% of the water a plant absorbs from the soil is lost by evaporation from the leaves and stem. This loss, mostly through stomata, is called **transpiration** and the flow of water through the plant is called the **transpiration stream**. Plants rely on an increasing gradient in solute concentration from the roots to the air to move water through their cells. Water flows passively from soil to air along this gradient of increasing solute concentration. The gradient is the driving force for the movement of water up a plant. Transpiration has benefits to the plant because evaporative water loss cools the plant and the transpiration stream helps the plant to take up minerals. Factors contributing to water movement are described below.

1. (a) What is transpiration? ______

(b) Describe one benefit of the transpiration stream for a plant: ______

2. How does the plant regulate the amount of water lost from the leaves? ______

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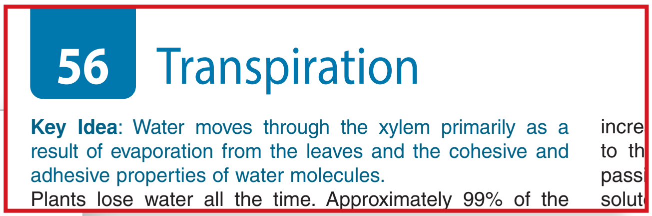


56 Transpiration

Key Idea: Water moves through the xylem primarily as a result of evaporation from the leaves and the cohesive and adhesive properties of water molecules.

Plants lose water all the time. Approximately 99% of the

incre to th pass solut

The **key idea** provides a focus for each activity. It summarises the focus of the activity and provides a clear take-home message for the student.

Annotated diagrams, sometimes including photo panels, explain the content of the page, providing the information necessary to complete the activity.

Understanding of content is tested through questions, data handling, analysis, prediction, or summary. Students are often required to apply their understanding to a new scenario or make connections to related content. Students must interact with the information on the page in order to complete the activity. It is this interaction that provides the valuable learning experience, reinforcing and explaining the key idea. Students are frequently asked to work in small groups to discuss ideas and formulate responses.

Related or supporting content is identified through the **colour-coded tab system** (below).

Grey hub tabs indicate the activity is supported on the Resource Hub. See page v for details.

Green tabs make connections to related activities elsewhere in the book

Blue tabs indicate the activity covers the following **key skills** (L → R):

- Develop aims and questions, formulate hypotheses, make predictions
- Plan and conduct investigations
- Comply with safety and ethical guidelines
- Generate, collate, and record data
- Analyse and evaluate data and investigation methods
- Construct evidence-based arguments and draw conclusions
- Analyse, evaluate and communicate scientific ideas

Red tabs indicate appendices (L → R):

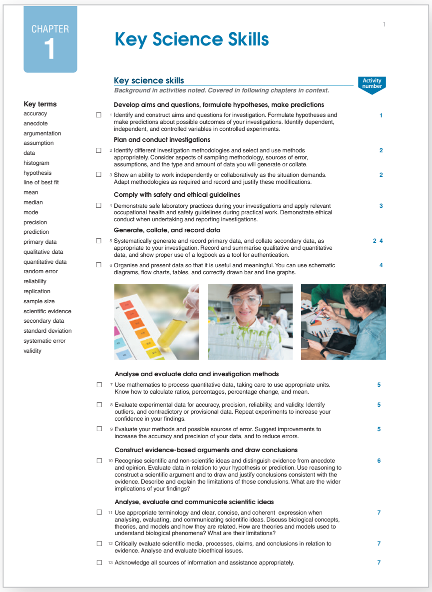
- A-1: Which graph to use?
- A-2: Basic mathematical formulae
- A-3: Glossary
- A-4: Equipment list

See pages 276-283

Support for Science Skills and Practical Investigations

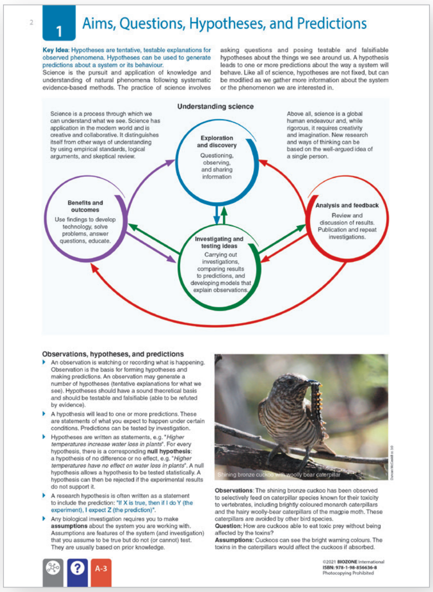
The *Key Science Skills* of the VCE Biology Study Design are well supported with Chapters 1, 6, and 12. Chapter 1 provides overall support, with an activity devoted to each of the seven science skills outlined in the Study Design. Chapter 6 provides targeted support for Outcome 3 of Unit 1, while Chapter 12 does the same for Outcome 3 of Unit 2. Throughout the book, students practise these skills by applying them in practical situations (opposite). As students work through the units, there are many opportunities for them to develop skills in science practices and apply them within the context of an activity. Regular practise helps students become proficient in using these skills when they encounter them in their assessments.

Key science skills: A checklist for students


Chapter 1 Key Science Skills

The introduction to Chapter 1 provides an overview of the seven key science skills required in VCE Biology. This checklist will help students ensure they understand the skill requirements.

Develop aims and questions, formulate hypotheses, and make predictions


1 Aims, Questions, Hypotheses, and Predictions

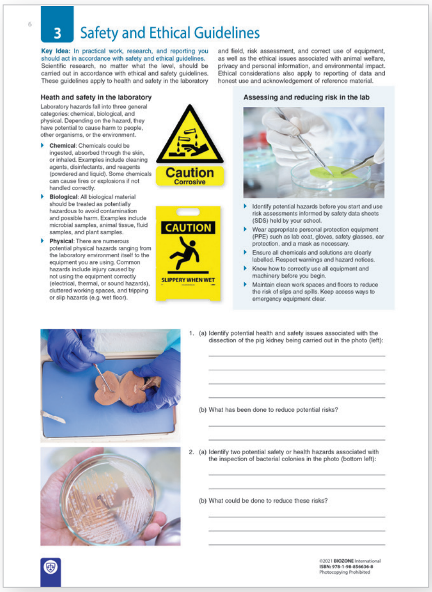
This activity helps students to identify and construct aims and questions for investigation, identify variables, formulate hypotheses, and make predictions. They will use these skills again in Chapter 6.

Plan and conduct investigations


2 Planning and Conducting Investigations

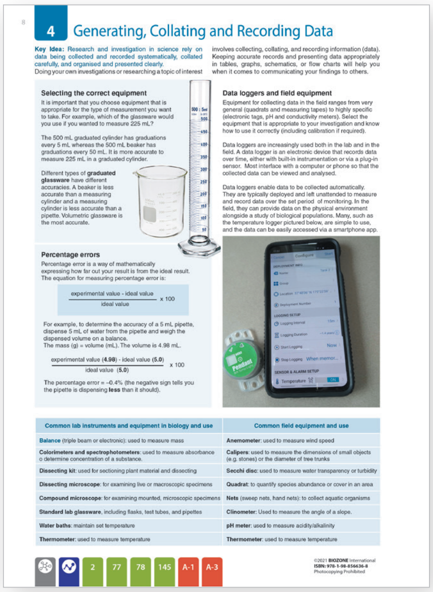
This activity focusses on how to plan and conduct investigations, including common pitfalls with sampling, and how to identify sources of error and uncertainty.

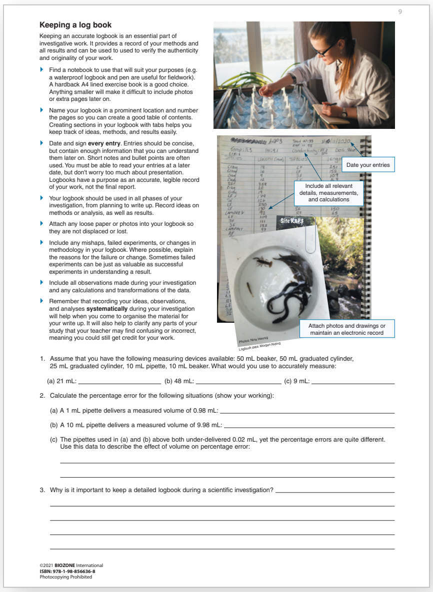
Comply with safety & ethical guidelines


3 Safety and Ethical Guidelines

This activity covers basic considerations for ethical science practices, including risk assessment and the importance of honest reporting.

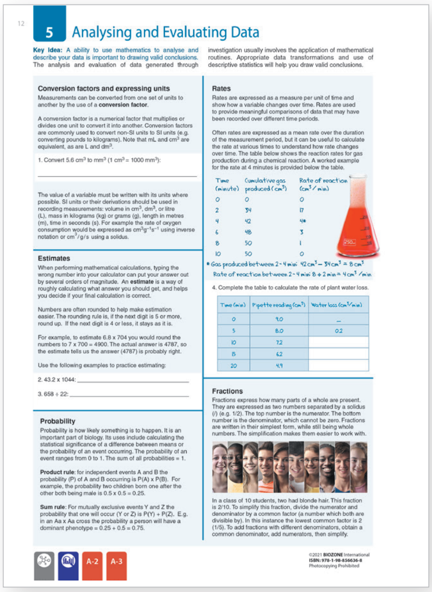
Generate, collate, and record data


4 Generating, Collating and Recording Data


Keeping a log book

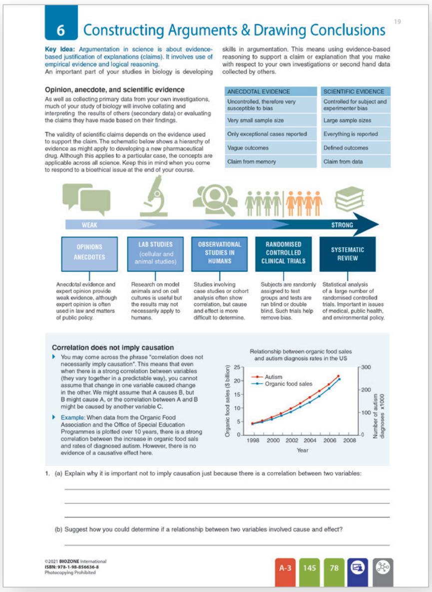
This longer activity covers some of the important aspects of collecting, collating, and recording data. Students have the opportunity to practise some of the skills they need, and can refer to the appendices as well if they need extra guidance. Attention to logbook use is an important part of this activity.

Analyse and evaluate data and investigation methods


5 Analysing and Evaluating Data

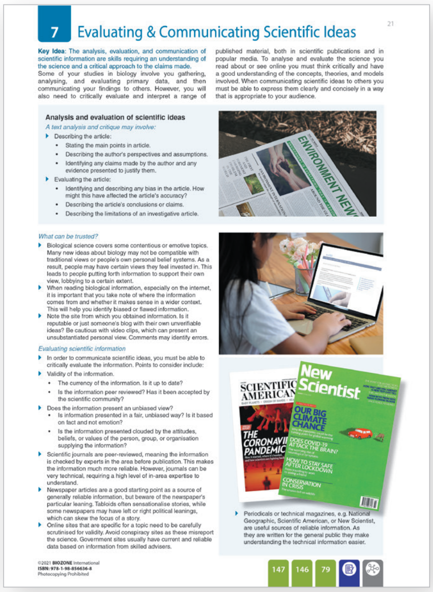
The analysis and evaluation of data is a longer activity that divides naturally into two areas: 1) basic mathematical routines and the evaluation of validity, and 2) use of descriptive statistics. Students could complete some of this activity in pairs.

Construct evidence-based arguments and draw conclusions


6 Constructing Arguments & Drawing Conclusions

One of the most challenging aspects of writing in science is in constructing evidence-based arguments. This activity introduces students to the basic principles, but there are many opportunities throughout the book to develop these skills as students complete the activities.

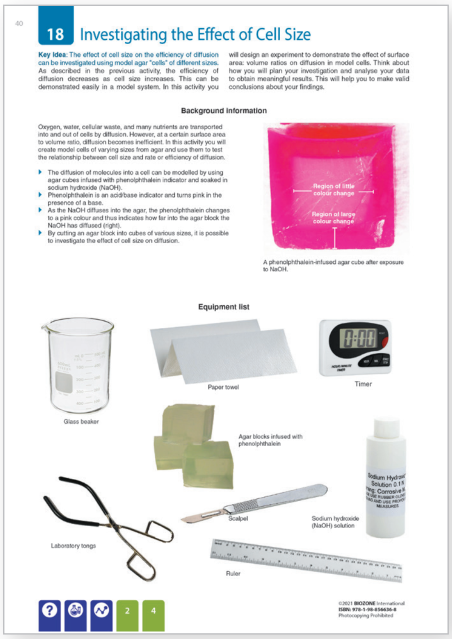
Analyse, evaluate, and communicate scientific ideas


7 Evaluating & Communicating Scientific Ideas

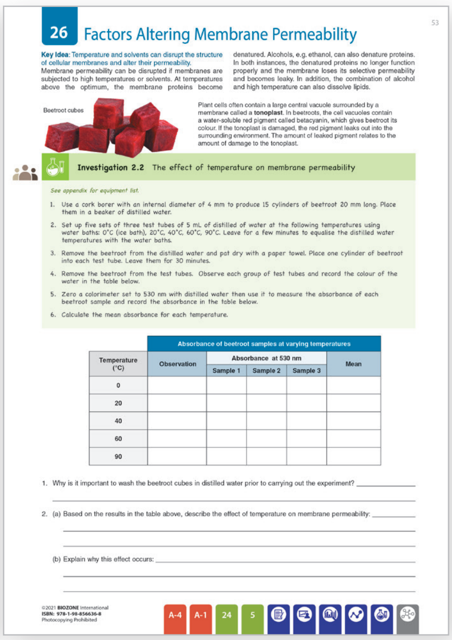
This skill requires students to think critically and communicate information to an audience in an appropriate way. Students are introduced to the basic principles here, and have the opportunity to implement them in Outcome 3 of Unit 2 (Chapter 12).

Practical Investigations in Context

Practical investigations appear in context throughout the book. For teachers who have used BIOZONE's books before and liked the practice problems that students had in Chapter 1 for plotting and data analysis, these are now included in context throughout the book. The practical investigations provide opportunities for students to develop many of their essential science skills within one activity, and group work enables stronger peers to support those who are less confident.


18 Investigating the Effect of Cell Size

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.


26 Factors Altering Membrane Permeability

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


67 Analysis of Stomatal Density in Different Plants

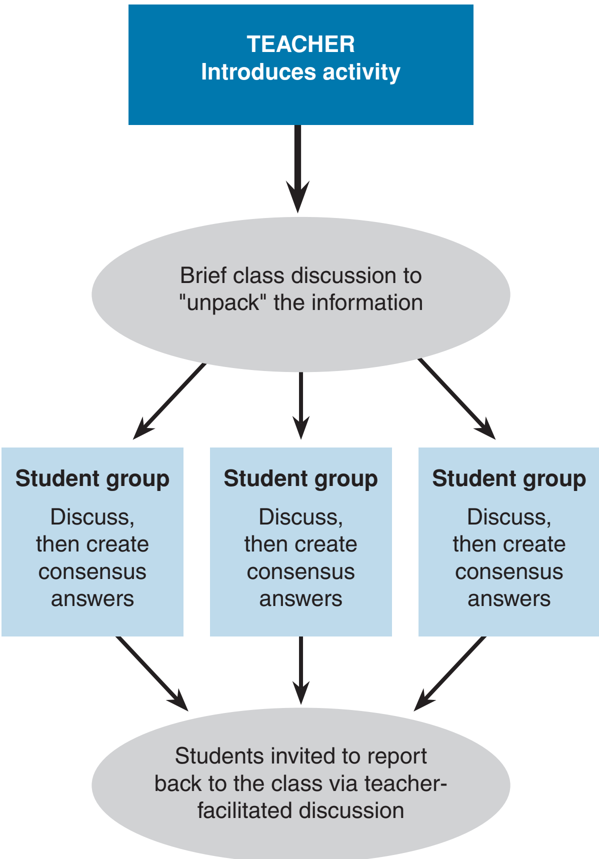
Sometimes an investigation makes up an assessment task. In this example, the assessment is associated with the analysis of the primary data collected.

Teaching Strategies for Classroom Use

Achieving effective differentiated 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 student books and supporting resources can make teaching a mixed ability class easier. Here, we suggest some approaches for differentiated instruction.

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, each with a balance of able and less able students. Depending on the activity, the class may regroup at the end of the lesson for discussion.



Using collaboration to maximise learning outcomes

- The structure of *VCE Biology Units 1&2* 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 and developing their English and scientific vocabularies.
- Use a short, informal collaborative learning session to get students to exchange ideas about the answer to a question. Alternatively, collaboration may take a more formal role that lasts for a longer period of time (e.g. assign groups to work together for a practical activity, to research an extension question, or design a solution to a problem).

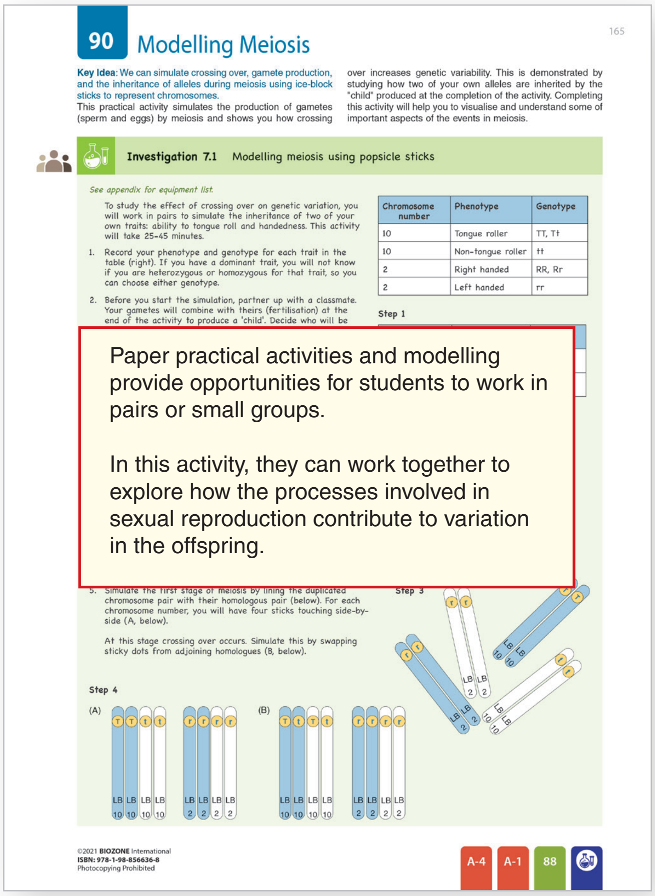
The teacher introduces the topic. They provide structure to the session by providing background information and setting up discussion points and clear objectives. Collaboration is emphasised to encourage participation from the entire group. If necessary, students in a group can be assigned specific tasks.

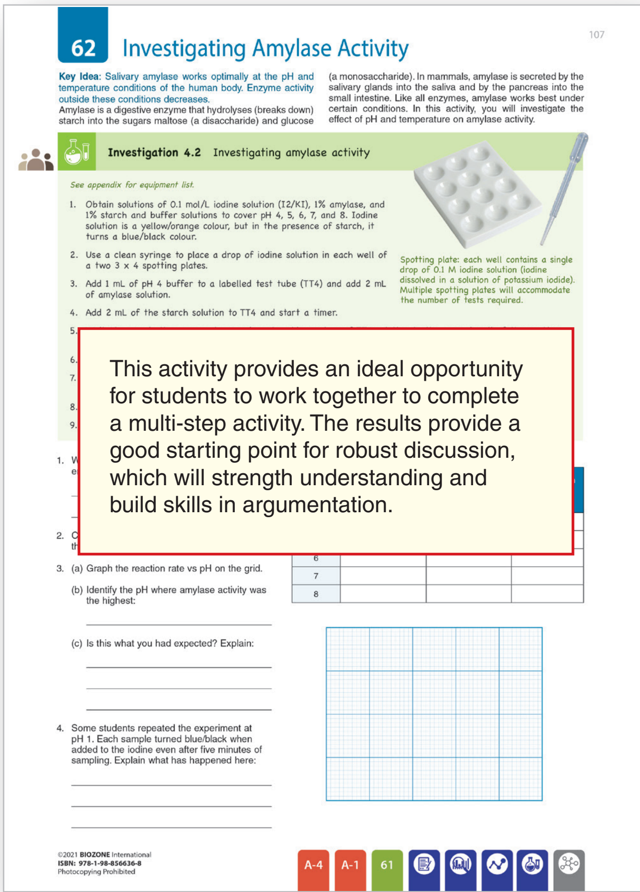
Students work in small groups so everyone's contribution is heard. They collaborate, share ideas, and engage in discourse. The emphasis is on discussing questions and formulating a consensus answer, not just sharing ideas.

At the end of the session, 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.

Peer to peer support

- **Peer-to-peer learning** is emphasised throughout the book, 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.
- **Practical activities, investigations** and **group research projects** are an ideal vehicle for peer-to-peer learning. Students can work together to review and discuss their results, ask and answer questions, and describe phenomena.





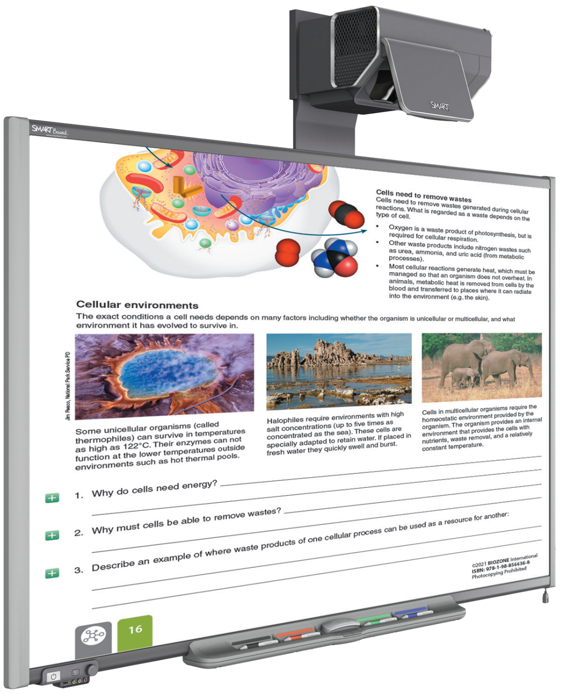
Collaboration and discovery

- BIOZONE's *VCE Biology Units 1&2* allows for collaboration and discovery. By working together and sharing ideas, students are exposed to different perspectives and levels of knowledge about biological concepts.
- BIOZONE's *VCE Biology Units 1&2* builds student understanding by providing a range of activities. These include getting students to think about and share what they already know and then build on this knowledge by exploring and explaining phenomena.

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.

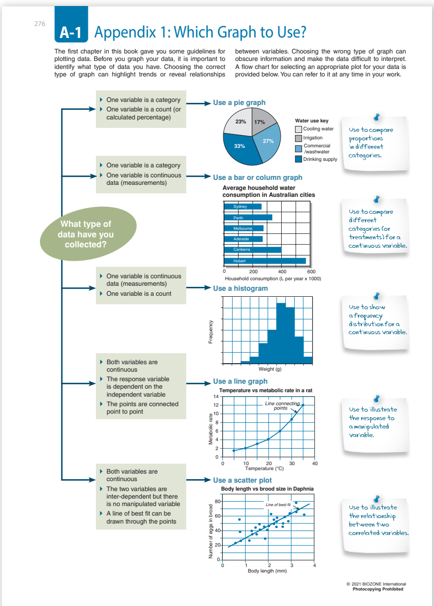


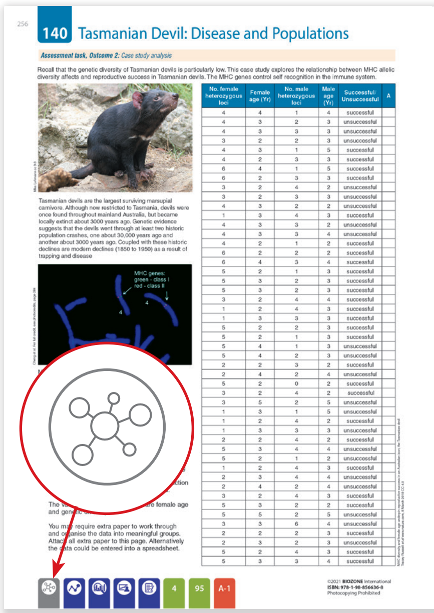
Interactive revision of tasks in class

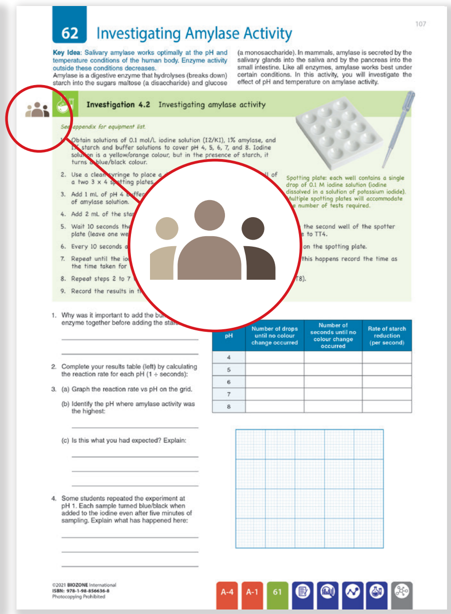
- The **Digital Teacher's Edition** provides a digital rights managed (DRM) version of the student book as PDF files. It features useful HIDE/SHOW answers, which can be used to review activities in class using a data projector or interactive whiteboard (left).
- Students benefit from the feedback in class, where questions can be addressed, and teachers benefit by having students self-mark their work and receive helpful feedback on their responses.
- This approach is particularly suited to activities with questions requiring a discussion, as students will be able to clarify some aspects of their responses. Stronger students can benefit by contributing to the explanatory feedback and class discussion.

Differentiated Learning

Tools for differentiated instruction within *VCE Biology Units 1&2* help teachers to support students all skill levels. BIOZONE's collaborative approach to science inquiry encourages students to share their ideas and knowledge with their peers while reinforcing their own understanding. There are several ways to use *VCE Biology Units 1&2* in a differentiated classroom:







Students requiring extra support with understanding and analysing data should be encouraged to refer to **Appendices 1 and 2**. They provide a quick reference guide to choosing the right graph, basic mathematical calculations, common units of measure, and basic statistical formulae (with a worked example). Support for mathematical routines and data analysis and presentation is also provided in the introductory *Key Science Skills* chapter.

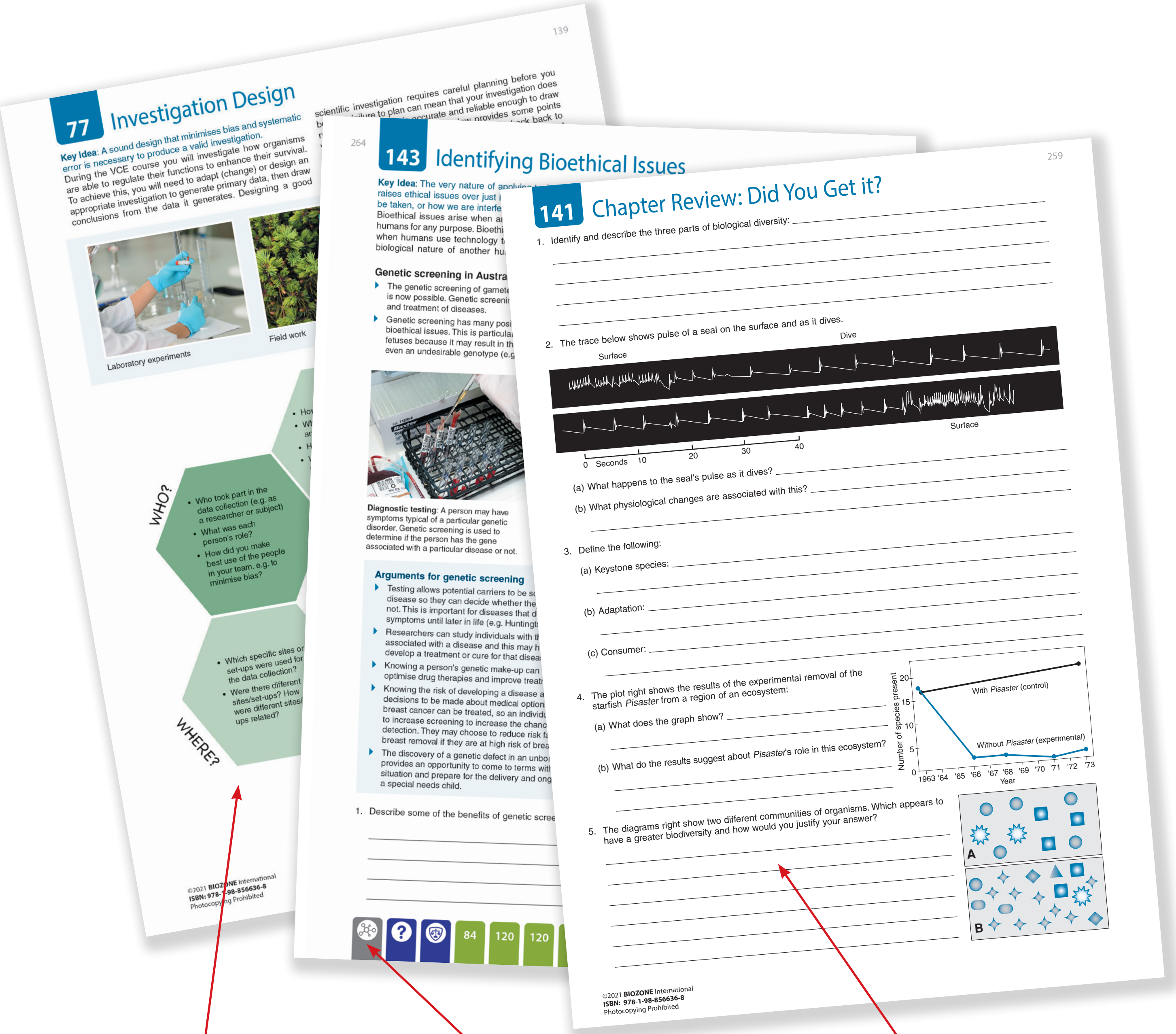
BIOZONE's Resource Hub provides curated content to support the activities in the book. Videos, animations, simulations, and 3D models support students of all abilities, while some resources (interactive spreadsheets, fact sheets, and reference papers) may be used as part of group work or extension.

A grey hub tab at the bottom of the page indicates the activity has online support.

A group symbol indicates where students can work together. Group work provides opportunities for student collaboration and peer-to-peer support to explore the principles and concepts they are engaged with in their course. Working in groups, students can experience the benefits of collaboration in the scientific process of discovery. By speaking and listening, they develop and extend their communication skills and scientific vocabulary.

Choosing Activities for Home Study

Many of the book's activities are ideal for homework or as vehicles for a quick formative assessment. End of chapter review activities are ideal as homework. They provide a way to review a topic that has recently been completed, while at the same time facilitating consolidation by presenting the material in a slightly different way. The information for review activities can be found within the chapter, although stronger students may not need to refer back to source material to complete the set work. Generally, homework activities should revise completed topics or provide a basic entry-level introduction.



The first few pages of an activity can be useful to set the scene for a chapter. In this activity, have students review the considerations when collecting data and start to think about how they might apply them to their own design.

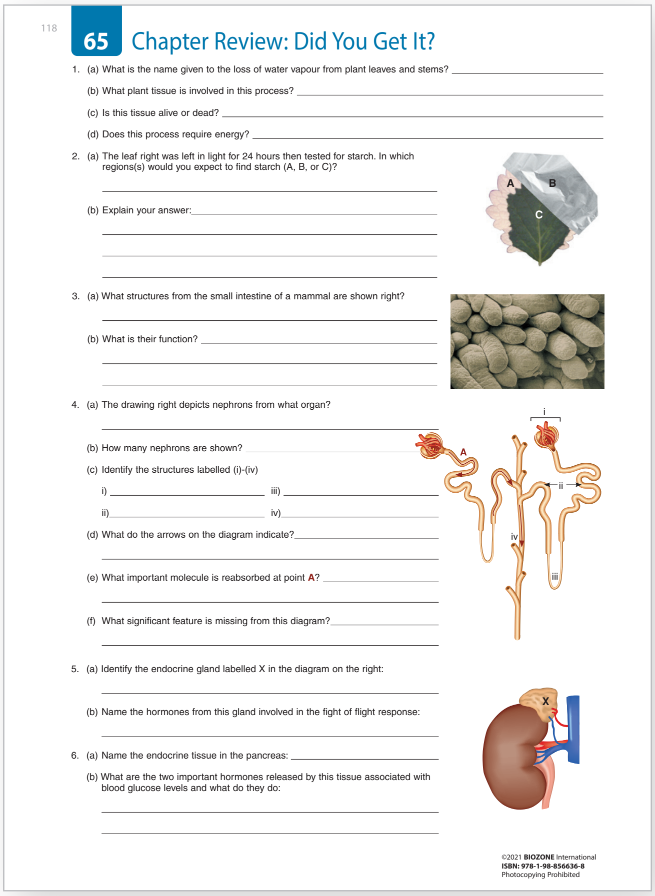
Most students will have access to the internet. Sometimes a homework activity might involve the student reviewing the resources on **BIOZONE's Resource Hub** for the next day's activity. Here, reviewing the resources on the Hub may help students decide on the bioethical issue they want to explore in Outcome 3.

Review activities are ideal as homework because they involve a self-test of the student's own understanding of completed work. In this activity, students apply their understanding of biodiversity and ecological interdependencies to complete the activity. Such activities allow the teacher to address any misconceptions before formal assessment.

Formative and Summative Assessments

BIOZONE's *VCE Biology Units 1&2* provides many opportunities to assess your students' progress as they work through the course. The *Contents* check-box list provides a list of activities completed, and the students' own self-tests in the review activities at the end of each chapter provide opportunity to address any misconceptions or lack of understanding. A summary of formative and summative assessments is provided in the table below. You may also choose to assess practical work as you move through the course.

SKILLS	UNIT 1: How do organisms regulate their functions?				
	AREA OF STUDY 1 How do cells function?		AREA OF STUDY 2 How do plant and animal systems function?		AREA OF STUDY 3
No formal assessment required	CHAPTER 2 Cellular Structure and Function	CHAPTER 3 Cell Cycle, Growth, and Differentiation	CHAPTER 4 Functioning Systems	CHAPTER 5 Regulation of Systems	CHAPTER 6 Investigating Organism Function
FORMATIVE Activity 8. Chapter Review	FORMATIVE Activity 34. Chapter Review	FORMATIVE Activity 48. Chapter Review SUMMATIVE Activity 47. Assessment task: Area of Study 1 *Response to a bioethical issue* Activity 48. Synoptic Questions	FORMATIVE Activity 65. Chapter Review	FORMATIVE Activity 75. Chapter Review SUMMATIVE Activity 67. Assessment task: Area of Study 2 *Data analysis of generated primary and/or collated data* Activity 76. Synoptic Questions	ASSESSMENT Report of student-adapted or student-designed investigation. Supported with Activity 80. A Template for Your Investigation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65 Chapter Review: Did You Get It?

1. (a) What is the name given to the loss of water vapour from plant leaves and stems? ____
(b) What plant tissue is involved in this process? ____
(c) Is this tissue alive or dead? ____
(d) Does this process require energy? ____
2. (a) The leaf right was left in light for 24 hours then tested for starch. In which regions(s) would you expect to find starch (A, B, or C)?
(b) Explain your answer: ____
3. (a) What structures from the small intestine of a mammal are shown right?
(b) What is their function? ____
4. (a) The drawing right depicts nephrons from what organ?
(b) How many nephrons are shown? ____
(c) Identify the structures labelled (i)-(iv)
i) ____ iii) ____
ii) ____ iv) ____
(d) What do the arrows on the diagram indicate? ____
(e) What important molecule is reabsorbed at point A? ____
(f) What significant feature is missing from this diagram? ____
5. (a) Identify the endocrine gland labelled X in the diagram on the right:
(b) Name the hormones from this gland involved in the fight of flight response:
6. (a) Name the endocrine tissue in the pancreas: ____
(b) What are the two important hormones released by this tissue associated with blood glucose levels and what do they do:

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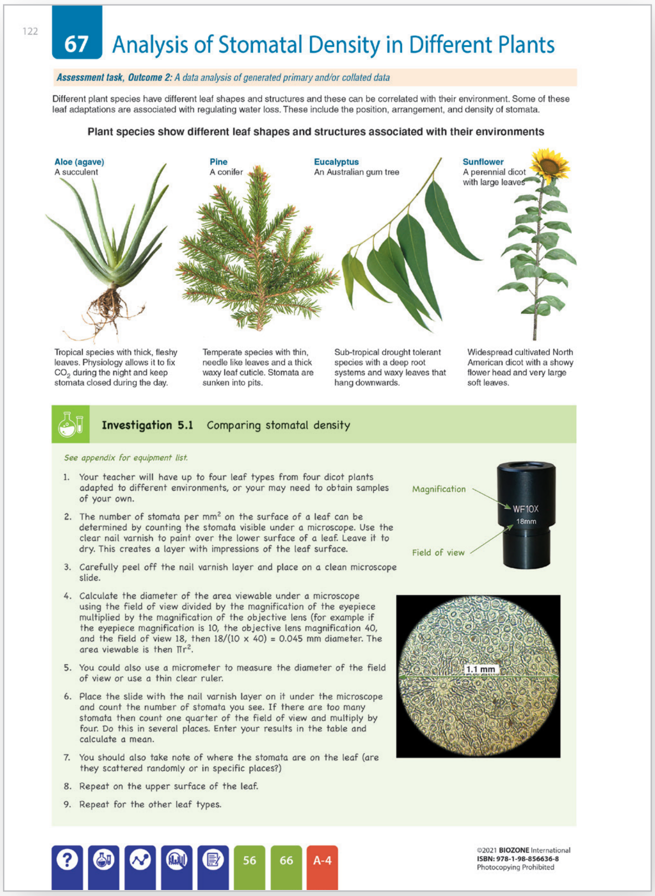
End of chapter reviews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67 Analysis of Stomatal Density in Different Plants

Assessment task, Outcome 2: *A data analysis of generated primary and/or collated data*

Different plant species have different leaf shapes and structures and these can be correlated with their environment. Some of these leaf adaptations are associated with regulating water loss. These include the position, arrangement, and density of stomata.

Plant species show different leaf shapes and structures associated with their environments

Aloe (agave) A succulent — Tropical species with thick, fleshy leaves. Physiology allows it to fix CO_2 during the night and keep stomata closed during the day.

Pine A conifer — Temperate species with thin, needle like leaves and a thick waxy leaf cuticle. Stomata are sunken into pits.

Eucalyptus An Australian gum tree — Sub-tropical drought tolerant species with a deep root systems and waxy leaves that hang downwards.

Sunflower A perennial dicot with large leaves — Widespread cultivated North American dicot with a showy flower head and very large soft leaves.

Investigation 5.1 Comparing stomatal density

See appendix for equipment list.

1. Your teacher will have up to four leaf types from four dicot plants adapted to different environments, or your may need to obtain samples of your own.
2. The number of stomata per mm^2 on the surface of a leaf can be determined by counting the stomata visible under a microscope. Use the clear nail varnish to paint over the lower surface of a leaf. Leave it to dry. This creates a layer with impressions of the leaf surface.
3. Carefully peel off the nail varnish layer and place on a clean microscope slide.
4. Calculate the diameter of the area viewable under a microscope using the field of view divided by the magnification of the eyepiece multiplied by the magnification of the objective lens (for example if the eyepiece magnification is 10, the objective lens magnification 40, and the field of view 18, then 18/(10 x 40) = 0.045 mm diameter. The area viewable is then πr^2.
5. You could also use a micrometer to measure the diameter of the field of view or use a thin clear ruler.
6. Place the slide with the nail varnish layer on it under the microscope and count the number of stomata you see. If there are too many stomata then count one quarter of the field of view and multiply by four. Do this in several places. Enter your results in the table and calculate a mean.
7. You should also take note of where the stomata are on the leaf (are they scattered randomly or in specific places?)
8. Repeat on the upper surface of the leaf.
9. Repeat for the other leaf types.

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Area of Study Assessment Task: Data analysis

UNIT 2: How does inheritance affect diversity?					
AREA OF STUDY 1 How is inheritance explained?			AREA OF STUDY 2 How do inherited adaptations affect diversity?		AREA OF STUDY 3
CHAPTER 7 From Chromosomes to Genomes	CHAPTER 8 Genotypes and Phenotypes	CHAPTER 9 Patterns of Inheritance	CHAPTER 10 Reproductive Strategies	CHAPTER 11 Adaptations and Diversity	CHAPTER 12 Exploring Bioethical Issues
FORMATIVE Activity 91. Chapter Review SUMMATIVE Activity 86. Assessment task: Area of Study 1 *Problem solving involving biological concepts or skills*	FORMATIVE Activity 99. Chapter Review	FORMATIVE Activity 114. Chapter Review SUMMATIVE Activity 115. Synoptic Questions	FORMATIVE Activity 122. Chapter Review	FORMATIVE Activity 141. Chapter Review SUMMATIVE Activity 140. Assessment task: Area of Study 2 *Case study analysis* Activity 142. Synoptic Questions	ASSESSMENT Response to an investigation into a bioethical issue. Supported with Activity 147. Your Research Question and Analysis

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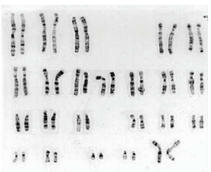
115 Synoptic Question: Unit 2, Area of Study 1

1. The preparation of a karyogram involves arranging the chromosomes of an individual into homologous pairs in order.
   (a) Name some applications of this process: ______
   (b) Study the karyogram on the right. Circle the sex chromosomes:
   (c) State the sex of this individual: ______
   (d) Determine if the karyotype shown is normal/abnormal:
   (e) Explain the reason for the answer you have given in (d):



Cytogenetics Dept, Waikato Hospital

2. (a) What would you expect to see in the karyogram of an individual with Down syndrome?
   (b) What type of disorder is Down syndrome? ______
   (c) Explain the cause of Down syndrome: ______
3. The picture shows an albino western grey kangaroo with her grey offspring. Explain the genetics of this relationship, i.e. genotypes of parents and joey:

4. Using examples, discuss how phenotype can be affected by:
   (a) Genotype: ______
   (b) Environment: ______
   (c) Epigenetic factors: ______

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End of Area of Study synoptic assessments

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140 Tasmanian Devil: Disease and Populations

***Assessment task, Outcome 2:** Case study analysis*

Recall that the genetic diversity of Tasmanian devils is particularly low. This case study explores the relationship between MHC allelic diversity affects and reproductive success in Tasmanian devils. The MHC genes control self recognition in the immune system.

Mike Lehmann cc 3.0

Tasmanian devils are the largest surviving marsupial carnivore. Although now restricted to Tasmania, devils were once found throughout mainland Australia, but became locally extinct about 3000 years ago. Genetic evidence suggests that the devils went through at least two historic population crashes, one about 30,000 years ago and another about 3000 years ago. Coupled with these historic declines are modern declines (1850 to 1950) as a result of trapping and disease

Cheng et al. For full credit, see photocredits, page 284

MHC genes are located on chromosome 4 of the Tasmanian devil genome.

1. The data on the right is part of a study on the breeding success of a group of captive Tasmanian devils. The data shows the age of the male and female in the pair, the reproductive success of the pair, and the number (out of 6) of MHC class-I heterozygous loci (location of microsatellite alleles) of each male and female in the pair.

   You will analyse this data to determine the effect of two separate variables on the breeding success of Tasmanian devils and use your analysis to recommend the best course of action to increase reproductive success in devils.

   The variables you will investigate are female age and genetic diversity.

   You may require extra paper to work through and organise the data into meaningful groups. Attach all extra paper to this page. Alternatively the data could be entered into a spreadsheet.

No. female heterozygous loci	Female age (Yr)	No. male heterozygous loci	Male age (Yr)	Successful/ Unsuccessful	A
4	4	1	4	successful	
4	3	2	3	unsuccessful	
4	3	3	3	unsuccessful	
3	2	2	3	unsuccessful	
4	3	1	5	successful	
4	2	3	3	successful	
6	4	1	5	successful	
6	2	3	3	successful	
3	2	4	2	unsuccessful	
3	2	3	3	unsuccessful	
4	3	2	2	unsuccessful	
1	3	4	3	successful	
4	3	3	2	unsuccessful	
4	3	3	4	unsuccessful	
4	2	1	2	successful	
6	2	2	2	successful	
6	4	3	4	successful	
5	2	1	3	successful	
5	3	2	3	successful	
5	3	2	3	successful	
3	2	4	4	successful	
1	2	4	3	successful	
1	3	3	3	successful	
5	2	2	3	successful	
5	2	1	3	successful	
5	4	1	3	unsuccessful	
5	4	2	3	unsuccessful	
2	2	3	2	successful	
2	4	2	4	unsuccessful	
5	2	0	2	successful	
3	2	4	2	successful	
3	5	2	5	unsuccessful	
1	3	1	5	unsuccessful	
1	2	4	2	successful	
1	3	3	3	unsuccessful	
2	2	4	2	successful	
5	3	4	4	unsuccessful	
5	2	1	2	unsuccessful	
1	2	4	3	successful	
2	3	4	4	unsuccessful	
2	4	2	4	unsuccessful	
3	2	4	3	successful	
5	3	2	2	successful	
5	5	2	5	unsuccessful	
3	3	6	4	unsuccessful	
2	2	2	3	successful	
2	3	2	3	unsuccessful	
5	2	4	3	successful	
5	3	3	4	successful	

MHC diversity and female age underpin reproductive success in an Australian icon; the Tasmanian devil Tracey Russell et al www.nature.com, 8 March 2018 CC 4.0

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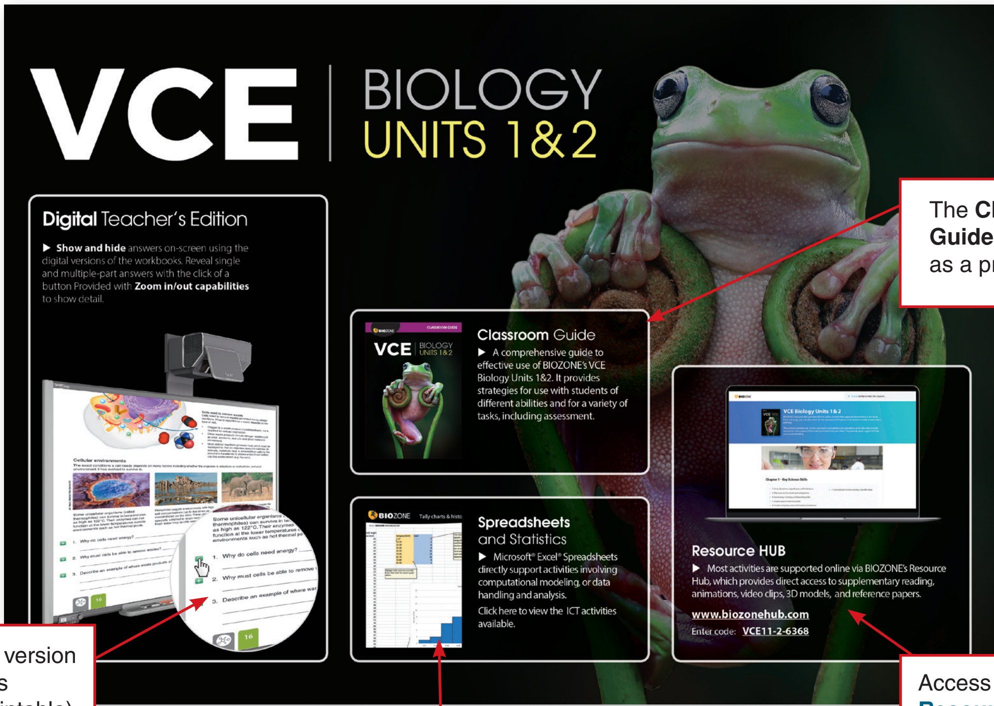
Area of Study Assessment Task: Case Study analysis

The Digital Teacher's Edition

The *Digital Teacher's Edition* is a DRM product, sold separately, and aimed primarily at extending the pedagogical tools at a teacher's disposal. Many of the features of this resource have been developed in response to requests from teachers themselves.

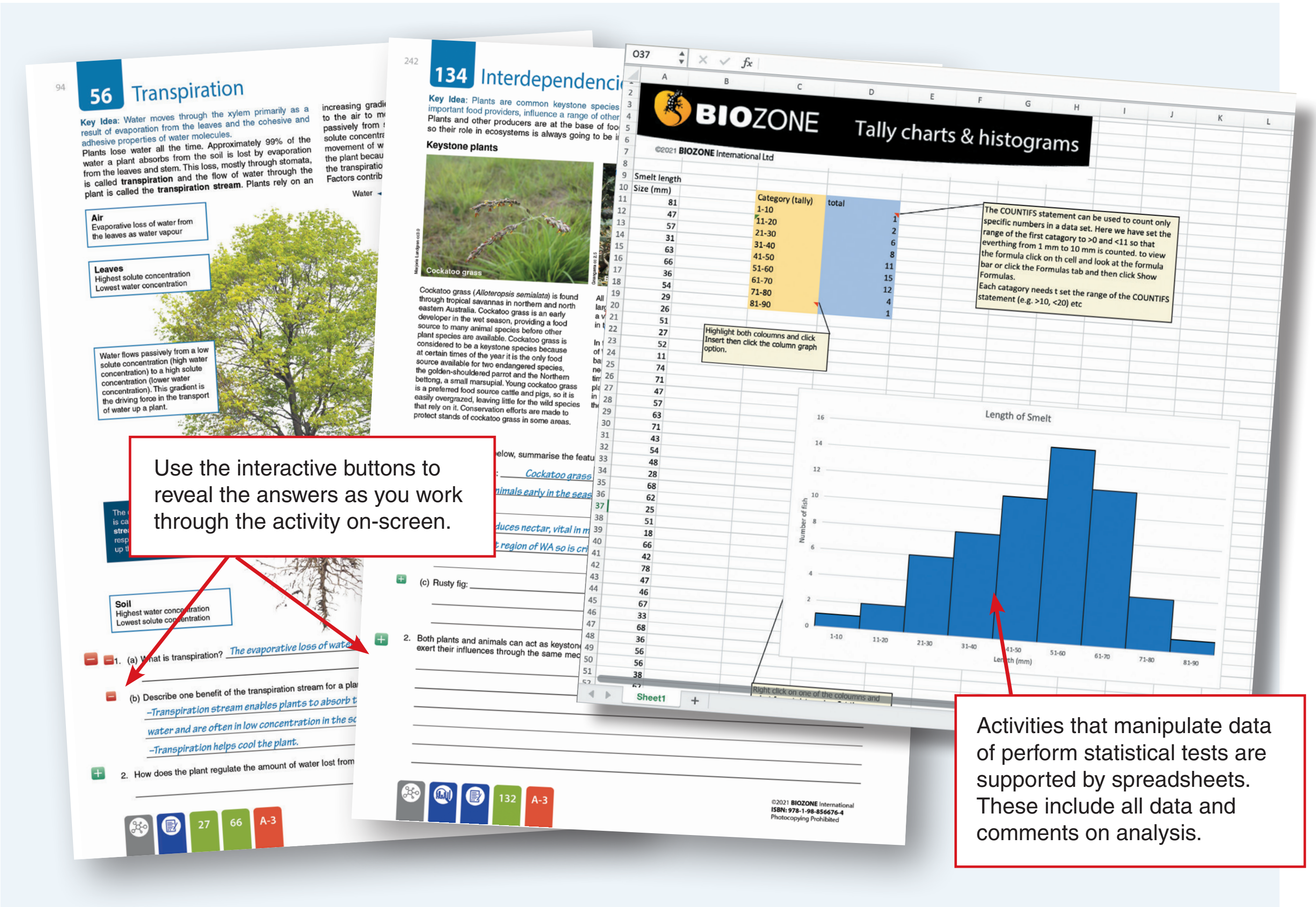


The **Classroom Guide** is provided as a printable PDF.

A digital (PDF) version of the Teacher's Edition (non-printable) is provided. Use the interactive buttons to HIDE or SHOW the answers.

Link to ***Excel***® **spreadsheets** for selected activities with a data analysis or computer modelling component.

Access **BIOZONE's Resource Hub** directly from this link for a range of resources to support the activities.



Use the interactive buttons to reveal the answers as you work through the activity on-screen.

Activities that manipulate data of perform statistical tests are supported by spreadsheets. These include all data and comments on analysis.