Suggested teaching program

**Chapter 6: Cells**

Time allocation: 4 weeks

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| **Context and overview** |
| In year 8, students are introduced to cells as microscopic structures that explain macroscopic properties of living systems. Students use experimentation to isolate relationships between components in systems and explain these relationships through increasingly complex representations. They make predictions and propose explanations, drawing on evidence to support their views. |
| **Syllabus outcomes addressed** |
| • Cells are the basic units of living things; they have specialised structures and functions ACSSU149  • Science knowledge has changed peoples’ understanding of the world and is refined as new evidence becomes available ACSHE134  • Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures ACSHE226  • People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity ACSHE136  • Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge ACSIS139  • Collaboratively and individually plan and conduct a range of [investigation](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/investigation) types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed ACSIS140  • Measure and control variables, select equipment appropriate to the task and collect [data](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/data) with accuracy ACSIS141  • Construct and use a range of representations, including graphs, keys and models to represent and [analyse](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/analyse) patterns or relationships in [data](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/data) using [digital technologies](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/digital-technologies) as appropriate ACSIS144  • Summarise [data](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/data), from students’ own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on [evidence](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/evidence) ACSIS145  • Reflect on scientific investigations including evaluating the quality of the [data](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/data) collected, and identifying improvements ACSIS146  • Use scientific knowledge and findings from investigations to [evaluate](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/evaluate) claims based on [evidence](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/evidence) ACSIS234  • Communicate ideas, findings and [evidence](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/evidence) based solutions to problems using [scientific language](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/scientific-language), and representations, using [digital technologies](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/digital-technologies) as appropriate ACSIS148 |
| **Achievement standards** |
| Students analyse the relationship between structure and function at the cell level. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems.  Students identify and construct questions and problems that they can investigate scientifically. They consider safety and ethics when planning investigations, including designing field or experimental methods. They identify variables to be changed, measured and controlled. Students construct representations of their data to reveal and analyse patterns and trends, and use these when justifying their conclusions. They explain how modifications to methods could improve the quality of their data and apply their own scientific knowledge and investigation findings to evaluate claims made by others. They use appropriate language and representations to communicate science ideas, methods and findings in a range of text types. |

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| **Student book section** | **WA Syllabus links** | **Suggested indicators of learning and understanding** | **Suggested teaching and learning activities** | **Resources** |
| **6.1 All living things are made up of cells**  **(pages 96–97)** | *Science Understanding*  ACSSU149  *Science as a Human Endeavour*  ACSHE134  ACSHE226  ACSHE227  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS144  ACSIS148 | By the end of this unit, students should be able to:  • define cell, microbiology, multicellular, single-celled, unicellular, microorganism, microbe, cell membrane and nutrients  • describe the surface area to volume ratio  • provide examples of unicellular and multicellular organisms  • explain the key concepts of the cell theory  • relate the discovery of cells with the development of the microscope. | **What if?**  Students investigate the use of small units to make larger bodies.  **Skills Lab 6.1**  *Drawing cells*  Students develop their specimen drawing skills by drawing cells from a microscope.  **Development of the cell theory**  Students can research the contributors to and development of the cell theory using the Soft School timeline. The timeline could be presented around the classroom using an appropriate scale. Encourage students to include references to the development of useful technology.  **Investigating the surface area to volume ratio**  Students can complete the Biology Junction activity to consolidate their understanding of the SA:V. | **Oxford Science 8 Western Australian Curriculum resources**  • What if? Page 95  • Check your learning, page 97  • Skills Lab 6.1, page 196 |
| **Additional resources**  Soft School timeline of the development of the cell theory:  <http://www.softschools.com/timelines/cell_theory_timeline/96/>  Biology Junction SA:V activity:  <http://www.biologyjunction.com/cell_size.htm> |

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| **6.2 Microscopes are used to study cells**  **(pages 98–99)** | *Science Understanding*  ACSSU149  *Science as a Human Endeavour*  ACSHE134  ACSHE226  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS145  ACSIS148 | By the end of this unit, students should be able to:  • define microscope, microscopy, monocular, binocular and stain  • describe the differences in structure and function between electron microscopes and light microscopes  • compare and contrast stereomicroscopes and compound light microscopes  • name and identify all main components of a compound light microscope  • calculate the magnification  • demonstrate the ability to focus a compound light microscope. | **Skills Lab 6.2**  *Getting to know your microscope*  Students develop their microscope skills and investigate how a microscope actually works.  **How does a compound light microscope work?**  Students can get a basic overview of how their microscope works reading the How Stuff Works article.  **Finding microscopy images**  Students can search the internet for images taken through a compound light microscope, stereomicroscope, SEM and TSM. Students can compare the images and see if they can correctly identify the type of microscope used to take each one. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 99  • Skills Lab 6.2, page 197 |
| **Additional resources**  UCDavis SmartSite light microscope animation How Stuff Works article on ‘How light microscopes work’:  <http://science.howstuffworks.com/light-microscope1.htm> |

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| **6.3 Plant and animal cells have organelles**  **(pages 100–103)** | *Science Understanding*  ACSSU149  *Science Inquiry Skills*  ACSIS140  ACSIS144  ACSIS148 | By the end of this unit, students should be able to:  • define organelle, chlorophyll and photosynthesis  • identify the cell membrane, cell wall, mitochondria, chloroplasts and nucleus of a cell  • describe the functions of the cell membrane, cytoplasm, DNA, mitochondria, ribosomes, chloroplasts and vesicles  • identify the key differences in structures of plant and animal cells  • explain why plant and animal cells are different in structure. | **Challenge 6.3**  *Comparing the size of cells and their parts*  Students use a scale to compare the sizes of different cell types and organelles.  **Experiment 6.3A**  *Looking at organelles*  Students develop their slide preparation and microscope skills and investigate the key features of plant cells.  **Experiment 6.3B**  *Measuring cells*  Students develop their microscope skills and use a min-grid to estimate the sizes of plant and animal cells.  **Cell organelles**  Students can find out more about the functions of cell organelles and cellular processes with the Virtual Cell Animation Collection. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 103  • Experiment 6.3A, page 199  • Experiment 6.3B, page 200  • Challenge 6.3, page 198 |
| **Additional resources**  Virtual Cell Animation Collection:  <http://vcell.ndsu.nodak.edu/animations/> |

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| **6.4 All organisms have cells that specialise**  **(pages 104–105)** | *Science Understanding*  ACSSU149  *Science Inquiry Skills*  ACSIS140  ACSIS145  ACSIS148 | By the end of this unit, students should be able to:  • define prokaryotic and eukaryotic  • describe the key differences between prokaryotic and eukaryotic cells  • provide examples of prokaryotic and eukaryotic cells. | **Challenge 6.4**  *Classifying using cells*  Students apply their knowledge of cells and their microscope skills to classify unknown cells into kingdoms.  **Experiment 6.4**  *Plant and animal cells*  Students use their microscope and slide preparation skills to compare plant and animal cells.  **Comparing eukaryotic and prokaryotic cells**  Students can explore the animated cell diagrams on the Cells Alive! website and compare and construct the structures and functions of the cells. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 105  • Experiment 6.4, page 201  • Challenge 6.4, page 200 |
| **Additional resources**  Cells Alive! interactive plant, animal and prokaryotic cell diagrams:  <http://www.cellsalive.com/cells/3dcell.htm> |
| **6.5 Bacteria are single-cells organisms**  **(pages 106–107)** | *Science Understanding*  ACSSU149  *Science as a Human Endeavour*  ACSHE134  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS144  ACSIS145  ACSIS146  ACSIS234  ACSIS148 | By the end of this unit, students should be able to:  • define natural flora, pathogen, infectious disease, symptoms and binary fission  • describe the differences between natural floral and pathogens  • provide examples of pathogens and symptoms  • explain the benefits of natural flora to human health. | **Experiment 6.5**  *Microbes all around*  Students investigate the presence of microbes and the effectiveness of detergents and disinfectants at killing microbes.  **Investigating microbes**  Students can choose or be assigned to research a class of microbe. The Microbiology Online website is a great source of information and pictures. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 107  • Experiment 6.5, page 202 |
| **Additional resources**  Microbiology online:  <http://www.microbiologyonline.org.uk/about-microbiology/introducing-microbes> |
| **6.6 Eukaryotic cells undergo mitosis**  **(pages 108–109)** | *Science Understanding*  ACSSU149  *Science as a Human Endeavour*  ACSHE134  *Science Inquiry Skills*  ACSIS140  ACSIS144  ACSIS146  ACSIS148 | By the end of this unit, students should be able to:  • define mitosis, apoptosis, nucleus, parent cell, daughter cell, cancer, mutagen, carcinogen and tumour  • describe the process of mitosis  • provide examples of mutagens  • relate cancer to a malfunction in normal mitosis. | **Challenge 6.6**  *Modelling mitosis*  Students use balloons to model mitosis and to represent cancerous cells and apoptosis.  **Animated mitosis**  Students can extend their understanding of mitosis by watching the narrated animation from Sumanas Inc.  **Apoptosis vs. necrosis**  Student can learn more about the process of apoptosis and how it is a different form of cell death to necrosis by watching the narrated Learners TV animation. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 109  • Challenge 6.6, page 203 |
| **Additional resources**  Sumanas Inc. Mitosis animation:  <http://www.sumanasinc.com/webcontent/animations/content/mitosis.html>  Learners TV apoptosis animation:  <http://www.learnerstv.com/animation/animation.php?ani=404&cat=biology> |
| **6.7 Fungal cells can save lives**  **(pages 110–111)** | *Science Understanding*  ACSSU149  *Science as a Human Endeavour*  ACSHE134  ACSHE226  ACSHE136  *Science Inquiry Skills*  ACSIS148 | By the end of this unit, students should be able to:  • describe the development of penicillin  • explain the problems associated with the overuse of antibiotics. | **Fungi, friend or foe?**  Students can investigate other fungal sources of antibiotics as well as fungi species that cause disease. | **Oxford Science 8 Western Australian Curriculum resources**  • Extend your understanding, page 111 |
| **6 Review**  **(pages 112–114)** | *Science Understanding*  ACSSU149  *Science Inquiry Skills*  ACSIS148 | By the end of this unit, students should be able to:  • define all Key Words listed on page 114  • describe cells as the basic unit of life and identify that they contain specialised structures and have specialised functions  • identify areas of personal strengths and weaknesses in their knowledge and understanding of the topic. | **Revision activities**  • Students could play celebrity heads with the Key Words list  • Students can make dominoes with Key Words on one end and definitions/diagrams/examples on the other end  • Students can create mind maps, Venn diagrams or other graphic organisers to summarise the key concepts of this chapter  • Peer teaching: students can work in groups to reteach the content of the unit to the class for the purpose of revision. Each group could be allocated a double-page to summarise | **Oxford Science 8 Western Australian Curriculum resources**  • Review questions, pages 112-113  • Research topics, page 113  • Key Words list, page 114 |