PEARSON

BIOLOGY

QUEENSLAND

STUDENT BOOK

12

UNITS 3 & 4

Pearson

Contents

ONLINE CHAPTER

Chapter 1 Biology skills and assessment toolkit

Go to your eBook to access this chapter.
Page numbering starts at e1 for this eBook chapter.
Unit 3 starts on page 1, followed by Chapter 2.

Unit 3: Biodiversity and the interconnectedness of life

Topic 1: Describing biodiversity

Topic 2: Ecosystem dynamics

Unit 4: Heredity and continuity of life

Topic 1: DNA, genes and the continuity of life

Topic 2: Continuity of life on Earth

How to use this book

PEARSON BIOLOGY 12 QUEENSLAND STUDENT BOOK

Pearson Biology 12 Queensland student book has been written to the new QCAA Biology 2019 General Senior Syllabus. The book is an easy-to-use resource that covers Units 3 & 4 and comprehensively addresses the skills and assessment requirements.

Explore how to use this book below.

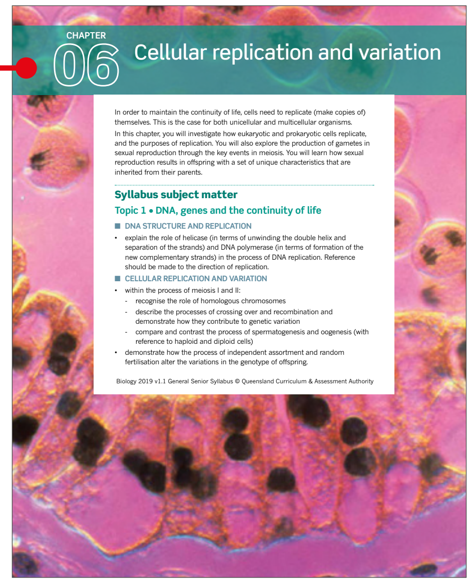
Design

The best-practice literacy and instructional design supports all learners.

A simple to navigate, predictable design enables ease of use. The high-quality, relevant photos and illustrations assist the student understanding of the concepts.

Chapter opener

The syllabus subject matter addressed in each chapter is clearly listed, along with any Science as a human endeavour features and mandatory practicals.



CHAPTER 06 Cellular replication and variation

In order to maintain the continuity of life, cells need to replicate (make copies of) themselves. This is the case for both unicellular and multicellular organisms.

In this chapter, you will investigate how eukaryotic and prokaryotic cells replicate, and the purposes of replication. You will also explore the production of gametes in sexual reproduction through the key events in meiosis. You will learn how sexual reproduction results in offspring with a set of unique characteristics that are inherited from their parents.

Syllabus subject matter

Topic 1 • DNA, genes and the continuity of life

DNA STRUCTURE AND REPLICATION

- explain the role of helicase (in terms of unwinding the double helix and separation of the strands) and DNA polymerase (in terms of formation of the new complementary strands) in the process of DNA replication. Reference should be made to the direction of replication.

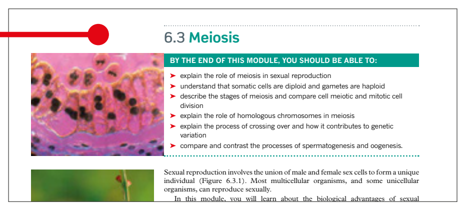
CELLULAR REPLICATION AND VARIATION

- within the process of meiosis I and II:
  - recognise the role of homologous chromosomes
  - describe the processes of crossing over and recombination and demonstrate how they contribute to genetic variation
  - compare and contrast the process of spermatogenesis and oogenesis (with reference to haploid and diploid cells)
- demonstrate how the process of independent assortment and random fertilisation alter the variations in the genotype of offspring.

Biology 2019 v1.1 General Senior Syllabus © Queensland Curriculum & Assessment Authority

Module opener

Module openers outline the key concepts and skills to be developed and link to the syllabus subject matter listed in the chapter opener.



6.3 Meiosis

BY THE END OF THIS MODULE, YOU SHOULD BE ABLE TO:

- explain the role of meiosis in sexual reproduction
- understand that somatic cells are diploid and gametes are haploid
- describe the stages of meiosis and compare cell meiotic and mitotic cell division
- explain the role of homologous chromosomes in meiosis
- explain the process of crossing over and how it contributes to genetic variation
- compare and contrast the processes of spermatogenesis and oogenesis.

Sexual reproduction involves the union of male and female sex cells to form a unique individual (Figure 6.3.1). Most multicellular organisms, and some unicellular organisms, can reproduce sexually.

In this module, you will learn about the biological advantages of sexual

Science as a human endeavour

The SHE feature provides an opportunity for students to appreciate the development of science and its use and influence on society. The SHE features provide a segue into the development of claims and research questions for the research investigation.

SCIENCE AS A HUMAN ENDEAVOUR

From a distance...

The LANDSAT 8 satellite (Figure 2.3.11) was launched on 11 February 2013. It carries two very important scientific instruments: the Operational Land Imager and the Thermal Infrared Sensor. These two sensors provide seasonal coverage of the global landmass at a spatial resolution of 30 m (visible, NIR, SWIR); 100 m (thermal) and 15 m (panchromatic). Such detail, correlated with on the ground surveys, allows scientists to accurately map the changes in our ecosystems due to urban growth, deforestation and agriculture.

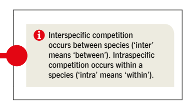
Since the first LANDSAT satellite was launched in 1972, their images have been used to map faults and fracture zones and identify volcanic and tectonic activity. LANDSAT images have also been used to monitor the seasonal changes in the Arctic ice pack, and have provided accurate data about the receding of the world's glaciers and the ice fields of Antarctica.

Having free access to LANDSAT imagery helps scientists understand the effect that changes in climate, human harnessing of freshwater resources and sedimentation spumes from river mouths have on our environment. It gives policymakers data about which land areas need to be conserved in order to protect natural resources, such as the Great Barrier Reef and coastal mangroves.

Observations from the Australian Bureau of Meteorology show record-high night and day temperatures, combined with a summer monsoon period which had less than 41% of the regular rainfall and a 20 cm drop in local sea levels that lasted for a month. The Gulf of Carpentaria is a large, shallow body of water that is usually subjected annually to cyclones. Mangrove forests fortify and buffer the coastline against tidal and wave action and help to filter sediments from water. They extend the coastline and act as nurseries for many species of fish and crustaceans that are important to our fishing industry. LANDSAT imagery (Figure 2.3.12) showed extensive die-off of mangroves along the Gulf coastline.

FIGURE 2.3.11 LANDSAT 8 passing over the Gulf Coast of the USA.

FIGURE 2.3.12 Satellite imagery reveals a severe die-off of mangroves along Australia's northern coast. The data indicates that more than 7000 hectares of mangroves have died. These natural-colour images were acquired on (a) 15 July 2014 and (b) 20 July 2016 by the Operational Land Imager on LANDSAT 8. They capture the extent of mangrove die-offs on a strip of beach along the Gulf of Carpentaria.



Interspecific competition occurs between species ('inter' means 'between'). Intraspecific competition occurs within a species ('intra' means 'within').

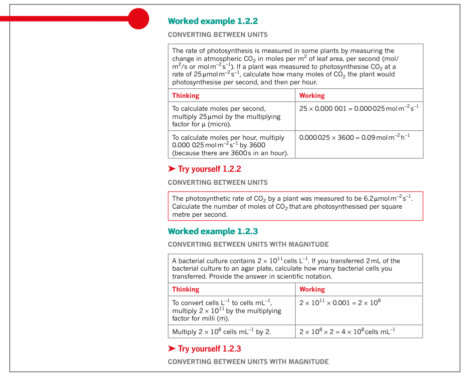
Highlight box

Highlight features focus students' attention on important information such as key definitions, formulas and salient points.

Worked examples

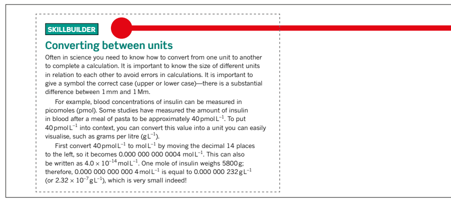
Worked examples use sequential steps of thinking and working to enhance student understanding of subject matter. Each worked example is followed by a try yourself task where students apply their learning to a mirrored problem.

Fully worked solutions to all try yourself problems are available on *Pearson Biology 12 Queensland Teacher Support*.


Worked example 1.2.2

Skillbuilder

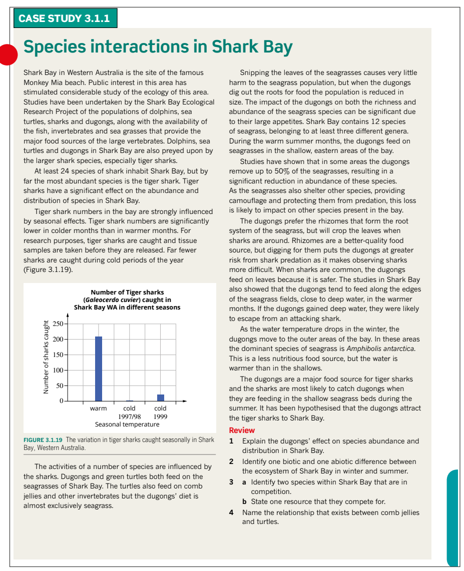
A Skillbuilder outlines a method or technique. Each is instructive and self-contained. Skillbuilders step students through the skill to support science application required when analysing or utilising knowledge.


SKILLBUILDER

Converting between units

Case studies

Case studies provide opportunities to engage with current applications and research in biology and address essential syllabus objectives beyond typical learning and understanding conventions. Case studies develop skills in analysing, interpreting, evaluating, decision-making and predicting. Skills are modelled for students in the case studies and then learning is applied in the case study review.


CASE STUDY 3.1.1

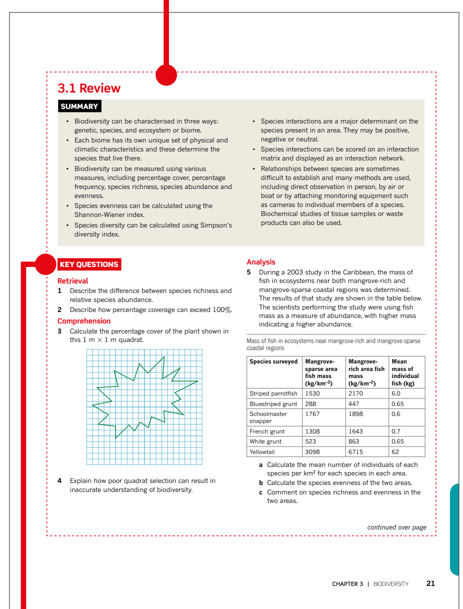
Species interactions in Shark Bay

Module summary

Each module concludes with a summary to help students consolidate the key points and concepts.

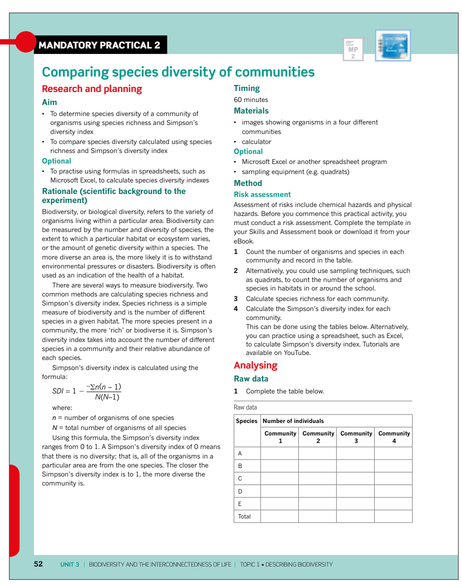
Module review

Key instructions are provided to test students' understanding of concepts of the module. Tasks are carefully categorised under the relevant cognitive level: retrieval, comprehension and analysis, and are developed to assess the syllabus requirements.


3.1 Review

Mandatory practicals

The student book includes all mandatory practicals. Each practical has been trialled and tested to ensure it can be safely performed and yields effective results.

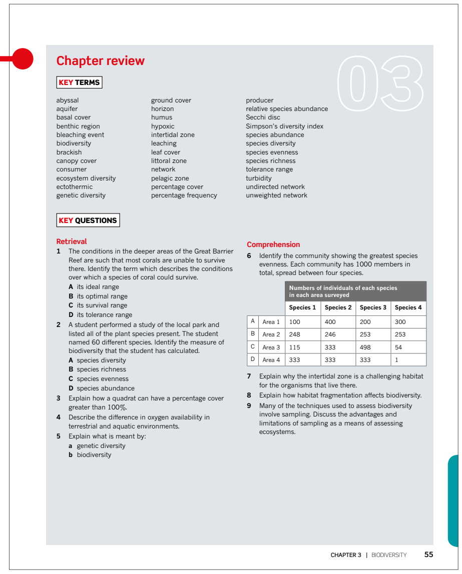

MANDATORY PRACTICAL 2

Comparing species diversity of communities

How to use this book

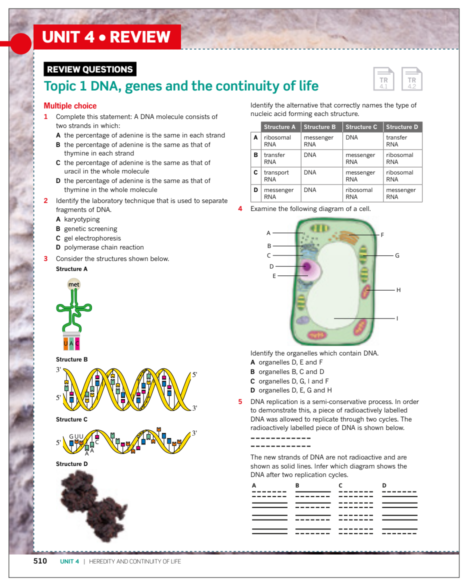
Chapter review

Each chapter finishes with a list of key terms covered in the chapter and a set of tasks to test students' abilities to apply the knowledge gained from the chapter.



Unit review

Each unit finishes with a comprehensive set of exam-style instructions, including multiple choice and short answer. These review tasks assist students to draw together their knowledge and understanding of the whole unit.



Glossary

Key terms are shown in **bold** throughout the student book and are listed at the end of each chapter. A comprehensive glossary at the end of the book defines all the key terms. The glossary aligns with the syllabus context and includes the QCAA defined terminology.

Answers

Comprehensive answers and fully worked solutions for all module review tasks, try yourself, Science as a human endeavour, case studies, chapter reviews and unit reviews are provided via the teacher *Pearson Biology 12 Queensland* Reader+ eBook.

Icons

Go To icons make important links to relevant content within the student books in the course. The Go To icons indicate where to engage with Chapter 1 in your eBook.

GO TO ➤

Every mandatory practical is supported by a complementary **SPARKlab** alternative practical.

The ***Pearson Biology Skills and Assessment* book** icons indicate the best time to engage with an activity for practice, application and revision.
The type of activity is indicated as follows:

Worksheet (WS) — WS 3.1.1

Mandatory practical (MP) — MP 4

Practical activity (PA) — PA 3.2.1

Sample assessment task (SAT) — SAT IA1

Topic review (TR) — TR 3.1

The **Reader+** icon indicates when to engage with an asset via your Reader+ eBook. Assets may include videos and interactive activities.

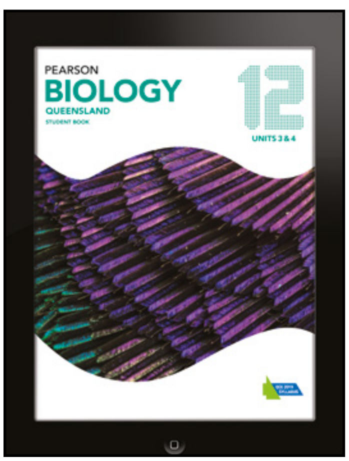
Pearson Biology 12 Queensland

Student book

Pearson Biology 12 Queensland Student Book has been developed by experienced Queensland teachers to address all the requirements of the new QCAA Biology 2019 General Senior Syllabus. The series features the very latest developments and applications of biology, literacy and instructional design to ensure the content and concepts are fully accessible to all students.

Skills and assessment book

The *Pearson Biology 12 Skills and Assessment* book gives students the edge in preparing for all forms of assessment. Specifically prepared to provide opportunities to consolidate, develop and apply subject matter and science inquiry skills, this resource features a toolkit, key knowledge summaries, worksheets, practical activities and guidance, assessment practice and topic review sets.



Reader+ the next generation eBook

Reader+ is our next generation eBook. Students can read, take notes, save bookmarks and more in the one seamless experience. Integrated multimedia (audio/video) and interactive activities enhance and extend the learning experience. In addition, Reader+ provides the digital-only Chapter 1 Biology skills and assessment toolkit.

Teacher support

Pearson Biology 12 Queensland Teacher Support provides:

- complete answers, fully worked solutions or suggested answers to all tasks in the student book, and the skills and assessment book
- expected results, common mistakes, suggested answers and full safety notes and risk assessments for all practical activities
- teaching, learning and assessment programs.