Suggested teaching program

**Chapter 7: Forces**

Time allocation: 5 weeks

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| **Context and overview** |
| In year 7, students develop their understanding of how systems are shaped interactions due to forces, and develop the ability to quantify changes and relative amounts. They consider the interaction between multiple forces when explaining changes in an object’s motion. 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** |
| • Change to an object’s motion is caused by unbalanced forces, including Earth’s gravitational attraction, acting on the object ACSSU117  • 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  • Reflect on scientific investigations including evaluating the quality of the data collected, and identifying improvements ACSIS131  • Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate ACSIS133 |
| **Achievement standards** |
| Students represent and predict the effects of unbalanced forces on motion. 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** |
| **7.1 A force is a push or a pull**  **(pages 120–121)** | *Science Understanding*  ACSSU117  *Science Inquiry Skills*  ACSIS125  ACSIS126  ACSIS129  ACSIS133 | By the end of this unit, students should be able to:  • define force, gravity and newton  • explain why a measuring device must be calibrated  • provide examples of forces in real life situations. | **Experiment 7.1**  *Measuring forces*  Students investigate forces in common situations  **An introduction to forces**  Students may benefit from completing the Bitesize interactive tutorial about forces. | **Oxford Science 7 WA resources**  • Check your learning, page 121  • Experiment 7.1, page 202 |
| **Additional resources**  The BBC Bitesize has a range of great activities, tutorials and games about forces.  <http://www.bbc.co.uk/bitesize/ks3/science/energy_electricity_forces/forces/activity/> |
| **7.2 An unbalanced force causes change**  **(pages 122–123)** | *Science Understanding*  ACSSU117  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS130  ACSIS131  ACSIS133 | By the end of this unit, students should be able to:  • define balanced forces, unbalanced forces and net force  • describe how force diagrams can represent forces in a situation  • provide examples of real life situations where forces are balanced and unbalanced  • explain what happens when forces are balanced and unbalanced. | **Challenge 7.2**  *Design a ball whacker*  Students design and construct a device to hit a tennis ball.  **Drawing force diagrams**  Students can extend their understanding of forces by learning to draw free-body or force diagrams. | **Oxford Science 7 WA resources**  • Check your learning, page 123  • Challenge 7.2, page 203 |
| **Additional resources**  The Physics Classroom website explains how to draw force diagrams and provides questions and answers for students to test their knowledge and understanding.  <http://www.physicsclassroom.com/class/newtlaws/Lesson-2/Drawing-Free-Body-Diagrams> |

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| **7.3 Forces can be contact or non–contact**  **(pages 124–125)** | *Science Understanding*  ACSSU117  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS130  ACSIS131  ACSIS133 | By the end of this unit, students should be able to:  • define contact forces, non-contact forces, attraction, repulsion, magnetic poles and domains  • describe what happens when two like poles are pushed together and when two unlike poles are pushed together  • provide examples of contact and non-contact forces. | **Challenge 7.3**  *Can you use the push and pull of a magnet?*  Students investigate magnetic forces through three activities.  **Magnetic force lines**  The non-contact force of magnetism can be demonstrated by dusting iron filings on top of a piece of paper that is sitting on top of a magnet.  **Forces of attraction**  Students can investigate the types of materials that are attracted to magnets and the strength of attraction as provided by the Science NetLinks website. | **Oxford Science 7 WA resources**  • Check your learning, page 125  • Challenge 7.3, page 203 |
| **Additional resources**  The Science NetLinks website has a number of magnetism activities.  <http://sciencenetlinks.com/lessons/exploring-magnetic-fields/> |
| **7.4 Magnetic fields can apply a force from a distance**  **(pages 126–127)** | *Science Understanding*  ACSSU117  *Science as a Human Endeavour*  ACSHE120  *Science Inquiry Skills*  ACSIS133 | By the end of this unit, students should be able to:  • define magnetic field  • describe the natural magnetic field of the Earth  • provide examples of using magnetism in real life situations  • explain how a compass works. | **Uses of magnetism**  Students can investigate some of the uses of magnetism in everyday life. The How Stuff Works website could be a good place to start.  **Geomagnetic reversal**  Students can research geomagnetic reversal and the affects it will have on the Earth. The Science Channel video will be a good place to start. | **Oxford Science 7 WA resources**  • Check your learning, page 127 |
| **Additional resources**  The How Stuff Works website explain how the magnetic strip of a bankcard works.  <http://money.howstuffworks.com/personal-finance/debt-management/magnetic-stripe-credit-card1.htm>  This Science Channel video explains geomagnetic reversal.  <http://www.sciencechannel.com/tv-shows/greatest-discoveries/videos/100-greatest-discoveries-magnetic-field-reversal/> |

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| **7.5 Electrostatic forces are non–contact forces**  **(pages 128–129** | *Science Understanding*  ACSSU117  *Science as a Human Endeavour*  ACSHE121  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS130  ACSIS133 | By the end of this unit, students should be able to:  • define electrostatic forces and charge  • describe what happens when like charges are place near each other and when two unlike charges are laced near each other  • provide examples of when electrostatic forces are present in everyday situations  • relate electrostatic forces and magnetic forces. | **Experiment 7.5**  *What if a balloon were electrostatically charged?*  Students investigate electrostatic forces with charged balloons.  **Van de Graaff generator**  There are numerous demonstrations that can be done with a Van de Graaff generation, some of which can be found at the AMA Sci website. Encourage students to explain what is happening in terms of unbalanced forces in each situation. | **Oxford Science 7 WA resources**  • Check your learning, page 129  • Experiment 7.5, page 204 |
| **Additional resources**  Van de Graaff generator tips, hints and activities can be found at:  <http://amasci.com/emotor/vdgdemo.html> |
| **7.6 Friction slows down moving objects**  **(pages 130–131)** | *Science Understanding*  ACSSU117  *Science as a Human Endeavour*  ACSHE120  ACSHE121  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS129  ACSIS130  ACSIS133 | By the end of this unit, students should be able to:  • define friction, lubrication, air resistance, drag and streamlining  • describe friction as a contact force  • provide examples of friction in real life. | **Experiment 7.6**  *What if the amount of friction were changed?*  Students investigate friction and the ways in which it can be decreased.  **More about friction**  Students will benefit form consolidating their understanding of friction with the Bitesize tutorial, game and/or quiz. | **Oxford Science 7 WA resources**  • Check your learning, page 131  • Experiment 7.6, page 205 |
| **Additional resources**  BBC Bitesize Friction page has a tutorial, game and quiz.  <http://www.bbc.co.uk/bitesize/ks2/science/physical_processes/friction/read/1/> |

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| **7.7 Simple machines decrease the amount of effort needed to do work**  **(pages 132–133)** | *Science Understanding*  ACSSU117  *Science as a Human Endeavour*  ACSHE121  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS129  ACSIS130  ACSIS133 | By the end of this unit, students should be able to:  • define simple machine, fulcrum, load and effort  • compare and contrast distance magnifiers and force magnifiers  • provide examples of first-, second- and third-class levers  • explain the differences between first-, second- and third-class levers  • calculate mechanical advantage. | **Experiment 7.7A**  *Using a first-class lever to lift weights*  Students investigate first-class levers with emphasis on the position of the fulcrum.  **Experiment 7.7B**  *Using a second-class lever to lift weights*  Students investigate second-class levers and calculate a simplified version of mechanical advantage.  **Rube Goldberg challenge**  A Rube Goldberg machine is one that uses overly complicated steps to carry out a simple task. Challenge students to create a Rube Goldberg machine that uses all three classes of lever. | **Oxford Science 7 WA resources**  • Check your learning, page 133  • Experiment 7.7A, page 206  • Experiment 7.7B, page 207 |
| **Additional resources**  Rube Goldberg machines  <http://coolmaterial.com/roundup/rube-goldberg-machines/> |
| **7.8 A pulley changes the size or direction of force**  **(pages 134–135)** | *Science Understanding*  ACSSU117  *Science as a Human Endeavour*  ACSHE121  *Science Inquiry Skills*  ACSIS125  ACSIS126  ACSIS129  ACSIS133 | By the end of this unit, students should be able to:  • define pulley and block and tackle  • explain how a pulley makes it easier to lift a load  • relate the number of pulleys to the mechanical advantage. | **Experiment 7.8**  *Calculating the mechanical advantage*  Students investigate the relationship between the number of pulleys and the effort and distance moved required to lift a load.  **Pulley’ing your own weight**  Students can investigate the use of pulleys in engineering with the Teach Engineering activity. | **Oxford Science 7 WA resources**  • Check your learning, page 135  • Experiment 7.8, page 208 |
| **Additional resources**  Teach Engineering hands–on activity.  <https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_simple/cub_simple_lesson05_activity1.xml> |

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| **7.9 There are different types of machines**  **(pages 136–137)** | *Science Understanding*  ACSSU117  *Science as a Human Endeavour*  ACSHE121  *Science Inquiry Skills*  ACSIS125  ACSIS126  ACSIS130  ACSIS133 | By the end of this unit, students should be able to:  • define ramp, wedge, screw, thread, wheel and axle  • describe how ramps, wedges, screws and wheels make moving a load easier  • provide examples of ramps, wedges, screws and wheels in real life  • relate ramps, wedges and screws. | **Experiment 7.9**  *Comparing different machines*  Students investigate the advantages and disadvantages of different machines.  **Simple machines in action**  Students can play the simple machine game on the Museum of Science and Industry Chicago website to demonstrate their understanding of how simple machine reduce effort. | **Oxford Science 7 WA resources**  • Check your learning, page 137  • Experiment 7.9, page 208 |
| **Additional resources**  Museum of Science and Industry Chicago simple machines game.  <http://www.msichicago.org/play/simplemachines/> |
| **7.10 Forces are involved in sport**  **(pages 138–139)** | *Science Understanding*  ACSSU117  *Science as a Human Endeavour*  ACSHE120  ACSHE121  *Science Inquiry Skills*  ACSIS133 | By the end of this unit, students should be able to:  • provide examples of forces and simple machines in sport  • explain how understanding of forces has improved sporting abilities and technologies. | **Researching forces in sport**  Students can research a technology associated with a sport to find out its purpose and how it related to forces and/or simple machines. Technologies may include smart suits for swimming, gold balls, tennis racquets, hockey sticks, gold clubs, spiked shoes, etc. | **Oxford Science 7 WA resources**  • Extend your understanding, page 139 |
| **7 Review**  **(pages 140–142)** | *Science Understanding*  ACSSU117  *Science Inquiry Skills*  ACSIS133 | By the end of this unit, students should be able to:  • Define all Key Words listed on page 142  • predict the effect of unbalanced forces  • 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 7 WA resources**  • Review questions, pages 140–141  Critical and creative thinking page 141  Research page 141  • Key Words list, page 142 |