Suggested teaching program

**Chapter 3: Energy**

Time allocation: 4 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. 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** |
| • Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems ACSSU155  • 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 identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. 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** |
| **3.1 Energy can be transferred**  **(pages 40–43)** | *Science Understanding*  ACSSU155  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS144  ACSIS148 | By the end of this unit, students should be able to:  • define energy transfer  • provide examples of types of energy  • explain that energy cannot be created or destroyed, but can be passed between objects  • draw and interpret energy transfer diagrams. | **What if?**  Students investigate the effect of ramp length and angle on the distance a toy car can travel.  **Skills Lab 3.1**  *Drawing flow diagrams of energy transfer*  Students observe different types of energy transformations and identify energy types.  **Energy transfers**  Students can learn more about energy and energy transfers, with an emphasis on heat energy transfers, with the BBC Bitesize tutorial. | **Oxford Science 8 Western Australian Curriculum resources**  • What if? Page 39  • Check your learning, page 43  • Skills Lab 3.1, page 168 |
| **Additional resources**  BBC Bitesize Science has an interactive tutorial about energy transfers, including an activity and test:  <http://www.bbc.co.uk/education/guides/z99jq6f/revision> |
| **3.2 Potential energy is stored energy**  **(pages 44–45)** | *Science Understanding*  ACSSU155  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS144  ACSIS145  ACSIS146  ACSIS234  ACSIS148 | By the end of this unit, students should be able to:  • define potential energy, elastic potential energy, gravitational potential energy, chemical potential energy and nuclear energy  • provide examples of objects with elastic, gravitational and chemical potential energy  • relate changes in shape, position above the surface of the Earth and chemical bonds to potential energy transfers. | **Experiment 3.2**  *What if the amount of elastic potential energy were increased?*  Students investigate elastic potential energy using a model boat.  **Potential energy transfers**  Students can watch the BBC Bitesize clips on the transfers between GPE and KE and develop their own examples of energy transfers of elastic potential energy and chemical potential energy. Challenge students to use transfers involving other forms of energy than kinetic. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 45  • Experiment 3.2, page 170 |
| **Additional resources**  BBC Bitesize clip explaining the transfers between gravitational potential energy and kinetic energy:  <http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_gateway/forces/kineticact.shtml> |
| **3.3 Moving objects have kinetic energy**  **(pages 46–47)** | *Science Understanding*  ACSSU155  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS140  ACSIS145  ACSIS148 | By the end of this unit, students should be able to:  • define kinetic energy, electrical energy, thermal energy and sound energy  • provide examples of objects that use or have kinetic, electrical, thermal and sound energy  • provide examples of energy transfers involving kinetic, electrical, thermal and sound energy. | **Challenge 3.3**  *Exploring sound energy*  Students investigate the relationship between sound and kinetic energy.  **Sound and kinetic energy**  Students can develop their understanding of sound energy as a form of kinetic energy using the Teach Engineering activities. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 47  • Challenge 3.3, page 171 |
| **Additional resources**  Teach Engineering website has a number of sound energy activities: <https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_energy2/cub_energy2_lesson05_activity1.xml> |
| **3.4 Energy can be transformed**  **(pages 48–49)** | *Science Understanding*  ACSSU155  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS148 | By the end of this unit, students should be able to:  • define energy transformation  • describe how energy transformation can be used to generate electricity  • provide examples of energy transformations  • draw energy transformation diagrams. | **Challenge 3.4**  *Energy converters*  Students apply energy transformations to real life devices and identify the types of energy involved.  **Energy transformations**  Students can investigate energy transformations using the activities from the Science NetLinks website. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 49  • Challenge 3.4, page 171 |
| **Additional resources**  Science NetLinks has a number of activities and investigations involving energy transformations:  <http://sciencenetlinks.com/lessons/transforming-energy/>  <http://sciencenetlinks.com/lessons/converting-energy/> |

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| **3.5 Energy cannot be created or destroyed**  **(pages 50–51)** | *Science Understanding*  ACSSU155  *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 energy efficiency  • describe waste energy and identify the form it often takes  • explain the law of conservation of energy  • relate the efficiency of an energy transformation with the amount of waste energy  • use the efficiency formula to calculate unknown values. | **Experiment 3.5**  *What if you bounced a ball?*  Students investigate energy efficiency and the conservation of energy through bouncing a ball.  **Energy lost as heat**  Using the activities in the Teach Engineering lesson plan, students can investigate the link between energy efficiency, energy loss and thermal energy. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 51  • Experiment 3.5, page 172 |
| **Additional resources**  The Teach Engineering website has a lesson plan linking energy efficiency to thermodynamic laws:  <https://www.teachengineering.org/view_lesson.php?url=collection/cla_/lessons/cla_lesson6_efficiency/cla_lesson6_efficiency.xml> |
| **3.6 Energy efficiency can reduce consumption**  **(pages 52–53)** | *Science Understanding*  ACSSU155  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS144  ACSIS145  ACSIS146  ACSIS234  ACSIS148 | By the end of this unit, students should be able to:  • describe the importance of energy efficiency  • provide examples of features in building that improve energy efficiency  • explain how at least one energy efficiency feature of a house improves efficiency. | **Challenge 3.6, page 173**  *Design an energy efficient house*  Students are challenged to incorporate their understanding of energy efficiency and energy transformations to design and test the design of an energy efficient house.  Students may get some useful ideas from the animated energy house at the Animated Science website. | **Oxford Science 8 Western Australian Curriculum 8 resources**  • Extend your understanding, page 53  • Challenge 3.6, page 173 |
| **Additional resources**  Animated Science has an interactive house diagram showing energy efficiency features:  [http://animatedscience.co.uk/blog/energy-house#](http://animatedscience.co.uk/blog/energy-house) |

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| **3.7 Solar cells transform the sun’s light energy into electrical energy**  **(pages 54–55)** | *Science Understanding*  ACSSU155  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS144  ACSIS145  ACSIS146  ACSIS234  ACSIS148 | By the end of this unit, students should be able to:  • define photovoltaic cell  • describe the energy transfers involved in a solar panel  • provide examples of solar power use in Australia. | **Challenge 3.7**  *During what time of the day does the sun produce the most energy?*  Students use solar panels to determine peak energy conversion times.  **Design a solar powered car**  Students can investigate the World Solar Challenge that races vehicles between Darwin and Adelaide and then design their own solar car. They may like to use the Lego solar car kit to test their designs. | **Oxford Science 8 Western Australian Curriculum resources**  • Extend your understanding, page 55  • Challenge 3.7, page 174 |
| **Additional resources**  World Solar Challenge website:  <http://www.worldsolarchallenge.org/page/view_by_id/76>  Lego Solar add on:  <https://education.lego.com/es-es/lego-education-product-database/machines-and-mechanisms/9688-renewable-energy-add-on-set> |
| **3.8 Engineers use their understanding of energy to solve problems**  **(pages 56–57)** | *Science Understanding*  ACSSU155  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS144  ACSIS145  ACSIS146  ACSIS234  ACSIS148 | By the end of this unit, students should be able to:  • define cost-benefit analysis and criteria  • describe the roles of chemical, mechanical, electrical and civil engineers  • explain the key steps involved in evaluating an engineering proposal. | **Experiment 3.8**  *Investigating structures and materials using icy pole sticks*  Students use engineering principles to investigate the strength of icy pole sticks.  **Challenge 3.8**  *Leakywater Council Swimming Pool and Waterslide*  Students are challenged to apply their understanding of energy transformations to design a waterslide to specified criteria. | **Oxford Science 8 Western Australian Curriculum resources**  • Extend your understanding, page 57  • Experiment 3.8, page 175  • Challenge 3.8, page 176 |
| **3 Review**  **(pages 58–60)** | *Science Understanding*  ACSSU155  *Science as a Human Endeavour*  ACSHE136  *Science Inquiry Skills*  ACSIS148 | By the end of this unit, students should be able to:  • define all Key Words listed on page 60  • explain that energy appears in different forms, cannot be created or destroyed, but that it can be transferred and transformed  • 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 58–59  • Research topics, page 59  • Key Words list, page 60 |