Suggested teaching program

**Chapter 2: Rocks and minerals**

Time allocation: 5 weeks

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| **Context and overview** |
| In year 8, students begin to classify different forms of energy, and describe the role of energy in causing change in systems, including the role of heat and kinetic energy in the rock cycle. 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** |
| • Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales ACSSU153  • Scientific knowledge has changed peoples’ understanding of the world and is refined as new [evidence](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/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  • Solutions to contemporary issues that are found using science and [technology](http://k10outline.scsa.wa.edu.au/home/p-10-curriculum/curriculum-browser/science-v9/overview/glossary/technology), may impact on other areas of society and may involve ethical considerations ACSHE135  • 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 compare processes of rock formation, including the scales involved. 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** |
| **2.1 Rocks have different properties**  **(pages 18–19)** | *Science Understanding*  ACSSU153  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS148 | By the end of this unit, students should be able to:  • define properties, geologist and geology  • describe how to identify a crystal  • provide examples of some rock properties  • explain the difference between fine, medium and course rock grains. | **What if?**  Students classify rock samples into groups and investigate the subjective nature of classification.  **Skills Lab 2.1**  *Identifying rocks*  Students develop their skills with a hand lens and use a dichotomous key to identify rock samples.  **Classifying rocks**  Students can create a dichotomous key to classify a range of rock samples, or images of rock samples that can be sources from Geology.com. They can build on their classification attempt from the ‘What if?’ activity.  **Introducing the three types of rocks**  Students can work through the Bitesize overview of the types as an introduction to the rest of the chapter. | **Oxford Science 8 Western Australian Curriculum resources**  • What if? Page 17  • Check your learning, page 19  • Skills Lab 2.1, page 160 |
| **Additional resources**  The Geology website has a number of excellent images of different types of rocks:  <http://geology.com/rocks/>  BBC Bitesize Science overview of the three types of rock:  <http://www.bbc.co.uk/schools/gcsebitesize/geography/rock_landscapes/classification_rocks_rev1.shtml> |

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| **2.2 Rocks are made up of minerals**  **(pages 20–21)** | *Science Understanding*  ACSSU153  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS148 | By the end of this unit, students should be able to:  • define mineral, lustre, streak, hardness and cleavage  • describe a rock sample in terms of its lustre, hardness, streak and cleavage  • explain how to test a rock sample for hardness and streak  • demonstrate the techniques required to test a rock sample for lustre and hardness. | **Skills Lab 2.2**  *Testing the hardness of common substances*  Students use the scratch test to determine the hardness of rock samples and develop a method to order the samples by hardness.  **Analogies of rock properties**  Students can read the rock/cookie analogy from the Science View website and write their own analogy. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 21  • Skills Lab 2.2, page 160 |
| **Additional resources**  Science Views website uses a cookie analogy to explain rock properties:  <http://scienceviews.com/geology/rockproperties.html> |
| **2.3 Minerals are a valuable resource**  **(pages 22–23)** | *Science Understanding*  ACSSU153  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS144  ACSIS145  ACSIS148 | By the end of this unit, students should be able to:  • define ore  • list some common ores and their minerals  • identify mineral ores as non-renewable resources  • relate the properties of minerals to their uses. | **Experiment 2.3**  *Testing the minerals in toothpaste*  Students determine which minerals contained in toothpaste are most effective at stain removal.  **Analysing toothpaste**  Students can investigate the ingredients in toothpaste and attempt to identity their sources. Student can also analyse the properties in toothpaste and compare the hardness of the minerals with the hardness of tooth enamel. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 23  • Experiment 2.3, page 161 |

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| **2.4 Igneous rocks develop from magma and lava**  **(pages 24–25)** | *Science Understanding*  ACSSU153  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS144  ACSIS145  ACSIS148 | By the end of this unit, students should be able to:  • define igneous rock, magma, lava, intrusive igneous rock and extrusive igneous rock  • describe the differences between magma and lava  • describe the differences between intrusive and extrusive igneous rocks  • provide examples of intrusive and extrusive igneous rocks  • relate the differences in structure and appearances of intrusive and extrusive igneous rock with the way in which they are formed. | **Experiment 2.4**  *What affects crystal size?*  Students investigate the affect of evaporation rates on the size of crystal growth.  **Igneous Rock Game**  Students can play the igneous rock game found on the National Park Services website to learn more about the formation of igneous rocks. Student can then reflect on the game in terms of how accurately it modelled igneous rock formation. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 25  • Experiment 2.4, page 162 |
| **Additional resources**  The National Park Service website has instructions for a game based on the formation of igneous rocks:  <http://www.nps.gov/brca/learn/education/randmact3.htm> |
| **2.5 Sedimentary rocks are compacted sediments**  **(pages 26–27)** | *Science Understanding*  ACSSU153  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS146  ACSIS148 | By the end of this unit, students should be able to:  • define sediment and sedimentary rock  • describe the process of sedimentary rock formation  • provide examples of sedimentary rocks  • explain the difference between biological and chemical rocks. | **Experiment 2.5**  *Making sedimentary rocks*  Students make model sedimentary rocks and compare them to real samples.  **Animated rock formation**  Students can watch the Bitesize animation of sedimentary rock formation, and then plan and create their own animation/Claymation for the formation of sedimentary rock or igneous rock. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 27  • Experiment 2.5, page 163 |
| **Additional resources**  BBC Bitesize Science sedimentary rock formation animation:  <http://www.bbc.co.uk/education/clips/zmwvcdm> |

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| **2.6 Metamorphic rocks require heat and pressure**  **(pages 28–29)** | *Science Understanding*  ACSSU153  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS148 | By the end of this unit, students should be able to:  • define metamorphic rock, foliation and index mineral  • describe the process of metamorphic rock formation  • provide examples of metamorphic rocks  • explain why metamorphic rocks are stronger than the original material. | **Experiment 2.6**  *Making a metamorphic rock*  Students use a Bunsen burner to artificially create a metamorphic sample and observe the changes compared to the shale sample.  **Animated metamorphosis**  Students learn about metamorphic rock formation at the Maths/Science nucleus website. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 29  • Experiment 2.6, page 164 |
| **Additional resources**  The Maths/Science nucleus website demonstrates the formation of metamorphic rock through annotated images:  <http://www.msnucleus.org/membership/html/jh/earth/metamorphic/lesson1/metamorphic1a.html> |
| **2.7 The rock cycle cause rock to be re-formed**  **(pages 30–31)** | *Science Understanding*  ACSSU153  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS144  ACSIS146  ACSIS148 | By the end of this unit, students should be able to:  • define rock cycle, weathering, erosion, onion-skin weathering and frost shattering  • describe the differences between physical, chemical and biological weathering  • relate the types of physical weathering with the location of the rocks. | **Skills Lab 2.7**  *Modelling the rock cycle*  Students model the main processes of the rock cycle, sedimentation, metamorphosis and solidification using crayons.  **Rock cycle activities**  test their knowledge on the rock cycle by working their way through the Annenberg Learner tutorial and interactives. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 31  • Skills Lab 2.7, page 165 |
| **Additional resources**  The Annenberg Learner website has an interactive tutorial about all processes involved in the rock cycle:  <http://www.learner.org/interactives/rockcycle/index.html> |

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| **2.8 Weathering and erosion can be prevented**  **(pages 32–33)** | *Science Understanding*  ACSSU153  *Science as a Human Endeavour*  ACSHE135  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS144  ACSIS145  ACSIS148 | By the end of this unit, students should be able to:  • describe the role of soil erosion engineers  • provide examples of solutions to reduce or prevent soil erosion  • explain the detrimental effects of soil erosion | **Challenge 2.8**  *Preventing soil erosion*  Students are challenged to create a substrate that is resistant to erosion by water.  **Evidence of erosion**  Students can watch some of the erosion clips and animations on the SERC website. Then challenge students to create a stop–motion capture of a soil erosion demonstration or to find evidence of soil erosion in their area.  **Soil as a resource**  Students can watch the 3D animation on the risks of soil erosion and discuss the importance of soil as a resource. | **Oxford Science 8 Western Australian Curriculum resources**  • Extend your understanding, page 33  • Challenge 2.8, page 166 |
| **Additional resources**  The Creative Bloq website has a great #D animated promotional clip about conserving soil:  <http://www.creativebloq.com/3d/soil-animation-12121428>  SERC website also has a number of short animations of different forms of erosion:  <http://serc.carleton.edu/NAGTWorkshops/geomorph/visualizations/soil_erosion.html> |
| **2.9 Rocks are studied by geologists**  **(pages 34–35)** | *Science Understanding*  ACSSU153  *Science as a Human Endeavour*  ACSHE134  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS234  ACSIS148 | By the end of this unit, students should be able to:  • define palaeontologist, fossil, comparative dating, index fossils and radioactive dating  • compare and contrast the techniques and purposes of comparative and radioactive dating of fossils  • describe the conditions required for the formation of a fossil  • explain the difference between a geologist and an palaeontologist  • relate the position of rock strata with the comparative age of a fossil. | **Challenge 2.9A**  *Using evidence to deduce*  Students use fossil evidence to predict dinosaur activity.    **Challenge 2.9B**  *Reconstructing animals*  Students use palaeontological skills to reconstruct skeletons applying existing knowledge of the human skeleton to a less familiar frog skeleton, and then to an unknown skeleton.  **Key fossils**  Students can choose one of the fossils represented on the BBC website to investigate. The clips on the site are a good starting point for their research. Students can describe the fossil, where and when it was discovered and its importance as part of the fossil record. | **Oxford Science 8 Western Australian Curriculum resources**  • Extend your understanding, page 35  • Challenge 2.9A, page 166  • Challenge 2.9B, page 167 |
| **Additional resources**  The BBC website has a large number of resources about the formation and types of fossil as well as specific examples of fossil specimens:  <http://www.bbc.co.uk/nature/fossils> |
| **2 Review**  **(pages 36–38)** | *Science Understanding*  ACSSU153  *Science as a Human Endeavour*  ACSHE226  *Science Inquiry Skills*  ACSIS148 | By the end of this unit, students should be able to:  • define all Key Words listed on page 38  • explain that rocks contain minerals and are formed by processes in the Earth  • ldentify 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, page 36  • Research topics, page 37  • Key Words list, page 38 |