Suggested teaching program

**Chapter 2: Mixtures**

Time allocation: 4 weeks

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| **Context and overview** |
| In year 7, students recognise the differences between pure substances and mixtures, and solvents and solutes. They investigate and use a range of physical separation techniques. Students make accurate measurements and control variables to analyse relationships between system components and explore and explain these relationships through increasingly complex representations. |
| **Syllabus outcomes addressed** |
| • • Mixtures, including solutions, contain a combination of pure substances than can be separated using a range of techniques ACSSU113  • Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures ACSHE223  • Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations ACSHE120  • People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity ACSHE121  • Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge ACSIS124  • Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed ACSIS125  • Measure and control variables, select equipment appropriate to the task and collect data with accuracy ACSIS126  • Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate ACSIS129  • Summarise data, from students’ own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence ACSIS130  • Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate ACSIS133 |
| **Achievement standards** |
| Students describe techniques to separate pure substances from mixtures. Students describe situations where scientific knowledge from different science disciplines has been used to solve a real-world problem. Students identify questions that can be investigated scientifically. They plan fair experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations. |

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| **Student book section** | **WA Syllabus links** | **Suggested indicators of learning and understanding** | **Suggested teaching and learning activities** | **Resources** |
| **2.1 Mixtures are a combination of two or more substances**  **(pages 30–31)** | ACSSU113  ACSHE120  ACSHE121  ACSIS124  ACSIS125  ACSIS130  ACSIS133 | By the end of this unit, students should be able to:  • describe the properties of various mixtures  • explain the difference between suspensions, solutions, colloids and emulsions. | **Chemical classification**  Provide students with a range of objects and substances (e.g. salt, peppercorns, sand, pencil shavings, water, etc.) and ask them to classify each as a pure substance, a compound or a mixture. Encourage students to explain and justify their decisions based on evidence.  **Challenge 2.1**  *Comparing different types of mixtures*  Students create a variety of different mixtures and analyse them according to their composition. If there is not enough time for all students to complete all tasks, have groups of students complete one task and present their findings to the class.  **Compounds and mixtures**  Students can complete this online, interactive tutorial to learn a little more about the differences between compounds and mixtures and get a quick introduction to some of the separation techniques they will explore in this chapter. | **Oxford Science 7 WA resources**  • Check your learning, page 31  • Challenge 2.1. page 174 |
| **Additional resources**  Compare compounds and mixtures and introduce separation techniques with this online tutorial.  <http://www.bbc.co.uk/bitesize/ks3/science/chemical_material_behaviour/compounds_mixtures/activity/> |

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| **2.2 A solution is a solute dissolved in a solvent**  **(pages 32–33)** | ACSSU113  ACSHE120  ACSHE121  ACSHE223  ACSIS124  ACSIS125  ACSIS126  ACSIS129  ACSIS130  ACSIS131  ACSIS132  ACSIS133 | By the end of this unit, students should be able to:  • explain the difference between the terms soluble and insoluble, solute and solvent, concentrated and dilute  • describe the properties of a saturated solution  • explain the importance of water as a solvent. | **Experiment 2.2A**  *What if salt were dissolved in water?*  In this experiment, students discover whether a mixture of salt and water makes a solution.  ***Inquiry Extension:*** Students investigate if other substances will dissolve in water.  **Experiment 2.2B**  *What if the solvent were heated when making a mixture?*  In this experiment, students determine the relationship between the amount of and the speed at which a solute will dissolve and the temperature of the solvent.  **Virtual solubility lab**  Students can test the solubility of five different substances in water. The variables they can test include the amount of each substance and the temperature of the water. Encourage students to use the table and graph tools to record their findings. | **Oxford Science 7 WA resources**  • Check your learning, page 33  • Experiment 2.2A, page 175  • Experiment 2.2B, page 176 |

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| **2.3 Mixtures can be separated according to their properties**  **(pages 34–35)** | ACSSU113  ACSHE120  ACSHE121  ACSHE223  ACSIS124  ACSIS125  ACSIS126  ACSIS129  ACSIS133 | By the end of this unit, students should be able to:  • describe the processes of decanting, sedimentation and flotation  • define sediment, magnetism and flocculent  • explain how flocculants assist the sedimentation process  • relate the properties of a substance to the methods used to separate it from mixtures. | **Skills Lab 2.3A**  *Separation using magnetic properties*  In this activity, students use magnetism to separate iron filing from sand.  **Skills Lab 2.3B**  *Separating mixtures using sedimentation and flotation*  In this activity, students compare the sedimentation and floatation as methods of separating mixtures.  **Experiment 2.3**  *What if a flocculent were added to muddy water?*  In this experiment, students investigate the effect of a flocculent on sedimentation.  **Eat Iron?**  Students can test the iron content in fortified breakfast cereals in this experiment. | **Oxford Science 7 WA resources**  • Check your learning, page 35  • Skills Lab 2.3A page, 177  • Skills Lab 2.3B page, 177  • Experiment 2.3 page, 178 |
| **Additional resources**  Students may benefit from an excursion to a local water treatment facility to see flocculation in action.  This alternative experiment relates science and engineering to everyday life.  <https://www.teachengineering.org/view_activity.php?url=collection/uoh_/activities/uoh_sep_mixtures_activity2/uoh_sep_mixtures_activity2.xml> |

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| **2.4 Mixtures can be separated according to their size and mass**  **(pages 36–37)** | ACSSU113  ACSHE121  ACSIS124  ACSIS125  ACSIS126  ACSIS130  ACSIS133 | By the end of this unit, students should be able to:  • define filtration, filtrate and residue  • describe the processes of filtration and centrifuging  • relate the size and mass of the molecules of a substance with the methods used to separate them from mixtures. | **Skills Lab 2.4**  *Filtering a mixture of sand and water*  In this activity, students use filter paper to separate sand and water.  **Experiment 2.4**  *What if you centrifuged tomato sauce?*  In this experiment, students attempt to separate the components of tomato sauce with centrifuging.  ***Inquiry Extension:*** Students investigate the components of different brands of tomato sauce.  **Alternative filtration activity**  Students can carry out this activity outside and build their own filters to ‘clean’ water. This activity can be easily extended by encourage students to design their own filtration units. | **Oxford Science 7 WA resources**  • Check your learning, page 37  • Skills Lab 2.4, page 179  • Experiment 2.4, page 180 |
| **Additional resources**  In this alternative experiment, students make their own filters with cotton balls and other materials.  <http://pbskids.org/zoom/activities/sci/waterfilter.html> |

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| **2.5 The boiling points of liquids can be used to separate mixtures**  **(pages 38–39)** | ACSSU113  ACSHE121  ACSIS124  ACSIS125  ACSIS131  ACSIS133 | By the end of this unit, students should be able to:  • define evaporation, distillation and condensation  • describe the process of chromatography  • explain the similarities between distillation and evaporation  • explain how varying boiling points of substances can be used to separate them. | **Experiment 2.5**  *Crystallisation of salt water*  In this experiment, students separate salt from solution using evaporation and crystallisation.  **Challenge 2.5**  *Design a way to purify water from sea water*  Based on their experience with the above experiment, students are required to apply their understanding of solutions and separation methods to design equipment than would enable salt water to be converted into drinking water.  **Animated separation**  Students can watch the animations of fractional distillation in action to better understanding this process of separation. A video clip of the same process is also available at the same website. | **Oxford Science 7 WA resources**  • Check your learning, page 39  • Experiment 2.5, page 180  • Challenge 2.5, page 181 |
| **Additional resources**  Students can watch animated diagrams to see how a solution can be separated with distillation.  <http://www.rsc.org/learn-chemistry/resource/res00002248/fractional-distillation?cmpid=CMP00007728> |

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| **2.6 Solubility can be used to separate mixtures**  **(pages 40–41)** | ACSSU113  ACSIS125  ACSIS126  ACSIS130  ACSIS131  ACSIS132  ACSIS133 | By the end of this unit, students should be able to:  • define solubility  • describe the process of chromatography  • describe how the solubility of a substance can be used to separate it from a mixture. | **Experiment 2.6**  *Who wrote the nasty note?*  In this experiment, students use paper chromatography to compare chromatograms of various marker brands.  **Challenge 2.6**  *Separation challenge*  In this activity, students are required to apply their knowledge and understanding of mixtures and separation techniques to design their own process for separating a mixture of four components.  **Animated separation**  Students can watch the animations chromatography in action to better understanding this process of separation. A video clip of the same process is also available at the same website. | **Oxford Science 7 WA resources**  • Check your learning, page 41  • Experiment 2.6, page 182  • Challenge 2.6, page 183 |
| **Additional resources**  Students can watch animated diagrams to see how a solution can be separated with chromatography.  <http://www.rsc.org/learn-chemistry/resource/res00001074/thin-layer-chromatography?cmpid=CMP00001940#!cmpid=CMP00001940> |
| **2.7 Waste water is a mixture that can be separated**  **(pages 42–43)** | ACSSU113  ACSIS133 | By the end of this unit, students should be able to:  • describe the separating processes involved in water treatment  • provide examples of occupations and industries that use separation techniques as part of their job  • suggest possible costs and benefits of treating water. | **Excursion**  An excursion to a local water treatment facility will enable students to see how some of the separation processes they have learnt about are applied in real life.  **Modelling a waste water treatment facility**  Students can build a 3D model or an annotated poster of a water treatment facility and label where each type of separation process occurs and what is removed form the water at each stage. | **Oxford Science 7 WA resources**  • Extend your understanding, page 43 |
| **Additional resources**  Students may benefit from seeing a local water treatment facility in action. |
| **2 Review**  **(page 44–46)** | ACSSU113  ACSIS133 | By the end of this unit, students should be able to:  • define all key words listed on page 46  • distinguish been a pure substance, a compound and a mixture  • distinguish between types of mixtures  • identify suitable separation techniques for various mixture types  • relate separation techniques with the properties of the substances that are being used to separate mixtures  • identify areas of personal strengths and weakness in their knowledge and comprehension 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 spread to summarise. | **Oxford Science 7 WA resources**  • Review questions, pages 44–45  • Research topics, page 45  • Key Words list, page 46 |