Suggested teaching program

**Chapter 5: Physical and chemical change**

Time allocation: 3 weeks

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| **Context and overview** |
| In year 8, students explore changes in matter at a particle level, and distinguish between chemical and physical change. 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** |
| • Chemical change involves substances reacting to form new substances ACSSU225  • 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 physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. 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** |
| **5.1 Physical change is a change in shape or appearance**  **(pages 80–81)** | *Science Understanding*  ACSSU225  *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 vaporise, vapour, fumes, volatile, boiling, condense, melt and sublimation  • describe the processes involved in each change of state  • explain the differences between a physical and a chemical change. | **What if?**  Students investigate the basic principles of the factors effecting reaction rate.  **Experiment 5.1**  *Melting chocolate*  Students investigate chemical and physical changes through melting different types of chocolate.  **Challenge 5.1**  *Exploring physical changes*  Students experiment with changing the physical appearances of substances. | **Oxford Science 8 Western Australian Curriculum resources**  • What if? Page 79  • Check your learning, page 81  • Experiment 5.1, page 189  • Challenge 5.1, page 190 |
| **5.2 Chemical change produces new substances**  **(pages 82–83)** | *Science Understanding*  ACSSU225  *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:  • provide examples of chemical and physical changes  • identify the features of a chemical change. | **Challenge 5.2**  *Making caramel*  Students investigate chemical changes through cooking sugar.  **Experiment 5.2**  *Observing chemical reactions*  Students observe a number of different chemical reactions characterised by a permanent colour change and/or the production of a new substance.  **Investigating chemical change**  Students can carry out some of the inquiry based learning activities from the Inquiry In Action Website. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 83  • Experiment 5.2, page 191  • Challenge 5.2, page 190 |
| **Additional resources**  Inquiry In Action website has a number of activities related to chemical change:  <http://www.inquiryinaction.org/classroomactivities/activities_by_chapter.php?chapter=5&chapter_title=Chemical%20Change> |
| **5.3 Chemical reactions can break bonds and re-form new bonds**  **(pages 84–85)** | *Science Understanding*  ACSSU225  *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 chemical reaction, reactants and products  • describe the purpose of chemical equations. | **Experiment 5.3**  *Comparing reactants and products*  Students investigate the differences in chemical and physical properties of reactants and products of chemical reactions.  **More about chemical reactions**  Students can extend their understanding of chemical reactions by completing the CK-12 tutorial including the video clips and games.  **Developing the concept of conservation of mass**  Students can experiment with the 3 forms of the PHET simulator to see how reactants are converted into products and leftovers based on the amount of reactants used. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 85  • Experiment 5.3, page 192 |
| **Additional resources**  CK-12 lesson plan:  <http://www.ck12.org/book/CK-12-Physical-Science-Concepts-For-Middle-School/section/3.13/>  PHET chemical reaction simulator:  <https://phet.colorado.edu/sims/html/reactants-products-and-leftovers/latest/reactants-products-and-leftovers_en.html> |
| **5.4 Heat can speed up a reaction**  **(pages 86–87)** | *Science Understanding*  ACSSU225  *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 collision theory, concentration, catalyst and enzyme  • compare and contrast enzymes and catalysts  • explain the factors that increase the rate of a reaction  • relate the reaction rate to the number and likelihood of collisions between reactants. | **Experiment 5.4A**  *Effect of particle size on reaction rates*  Students investigate the effect of particle size on the rate of dissolving eggshell.  **Experiment 5.4B**  *Speeding up reactions with enzymes*  Students investigate the effect of using an enzyme to speed up the decomposition of hydrogen peroxide.  **Simulating reaction rates**  Students can investigate factors that influence reaction rate, including temperature, amount of reactants, concentration, and molecule size, using the KScience simulator. | **Oxford Science 8 Western Australian Curriculum resources**  • Check your learning, page 87  • Experiment 5.4A, page 193  • Experiment 5.4B, page 194 |
| **Additional resources**  KScience website has a number of chemistry simulators including reaction rate:  <http://www.kscience.co.uk/animations/collision.htm>  And enzyme action:  <http://www.kscience.co.uk/animations/anim_2.htm> |
| **5.5 Many substances exist because of the work of scientists**  **(pages 88–89)** | *Science Understanding*  ACSSU225  *Science as a Human Endeavour*  ACSHE135  ACSHE136  *Science Inquiry Skills*  ACSIS139  ACSIS140  ACSIS141  ACSIS144  ACSIS145  ACSIS146  ACSIS234  ACSIS148 | By the end of this unit, students should be able to:  • describe how chemical reactions are used in everyday life  • provide examples of everyday experiments. | **Experiment 5.5**  *Making casein glue*  Students design an experiment to investigate the production of casein glue from milk.  **Investigating industrial chemistry**  Students can choose an industrial product to investigate. They must identify the raw reactants and some of the chemical reactions involved in making the final product. | **Oxford Science 8 Western Australian Curriculum resources**  • Extend your understanding, page 89  • Experiment 5.5, page 195 |
| **5.6 Physical and chemical changes are used to recycle household waste**  **(pages 90–91)** | *Science Understanding*  ACSSU225  *Science as a Human Endeavour*  ACSHE135  ACSHE136 | By the end of this unit, students should be able to:  • define corrosion  • classify the processes involved in recycling plastic as physical or chemical changes  • explain the benefits of recycling. | **Promoting recycling**  Students can choose an item that can be recycled in Australia and create a promotion video and/or campaign to increase recycling at school. Student may like to watch some of the Recycle Now videos for inspiration. | **Oxford Science 8 Western Australian Curriculum resources**  • Extend your understanding, page 91 |
| **Additional resources**  Recycle Now videos:  <https://vimeo.com/recyclenow/videos> |
| **5 Review**  **(pages 92–94)** | *Science Understanding*  ACSSU225  *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 94  • explain that chemical changes involve reactions that form new substances  • 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 92–93  • Research topics, page 93  • Key Words list, page 94 |