

**Term 3:** *Energy In My Life (physics unit)*

**See Unit [5&6] 10 weeks (C2Cs) for extra details and resources**

**Year 8 Australian Curriculum Achievement Standard:**

By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the timescales involved. They will analyse the relationship between structure and function at cell, organ and body system levels. 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. They reflect on implications of these solutions for different groups in society. 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.

**Unit Overview:**

In this unit students will classify energy forms. They will investigate different forms of potential energy, make predictions and conduct fair and safe experimental tasks.

Students will process and analyse experimental data and information and evaluate the experimental method used.

They will use models and representations to examine Kinetic energy and its relationship with potential energy and heat.

Students will communicate how energy is transferred and transformed through systems and cause change in systems.

They will recognise that energy can be transformed into usable and unusable forms and consider how this can impact on the efficiency of a system.

Students will discuss the use and influence of science on the utilisation of energy sources and consider how the efficiency of these sources in the production of energy could influence their use by society.

Students will also examine Australia's energy production and use of renewable and non-renewable energy resources. They will examine the impact of solar technology in Australian indigenous communities and consider how scientific knowledge can help make decisions into renewable resource use across the country.

**Assessment Overview:**

**Task: Formative Written Test**

**Key Skill/s:**

- Comprehensively **describe** and **explain** scientific information, concepts and relationships
- generate solutions and reasoned explanations
- plan an investigation that controls and measures variables
- analysis of data to interpret patterns, trends and relationships to make reasoned conclusions

**Task: SUMMATIVE Written test**

**Key Skill/s:**

- Comprehensively **describe** and **explain** scientific information, concepts and relationships
- generate solutions and reasoned explanations
- plan an investigation that controls and measures variables
- analysis of data to interpret patterns, trends and relationships to make reasoned conclusions

**Conditions:**

- 1 lesson under exam conditions
- 3 lessons to complete Part 2- Design and Energy Efficient Home (Science as a Human Endeavour)

Guaranteed Vocabulary:		Design Question Three Strategy	Design Question Four Strategy	21 <sup>st</sup> Century Skills:
Chemical potential energy Elastic potential energy Electrical energy Energy Energy efficiency Energy Transfer Energy transformation Engineer Gravitational potential energy	Heat Kinetic energy Conservation Nuclear energy Potential energy Sound energy Temperature Thermal energy	Science by Doing resources  Developing homework sheets – with extension questions for differentiation too  Compare and evaluate energy sources using graphic organisers.  Discuss and evaluate the advantages and disadvantages of different energy sources.	Science by Doing resources  Designing and modifying Rube Goldberg machines  Data loggers could be used to enhance the accuracy of the data collected during investigations into energy transformations.  Use STELR equipment to conduct investigations into renewable energy.	Use of ICT for learning  Collaboration  <i>Knowledge construction</i>
Guaranteed Skills/Language Features:		Reading Comprehension Skill and Strategy	CCEs and Key Terms:	ICT to Enhance Learning:
Factorial explanation  Consequential explanation	Connecting to prior knowledge  Creating mental images  <i>(Buehl, D. page 53)</i>	<i>Comparing</i> <i>Classifying</i> <i>Analysing</i> <i>Inferring</i> Generalising Synthesising	Use word to process word document Obook interactive Animations of complex concepts Internet research Web quests	

Know (declarative knowledge)	Be able to do... (procedural knowledge)
<ul style="list-style-type: none"> <li>• Law of energy</li> <li>• Types of Kinetic energy</li> <li>• Types of Potential energy</li> <li>• Energy transfer</li> <li>• Energy transformations</li> <li>• Energy conservation</li> <li>• Energy loss/ wasted energy</li> <li>• Energy diagrams and Sankey Diagrams</li> <li>• Advantages and disadvantages of Energy forms</li> </ul>	<ul style="list-style-type: none"> <li>• Identify types of energy</li> <li>• Law of conservation of energy</li> <li>• Draw flow diagrams that show energy transfers and transformations</li> <li>• Identify the types of energy and transfers and transformations within a system</li> <li>• Calculate Potential energy using: <math>PE = mgh</math></li> <li>• Calculate Kinetic energy using: <math>KE = \frac{ms^2}{2}</math></li> <li>• Evaluate the energy efficiency of an energy system</li> <li>• Interpret and make Sankey Diagrams</li> <li>• Explain that energy appears in different forms including movement (kinetic energy), heat and potential energy, and causes change within systems.</li> <li>• Identify the energy changes present in a variety of everyday situations (SHE)</li> <li>• Evaluate everyday situations about energy production and conservation</li> </ul>

**Learning Goals:**

Strands and Sub-Strands	Australian Curriculum Content Descriptors	Kirwan High Goals – Students will know and/or be able to
<b>SCIENCE UNDERSTANDING</b>		
Physical Sciences	<ul style="list-style-type: none"> <li>Energy appears in different forms including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (<a href="#">ACSSU155</a>)</li> </ul>	<ul style="list-style-type: none"> <li>Recognising that kinetic energy is the energy possessed by moving bodies</li> </ul>
		<ul style="list-style-type: none"> <li>Recognising that potential energy is stored energy, such as gravitational, chemical and elastic energy</li> </ul>
		<ul style="list-style-type: none"> <li>Investigating different forms of energy in terms of the effects they cause, such as gravitational potential causing objects to fall and heat energy transferred between materials that have a different temperature</li> </ul>
		<ul style="list-style-type: none"> <li>Using flow diagrams to illustrate changes between different forms of energy</li> </ul>
<b>SCIENCE AS HUMAN ENDEAVOUR</b>		
Use and influence of science	<ul style="list-style-type: none"> <li>Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations (<a href="#">ACSHE135</a>)</li> </ul>	<ul style="list-style-type: none"> <li>Investigating how energy efficiency can reduce energy consumption</li> </ul>
	<ul style="list-style-type: none"> <li>Science understanding influences the development of practices in areas of human activity such as industry, agriculture and marine and terrestrial resource management (<a href="#">ACSHE136</a>)</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>
	<ul style="list-style-type: none"> <li>People use understanding and skills from across the disciplines of science in their occupations (<a href="#">ACSHE227</a>)</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>
<b>SCIENCE INQUIRY SKILLS</b>		
Communicating	<ul style="list-style-type: none"> <li>Communicate ideas, findings and evidence based on solutions to problems using scientific language and representations using digital technologies as appropriate (<a href="#">AC SIS148</a>)</li> </ul>	<ul style="list-style-type: none"> <li>Selecting and using appropriate language and representations to communicate science ideas within a specified text type and for a specified audience</li> </ul>
Evaluating	<ul style="list-style-type: none"> <li>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 (<a href="#">AC SIS146</a>)</li> </ul>	<ul style="list-style-type: none"> <li>discussing investigation methods with others to share ideas about the quality of the inquiry process</li> <li>suggesting improvements to investigation methods that would improve the accuracy of the data recorded</li> </ul>
Planning and conducting	<ul style="list-style-type: none"> <li>Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (<a href="#">AC SIS140</a>)</li> </ul>	<ul style="list-style-type: none"> <li>identifying any ethical considerations that may apply to the investigation</li> <li>taking into consideration all aspects of fair testing, available equipment and safe investigation when planning investigations</li> <li>working collaboratively to decide how to best approach an investigation</li> </ul>
	<ul style="list-style-type: none"> <li>In fair tests, measure and control variables, and select equipment to collect data with accuracy appropriate to the task (<a href="#">AC SIS141</a>)</li> </ul>	<ul style="list-style-type: none"> <li>identifying and explaining the differences between controlled, dependent and independent variables</li> </ul>

		<ul style="list-style-type: none"> <li>• using specialised equipment to increase the accuracy of measurement within an investigation</li> </ul>
Processing and analysing data and information	<ul style="list-style-type: none"> <li>• 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 (AC SIS144)</li> </ul>	<ul style="list-style-type: none"> <li>• describing measures of central tendency (mean and mode) and identifying outliers for quantitative data</li> <li>• explaining the strengths and limitations of representations such as physical models, diagrams and simulations in terms of the attributes of systems included or not included</li> </ul>
	<ul style="list-style-type: none"> <li>• Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions (AC SIS145)</li> </ul>	<ul style="list-style-type: none"> <li>• constructing tables, graphs, keys and models to represent relationships and trends in collected data</li> <li>• drawing conclusions based on a range of evidence including primary and secondary sources</li> </ul>
Questioning and predicting	<ul style="list-style-type: none"> <li>• Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (AC SIS139)</li> </ul>	<ul style="list-style-type: none"> <li>• considering whether investigation using available resources is possible when identifying questions or problems to investigate</li> <li>• recognising that the solution of some questions and problems requires consideration of social, cultural, economic or moral aspects rather than or as well as scientific investigation</li> <li>• using information and knowledge from their own investigations and secondary sources to predict the expected results from an investigation</li> </ul>

**Possible Habit of Mind:**

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

<p><b>Literacy</b></p> <ul style="list-style-type: none"> <li>✓ Comprehending texts through listening, reading and viewing</li> <li>✓ Composing texts through speaking, writing and creating</li> <li>✓ Text knowledge</li> <li>✓ Grammar knowledge</li> <li>✓ Word knowledge</li> <li>✓ Visual knowledge</li> </ul> <p><b>Numeracy</b></p> <ul style="list-style-type: none"> <li>✓ Estimating and calculating with whole numbers</li> <li><input type="checkbox"/> Recognising and using patterns and relationships</li> <li><input type="checkbox"/> Using fractions, decimals, percentages, ratios and rates</li> <li><input type="checkbox"/> Using spatial reasoning</li> <li>✓ Interpreting statistical information</li> <li>✓ Using measurement</li> </ul>	<p><b>ICT</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Applying social and ethical protocols and practices when using ICT</li> <li>✓ Investigating with ICT</li> <li><input type="checkbox"/> Creating with ICT</li> <li><input type="checkbox"/> Communicating with ICT</li> <li>✓ Managing and operating ICT</li> </ul> <p><b>Critical and creative thinking</b></p> <ul style="list-style-type: none"> <li>✓ Inquiring - identifying, exploring and organising information and ideas</li> <li>✓ Generating ideas, possibilities and actions</li> <li>✓ Reflecting on thinking and processes</li> <li>✓ Analysing, synthesising and evaluating reasoning and procedures</li> </ul>	<p><b>Personal and social capability</b></p> <ul style="list-style-type: none"> <li>✓ Self-awareness</li> <li>✓ Self-management</li> <li>✓ Social awareness</li> <li>✓ Social management</li> </ul> <p><b>Ethical understanding</b></p> <ul style="list-style-type: none"> <li>✓ Understanding ethical concepts and issues</li> <li><input type="checkbox"/> Reasoning in decision making and actions</li> <li><input type="checkbox"/> Exploring values, rights and responsibilities</li> </ul> <p><b>Intercultural understanding</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Recognising culture and developing respect</li> <li><input type="checkbox"/> Interacting and empathising with others</li> <li><input type="checkbox"/> Reflecting on intercultural experiences and taking responsibility</li> </ul>
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**Cross Curriculum Priorities:**

<ul style="list-style-type: none"> <li>✓ Aboriginal and Torres Strait Islander histories and cultures</li> </ul> <p><i>Students will examine the influence the use of solar technology has had on Australian Indigenous communities.</i></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Asia and Australia's engagement with Asia</li> </ul>	<ul style="list-style-type: none"> <li>✓ Sustainability</li> </ul> <p><i>Examine renewable energy resources and consider issues associated with large scale transition to their use.</i></p> <p><i>Examine the availability and possible utilisation of renewable energy resources across Australia.</i></p> <p><i>Examine the use of biogas generators and how they could be used to produce energy from waste produced by societies.</i></p>
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**Differentiation [for small groups or individuals]:**

Review the available data for your class to understand areas of strength and areas needing support in your students.

Increase scaffolding to support low literacy classes and students.

Use formative tasks to give frequent feedback and maintain your understanding of student progress.

Include opportunities for students to demonstrate deep understanding of complex concepts.

Monitor the effectiveness of your teaching strategies and change strategies as required. Combine strategies to create macro strategies where appropriate

Give students choices throughout their assessment that allow them ownership of the task

Week	Lesson 1	Lesson 2	Lesson 3
1 20/04/20	<p><b>TOPIC: Defining Energy</b></p> <ul style="list-style-type: none"> <li>• Introduction (revision) to types of energy</li> <li>• Develop a definition of energy</li> <li>• Explain how energy is measured</li> </ul> <p><b>RESOURCES:</b> Science by doing: 1.1 Spot the energy OBI8 page 86 3.1 How do we experience energy?</p>	<p><b>TOPIC: Types of Energy</b></p> <ul style="list-style-type: none"> <li>• Energy types</li> <li>• Defining kinetic and potential energy</li> <li>• Organising energy types into kinetic and potential</li> </ul> <p><b>RESOURCES:</b> Science by doing: 1.2 Energy to burn &amp; 1.3 Forms of energy OBI8 page 88 – 89 SW1 page 135</p> <p><b>HOMEWORK:</b> OBI8 worksheet 3.2 Different forms of energy</p>	<p><b>TOPIC: Potential Energy</b></p> <ul style="list-style-type: none"> <li>• Defining potential energy</li> <li>• Identify types of potential energy</li> </ul> <p><b>RESOURCES:</b> Science by doing: 1.2 Energy to burn &amp; 1.3 Forms of energy OBI8 page 88 – 89 SW1 page 135</p> <p><b>HOMEWORK:</b> OBI8 worksheet 3.2 Different forms of energy</p>
2 27/04/20	<p><b>TOPIC: Energy focus – Chemical potential energy</b></p> <ul style="list-style-type: none"> <li>• Recognise sources of chemical potential energy</li> <li>• Calculate chemical potential energy in food</li> <li>• Understand how nutrient content relates to energy content of food</li> <li>• Apply understanding to create an appropriate eating plan</li> </ul> <p><b>RESOURCES:</b> Science by doing: 5.1 Food as Fuel Experiment (or equivalent) Science by doing: 5.2 Energy in food. C2C lesson 4 OBI8 page 93 Jacaranda 1 page 196 (more specific info about food) C2C lesson 3</p> <p><b>HOMEWORK:</b> Investigate alternative diets (like Paleo, Vegan, etc) – evaluate if these diets meet the nutritional needs.</p>	<p><b>TOPIC: Energy focus – Gravitational potential energy</b></p> <ul style="list-style-type: none"> <li>• Define gravitational potential energy and identify applications</li> <li>• Understand the relationship between mass, height and gravitational potential energy</li> <li>• Calculate gravitational potential energy</li> </ul> <p><b>RESOURCES:</b> OBI8 page 92 OBI8 teacher book page 92 (previewing) C2C lesson 5: sheet investigation GPE (experiment) Alt: Science by doing 2.3 Mass and weight: what's the difference? <b>Check STELR resources too</b></p>	<p><b>TOPIC: Energy focus – Elastic potential energy</b></p> <ul style="list-style-type: none"> <li>• Understand factors that affect elastic potential energy</li> <li>• Explain elastic potential energy and applications for its use</li> </ul> <p><b>RESOURCES:</b> OBI8 practivity 3.1 page 92 Rubber band boats (or equivalent – discussion questions are good) C2C lesson 6</p>

3 04/05/20	<p><b>TOPIC: Energy focus – Kinetic and Mechanical energy</b></p> <ul style="list-style-type: none"> <li>• Understand the relationship between potential and kinetic energy</li> <li>• Understand kinetic energy is transformed into heat due to friction</li> </ul>	<p><b>TOPIC: Energy focus – Electrical and Sound Energy</b></p> <ul style="list-style-type: none"> <li>• Define electrical and sound energy</li> <li>• Explain how these types of energy are transmitted</li> <li>• Understand that electrical energy depends on the flow of an electric charge</li> </ul>	<p><b>TOPIC: Energy focus – Heat and Light Energies</b></p> <ul style="list-style-type: none"> <li>• Define heat and light energies</li> <li>• Understand that heat energy is generally released as a waste product of the other types of energy</li> <li>• Explain the human uses of heat and light energy</li> </ul>
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	<ul style="list-style-type: none"> <li>Calculate kinetic energy</li> </ul> <p><b>RESOURCES:</b> Science by doing: 2.2 Energy skate park (interactive) OR C2C lesson 7 has same thing with worksheet OBI8 worksheet 3.3 Kinetic and potential energy experiment analysis</p> <p><b>Interactive:</b> <a href="http://www.pbslearningmedia.org/asset/mck05_int_rollercoaster/">http://www.pbslearningmedia.org/asset/mck05_int_rollercoaster/</a></p>	<ul style="list-style-type: none"> <li>Explain the importance of these types of energy in everyday life</li> </ul> <p>Possible Prac: <a href="https://www.kcedventures.com/blog/the-science-of-sound-waves-an-awesome-experiment-for-kids">https://www.kcedventures.com/blog/the-science-of-sound-waves-an-awesome-experiment-for-kids</a></p>	Possible Prac:
4 11/04/20	<p><b>Energy Creation: Traditional- coal and nuclear</b></p> <ul style="list-style-type: none"> <li>Be able to explain that fossil fuels are finite resources</li> <li>Understand that energy is stored in fossil fuels and can be released by combustion</li> <li>Understand that nuclear energy is energy stored in the nucleus of an atom</li> <li>Be able to explain how nuclear energy stores large quantities of potential energy</li> </ul>	<p><b>Energy Creation: Types of Renewable Energy</b></p> <ul style="list-style-type: none"> <li>Identify multiple types of renewable energy</li> <li>Be able to explain how these types of energy are produced and used in modern society</li> <li>Understand the benefits and limitations to using renewable energy</li> </ul>	Catch up/extension lesson
5 18/04/20	<p><b>FORMATIVE ASSESSMENT</b></p>	<p><b>TOPIC: Transfers and transformations</b></p> <ul style="list-style-type: none"> <li>Define and understand what energy transfers and transformations are</li> <li>Identify energy transfers and transformations within a system</li> <li>The Law of Conservation of energy</li> </ul> <p><b>RESOURCES:</b> C2C lesson 1 –what energy is that sheet/experiment OBI8 pages 100 – 101 (with highly specific on later pages) Jacaranda 1 page 194 SW1 page 136 OBI8 worksheet: Energy in different objects 3.1</p> <p><b>HOMEWORK:</b> Essential resources worksheet: Energy transformations Look at Rube Goldberg machines.</p>	<p><b>TOPIC: Transfers and transformations</b></p> <ul style="list-style-type: none"> <li>Construct energy chains</li> <li>Link the functioning of the system with the energy forms involved</li> <li>Explain why energy forms are usable and unusable within in a system</li> </ul> <p><b>RESOURCES:</b> C2C lesson 8-9 Science by doing 6.2 Energy systems Science by doing: 6.4 The Honda Ad</p> <p>Look at Rube Goldberg machines.</p>
6 25/04/20	<p><b>TOPIC: Evaluating energy efficiency</b></p> <ul style="list-style-type: none"> <li>Calculate the energy efficiency of different systems</li> <li>Construct representations of energy flow through systems</li> <li>Compare the efficiencies of different energy sources</li> </ul> <p><b>RESOURCES:</b></p>	<p><b>TOPIC: Writing Skills Practice</b></p> <ul style="list-style-type: none"> <li>Communicate energy transfers and transformation chains using clear and concise writing skills</li> </ul>	Revision

	C2C lessons 10-11 Jacaranda 1 page 198-199 Look at Rube Goldberg machines.		
<b>7</b> <b>01/06/20</b>	<b>Revision</b>	<b>Revision</b>	<b>Exam Part 1</b>
<b>8</b> <b>08/06/20</b>	<b>Environmental impacts of high energy usage</b>	<b>Energy efficient housing</b>	<b>Calculating home energy efficiency</b>
<b>9</b> <b>15/06/20</b>	<b>Home Energy Project (Exam Part 2)</b>	<b>Home Energy Project (Exam Part 2)</b>	<b>Home Energy Project (Exam Part 2)</b>
<b>10</b> <b>22/06/20</b>	Catch up/extension week	Catch up/extension week	<b>Catch up/extension week</b>

## Resources

### Science textbooks and collection:

- Big Ideas 8 (book, and online content)
- Big Ideas 7 (book, and online content)
- Essential resources (book, also on collection)
- Science by doing (online and collection)
- Old textbooks, e.g. Science World 1 (or 8) Macmillan Publishers
- Collection folders

### Comprehension and writing

- Buehl – comprehension strategies
- Writing books (given by school, cover how to write and CCE's)

### Online

- Science by doing (online and collection) <https://www.sciencebydoing.edu.au/>
- ASSIST website <http://assist.asta.edu.au/>
- ABC splash <http://splash.abc.net.au/home#/home>
- Scootle <https://www.scootle.edu.au/ec/p/home>