

Term 3: Physics: Exploring forces and motion
Unit 3: 10 weeks

Year 7 Australian Curriculum Achievement Standard:

Science Understanding:

By the end of Year 7, students describe techniques to separate pure substances from mixtures. **They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion.** They explain how the relative positions of Earth, the sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of human and environmental changes on interactions between organisms and classify and organise diverse organisms based on observable differences.

Science as human endeavour:

Students describe situations where scientific knowledge from different science disciplines and diverse cultures has been used to solve a real-world problem. **They explain possible implications of the solution for different groups in society.**

Science Inquiry Skills:

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.**

See Unit 1 and Unit 2 (C2Cs) for extra details and resources

Unit Overview:

Students will deepen their knowledge from year 4 of forces as a push or a pull and further develop how forces affect the motion of objects. Students will understand balanced and unbalanced forces. Students are introduced to the concept of inertia, its role in the motion of objects. They will further develop their understanding of contact forces such as friction and air resistance and non-contact forces such as gravity. Students will understand the difference between mass and weight and understand how each is measured.

Students will apply their forces learnings to critically process and accurately analyse experimental or secondary data to draw evidence based conclusions and communicate using scientific terminology and representations.

Assessment Overview:

Task: Formative Assessment - week 4

Key Skill/s:

- Describe and represent types of forces
- Predict and represent types of motion
- Use Newton's first law of motion to predict effects of unbalanced forces
- Represent the relationship between weight and gravity; and make predictions about motion as a result of this relationship

Conditions:

- 30 min test

Task: Summative Assessment: Collection of Work

Key Skill/s:

- Describe and represent types of forces
- Predict and represent types of motion
- Use Newton's first law of motion to predict the effects of unbalanced forces
- Represent Newtons (N) and weight (kg) in mathematical calculations of net force
- Represent the relationship between weight and gravity; and make predictions about motion as a result of this relationship

Conditions:

		<ul style="list-style-type: none"> Component 1: Scientific report extract detailing the forces involved, expected results and actual results of an experiment – length 400 words maximum. Component 2: A 1.5-2.5min video explaining the design, testing and implications of an experiment. 	
Guaranteed Vocabulary:	Design Question Three Strategy	Design Question Four Strategy	21st Century Skill:
force, push, pull, motion Agent & receiver balanced & non balanced forces contact forces, friction & air resistance non-contact forces, gravity Weight, mass, distance, newtons, spring balance, kilograms, meters Inertia, force diagram	<ul style="list-style-type: none"> Use concept map to explore the different types of separation Use Venn Diagram to compare mixtures and pure substances Use Frayer Model to represent important vocabulary Use cause and effect organisers 	<ul style="list-style-type: none"> Teach students the hypothesis format if...<i>then</i>...<i>because</i> Engage students in complex tasks that require students to generate and test hypotheses in collaborative groups 	<ul style="list-style-type: none"> Use of ICT for learning Self-regulation within a collaborative setting
Guaranteed Skills/Language Features:	Reading Comprehension Skill and Strategy	CCEs and Key Terms:	ICT to Enhance Learning:
Factorial Explanation Multiple Choice Short Response	<ul style="list-style-type: none"> Synthesising <ol style="list-style-type: none"> <i>Frayer Model</i> <i>Concept Maps</i> Making Inferences <ol style="list-style-type: none"> <i>Connect Two</i> <i>Hands on Reading</i> 	<ul style="list-style-type: none"> Describing <ol style="list-style-type: none"> <i>Frayer Model</i> <i>Concept Maps</i> Explaining <ol style="list-style-type: none"> <i>Cause and Effect</i> Comparing <ol style="list-style-type: none"> <i>Venn Diagram</i> 	<ul style="list-style-type: none"> Use Oxford big ideas obook and assess for digital tools Use digital simulations from phet web site

Strands and Sub-Strands	Australian Curriculum Content Descriptors	Kirwan High Goals – Students can...
SCIENCE UNDERSTANDING		
Physical sciences	<ul style="list-style-type: none"> Change to an object's motion is caused by unbalanced forces acting on the object (ACSSU117) Earth's gravity pulls objects towards the centre of the Earth (ACSSU118) 	<ol style="list-style-type: none"> Describe and represent types of forces, including normal, friction, air resistance and gravity Predict and represent types of motion, including: at rest, begins to move, moves faster, moves slower, changes shape and changes direction Use Newton's first law of motion to predict the effects of unbalanced forces represent Newtons (N) and weight (kg) in mathematical calculations of net force

		5. Represent the relationship between weight and gravity; and make predictions about motion as a result of this relationship
SCIENCE AS HUMAN ENDEAVOUR		
Use and influence of science	<ul style="list-style-type: none"> 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) 	<ol style="list-style-type: none"> Describing relating regulations about wearing seatbelts or safety helmets to knowledge of forces and motion Evaluating how sports scientists apply knowledge of forces to improve performance Investigating and evaluate resource management, e.g. sorting waste materials, reducing pollution, and cleaning up oil spills
SCIENCE INQUIRY SKILLS		
Processing and analysing and information	<ul style="list-style-type: none"> Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships, including 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 (ACSIS130) 	<ol style="list-style-type: none"> Construct representations, including tables and graphs, of the relationship between unbalanced forces and motion from student's own investigations and secondary investigations Describe trends and relationships between unbalanced forces and motion from students own investigations and secondary investigations.
Evaluating	<ul style="list-style-type: none"> Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method (ACSIS131) Use scientific knowledge and findings from investigations to evaluate claims (ACSIS132) 	<ol style="list-style-type: none"> evaluate the quality of the data collected, and identify corresponding improvements to the method evaluate hypothesis using scientific knowledge and finding from investigation evaluate resource management, e.g. sorting waste materials to reduce pollution
Communicating	<ul style="list-style-type: none"> Communicate ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate (ACSIS133) 	<ol style="list-style-type: none"> Communicate ideas, findings and solutions to problems using scientific language and representations in the form of a scientific report and short exam responses.

Possible Habit of Mind: STRIVING FOR ACCURACY

Exploring Meaning of the HOM By the end of this unit students will be able to:	Expanding Capacity for using the HOM By the end of this unit students will be able to:	Increasing Alertness for the HOM By the end of this unit students will be able to:	Extending Values of the HOM By the end of this unit students will be able to:	Building Commitment towards the HOM By the end of this unit students will be able to:
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General Capabilities: This unit provides opportunities for students to engage in following capabilities:

Literacy ✓ Comprehending texts through listening, reading and viewing ✓ Composing texts through speaking, writing and creating ✓ Text knowledge ✓ Grammar knowledge ✓ Word knowledge ✓ Visual knowledge Numeracy ✓ Estimating and calculating with whole numbers ✓ Recognising and using patterns and relationships ✗ Using fractions, decimals, percentages, ratios and rates ✓ Using spatial reasoning ✓ Interpreting statistical information ✓ Using measurement	ICT ✓ Applying social and ethical protocols and practices when using ICT ✓ Investigating with ICT ✓ Creating with ICT ✗ Communicating with ICT ✓ Managing and operating ICT Critical and creative thinking ✓ Inquiring - identifying, exploring and organising information and ideas ✓ Generating ideas, possibilities and actions ✓ Reflecting on thinking and processes ✓ Analysing, synthesising and evaluating reasoning and procedures	Personal and social capability ✓ Self-awareness ✓ Self-management ✓ Social awareness ✓ Social management Ethical understanding ✓ Understanding ethical concepts and issues ✓ Reasoning in decision making and actions ✗ Exploring values, rights and responsibilities Intercultural understanding ✓ Recognising culture and developing respect ✓ Interacting and empathising with others ✗ Reflecting on intercultural experiences and taking responsibility
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Cross Curriculum Priorities:

✓ Aboriginal and Torres Strait Islander histories and cultures	✗ Asia and Australia's engagement with Asia	✗ Sustainability
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Differentiation [for small groups or individuals]:

- Individualise formative assessment tools provided with oxford big ideas
- Include increased scaffolding around assigned formative assessment task where needed
- Plan open-ended lesson tasks that require higher order thinking skills from more capable students
- Make use of heterogeneous collaborative groups to gain different perspectives
- Make use of homogeneous collaborative groups to tailor tiered questions
- Attend to any individual work plan requirements
- Collect and analyse student profiles for literacy and numeracy needs

Lesson Sequence:

Week	Day 1	Day 2	Day 3
1	<p>LEARNING SEQUENCE 1: REPRESENTING FORCE AND MOTION</p> <ol style="list-style-type: none"> Describe and represent types of forces, including normal, friction, air resistance and gravity Predict and represent types of motion, including: at rest, begins to move, moves faster, moves slower, changes shape and changes direction 	<p>LEARNING SEQUENCE 1: REPRESENTING FORCE AND MOTION</p> <ol style="list-style-type: none"> Describe and represent types of forces, including normal, friction, air resistance and gravity Predict and represent types of motion, including: at rest, begins to move, moves faster, moves slower, changes shape and changes direction 	<p>LEARNING SEQUENCE 1: REPRESENTING FORCE AND MOTION</p> <ol style="list-style-type: none"> Describe and represent types of forces, including normal, friction, air resistance and gravity Predict and represent types of motion, including: at rest, begins to move, moves faster, moves slower, changes shape and changes direction
2	<p>LEARNING SEQUENCE 2: BALANCED VS. UNBALANCED FORCES & MOTION</p> <ol style="list-style-type: none"> Use Newton's first law of motion to predict the effects of unbalanced forces represent Newtons (N) and weight (kg) in mathematical calculations of net force 	<p>LEARNING SEQUENCE 2: BALANCED VS. UNBALANCED FORCES & MOTION</p> <ol style="list-style-type: none"> Use Newton's first law of motion to predict the effects of unbalanced forces represent Newtons (N) and weight (kg) in mathematical calculations of net force 	<p>LEARNING SEQUENCE 2: BALANCED VS. UNBALANCED FORCES & MOTION</p> <ol style="list-style-type: none"> Use Newton's first law of motion to predict the effects of unbalanced forces represent Newtons (N) and weight (kg) in mathematical calculations of net force
3	<p>LEARNING SEQUENCE 2: BALANCED VS. UNBALANCED FORCES & MOTION</p> <ol style="list-style-type: none"> Use Newton's first law of motion to predict the effects of unbalanced forces represent Newtons (N) and weight (kg) in mathematical calculations of net force 	<p>LEARNING SEQUENCE 3: WEIGHT, GRAVITY AND MOTION</p> <p>Represent the relationship between weight and gravity; and make predictions about motion as a result of this relationship</p>	<p>LEARNING SEQUENCE 3: WEIGHT, GRAVITY AND MOTION</p> <ol style="list-style-type: none"> Represent the relationship between weight and gravity; and make predictions about motion as a result of this relationship
4	<p>Formative Test</p>	<p>LEARNING SEQUENCE 3: WEIGHT, GRAVITY AND MOTION</p> <p>Represent the relationship between weight and gravity; and make predictions about motion as a result of this relationship</p>	<p>LEARNING SEQUENCE 3: WEIGHT, GRAVITY AND MOTION</p> <ol style="list-style-type: none"> Represent the relationship between weight and gravity; and make predictions about motion as a result of this relationship
5	<p>Reteach Revise Extend Revision Through Analysing Data</p>	<p>LEARNING SEQUENCE 4: UNDERSTANDING FORCE AND MOTION USING INVESTIGATION SKILLS</p> <ol style="list-style-type: none"> investigate the effects of applying different forces to familiar objects experimentally to collect quantitative data Construct representations, including tables and graphs, of the relationship between unbalanced forces and motion from student's own investigations and secondary investigations 	<p>LEARNING SEQUENCE 4: UNDERSTANDING FORCE AND MOTION USING INVESTIGATION SKILLS</p> <ol style="list-style-type: none"> investigate the effects of applying different forces to familiar objects experimentally to collect quantitative data Construct representations, including tables and graphs, of the relationship between unbalanced forces and motion from student's own investigations and secondary investigations

		4. Describe trends and relationships between unbalanced forces and motion from student's own investigations and secondary investigations.	7. Describe trends and relationships between unbalanced forces and motion from student's own investigations and secondary investigations.
6	<p>LEARNING SEQUENCE 4: UNDERSTANDING FORCE AND MOTION USING INVESTIGATION SKILLS</p> <p>8. investigate the effects of applying different forces to familiar objects experimentally to collect quantitative data</p> <p>9. Construct representations, including tables and graphs, of the relationship between unbalanced forces and motion from student's own investigations and secondary investigations</p> <p>10. Describe trends and relationships between unbalanced forces and motion from student's own investigations and secondary investigations.</p>	<p>Reteach</p> <p>Revise</p> <p>Extend Revision Through Analysing Data</p>	<p><i>Revision/catchup</i></p>
7	<p><u>Handout Student experiment</u></p> <p>Introduce assessment</p> <p>Part 1</p> <p>TOPIC:</p> <ol style="list-style-type: none"> Understand the experimental task in the community 	<p><u>Student experiment</u></p> <p>Develop research rational</p> <p>Develop research question and hypothesis</p> <p>TOPIC:</p> <ol style="list-style-type: none"> Understand how to modify a student experiment and the requirements of each report section Understand what a fair test is and the importance of fair testing Understand what independent, dependent and controlled variables are and be able to choose these in an experiment 	<p><u>Student experiment</u></p> <ul style="list-style-type: none"> Pre-Assessment Develop experiment using fair testing principles to → Modify experimental method Assess Risks <p>TOPIC:</p> <ol style="list-style-type: none"> Understand how to modify a student experiment and the requirements of each report section Understand what a fair test is and the importance of fair testing Understand what independent, dependent and controlled variables are and be able to choose these in an experiment
8	<p><u>Student experiment</u></p> <p>Conduct experiment</p> <p>Analyse Results: calculate, graph and explain findings</p>	<p><u>Student experiment</u></p> <p>Analyse Results: calculate, graph and explain findings</p> <p>Write evaluation, Conclusion</p>	<p><u>Student experiment</u></p> <p>Write evaluation, Conclusion</p> <p>TOPIC:</p>

	TOPIC: 7. Understand the importance of accurate measurements on the outcomes of experimental results 8. Understand how to analyse primary data	TOPIC: 7. Understand the importance of accurate measurements on the outcomes of experimental results 8. Understand how to analyse primary data 9. Understand how to write an evaluation and conclusion	9. Understand how to write an evaluation and conclusion FINAL LESSON
9	LEARNING SEQUENCE 5: Resource and Waste Unit 1. Investigating resource management, e.g. sorting waste materials, reducing pollution, and cleaning up oil spills 2. Derive a research question from a claim (formative IA3) 3. Evaluate resource management to reduce pollution and environmental impacts Plastic, Paper, Metal	LEARNING SEQUENCE 5: Resource and Waste Unit 4. Investigating resource management, e.g. sorting waste materials, reducing pollution, and cleaning up oil spills 5. Derive a research question from a claim (formative IA3) 6. Evaluate resource management to reduce pollution and environmental impacts Plastic, Paper, Metal	LEARNING SEQUENCE 5: Resource and Waste Unit 7. Investigating resource management, e.g. sorting waste materials, reducing pollution, and cleaning up oil spills 8. Derive a research question from a claim (formative IA3) 9. Evaluate resource management to reduce pollution and environmental impacts Plastic, Paper, Metal
10	LEARNING SEQUENCE 5: Resource and Waste Unit 10. Investigating resource management, e.g. sorting waste materials, reducing pollution, and cleaning up oil spills 11. Derive a research question from a claim (formative IA3) 12. Evaluate resource management to reduce pollution and environmental impacts Plastic, Paper, Metal	LEARNING SEQUENCE 5: Resource and Waste Unit 13. Investigating resource management, e.g. sorting waste materials, reducing pollution, and cleaning up oil spills 14. Derive a research question from a claim (formative IA3) 15. Evaluate resource management to reduce pollution and environmental impacts Plastic, Paper, Metal	LEARNING SEQUENCE 5: Resource and Waste Unit Poster or small report - claim to research question (individual)