

TEACHING PROGRAM

Nelson Physics Units 1 & 2 for the Australian Curriculum

Chapter 1 Heating and cooling

Semester One				
Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
1	Introduction to subject Requirements of the program Introduction to heating and cooling	Reading pages 1–5 Activity 1.1: Sensing hot and cold		Prior knowledge sheet
	Kinetic particle model of matter The energy model <ul style="list-style-type: none"> • potential energy • kinetic energy • internal energy 	Reading pages 5–9	Question set 1.1	
	Temperature <ul style="list-style-type: none"> • thermal equilibrium Heating and cooling curves	Reading pages 10–13 Investigation 1.1: Bimetal strip and thermometers		Question set 1.2 Research how a bimetallic strip behaves when heated
2	Specific heat capacity Water as a heat sink State changes	Reading pages 14–19 Worked example 1.1 Worked example 1.2	Experiment 1.1 Specific heat capacity of metals	Question set 1.3
3	Conservation of energy Latent heat Work energy and power	Reading pages 20–30 Worked example 1.3 Worked example 1.4 Worked example 1.5	Investigation 1.2 Latent heat of fusion of water	Scientific literacy: Steam weeding Case study: Professor David Mee Question set 1.4 Revision sheet Chapter review questions
			Chapter 1 test	

Chapter 2 Heating and cooling systems

Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
4	Conduction Convection Radiation Emission and absorption of radiation by surfaces Conservation of energy in open systems Energy efficiency	Reading pages 36–47 Experiment 2.1: Insulation Currents Experiment 2.2: Bottled convection currents Worked example 2.1 Question set 2.2		Prior knowledge sheet Question set 2.1 Investigation 2.1: Efficiency of microwave ovens
5	Energy efficient houses	Reading pages 48–50 Question set 2.3	Experiment 2.3 Energy absorption by different surfaces	Find out more about energy efficiency by design and climate change by visiting the weblinks on pages 50–1. Case study: Professor Hui Tong Chua
	Heating and the environment	Reading pages 50–61 Worked example 2.2 Question set 2.4	Scientific literacy: Upsetting the energy balance	
	Work, heat and energy	Reading pages 61–7 Question set 2.5		Chapter review questions Revision sheet
	Low temperature physics	Reading pages 68–9 Question set 2.6	Chapter 2 test	

Chapter 3 The nuclear atom

Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
6	Radiation	Reading pages 74–5	Experiment 3.1 Background ionising radiation	Prior knowledge sheet Question set 3.1
	Nuclear model of the atom	Reading pages 76–81		Activity 3.1 The golden age of Physics Question set 3.2
	Nuclides and the periodic table	Reading pages 81–4 Worked example 3.1 Question set 3.3		Learn about how you are exposed to more cosmic radiation when you are flying by visiting the weblink on page 75. Work through the simulation to see how Rutherford obtained evidence for his model of the atom, and learn more about the Geiger–Marsden experiment and Rutherford’s interpretation using the weblinks on page 78.
7	Radioactive decay	Reading pages 85–9 Worked example 3.2 Worked example 3.3 Question set 3.4		Use the two weblinks on page 84 to investigate all the isotopes of elements. Track the radioactivity of different isotopes.
	Alpha, beta and gamma radiation	Reading pages 90–4 Question set 3.5		Scientific literacy: Smoke detectors
	Half-life and decay series	Reading pages 95–9 Experiment 3.2 Random decay and half-life: a simulation Worked example 3.4		Question set 3.6
	Nuclear medicine			Reading pages 100–1 Question set 3.7 Chapter review questions Revision sheet
			Chapter 3 test	

Chapter 4 Energy from the nucleus

Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
8	What holds a nuclide together	Reading pages 108–12 Worked example 4.1 Question set 4.1		Prior knowledge sheet Find out more about the four fundamental forces and the way they operate by visiting the weblink on page 108.
	Nuclear energy: fission	Reading pages 113–16 Worked example 4.2 Question set 4.2		Download, open the file and follow the instructions for The Peninsula of Nuclear Stability weblink on page 109.
	Nuclear reactors	Reading pages 117–23		Question set 4.3
9	Risks of using nuclear energy	Reading pages 123–7	Scientific literacy: Nuclear disasters	Case study: Dr Ross Whitfield
	Nuclear energy: fusion	Reading pages 128–31 Worked example 4.3 Question set 4.4		Examine the safety record of different industries involved in primary energy production. Find other resources that come from a different position in the debate about energy production and safety. Visit the weblink on page 126.
	Effect of radiation on humans	Reading pages 131–4 Question set 4.5	Chapter 4 test	Chapter review questions Revision sheet

Chapter 5 Electricity

Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
10	Electrons Charge Insulators, conductors and semiconductors	Reading pages 140–5 Activity 5.1: Positive and negative charges		Prior knowledge sheet Question set 5.1
	Energy in circuits Separation of charge Batteries Potential difference	Reading pages 146–9 Question set 5.2		Question set 5.2
11	Current Conventional current Direct and alternating current	Reading pages 149–53 Worked example 5.1		Question set 5.3
	Types of circuits Series circuits Parallel circuits Kirchoff's energy law	Pages 154–5 Worked example 5.2 Worked example 5.3		Question set 5.4

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Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
12	Resistance Ohm's law	Reading pages 157–62 Worked example 5.4 Worked example 5.5	Experiment 5.1: Resistivity of a wire	Question set 5.5
	Power Energy and power	Reading pages 163–7 Worked example 5.6 Question set 5.6		Read Dr Jenny Riesz interview and answer the questions Activity 5.2: Household appliance energy use audit Chapter review questions Revision sheet
			Chapter 5 test	

Chapter 6 Electrical circuits

Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
13	Circuit analysis Thévenin's theorem	Reading pages 172–9		Prior knowledge sheet
	Resistors in series circuits	Worked example 6.1	Experiment 6.1 Investigating current in series and parallel circuits	
	Resistors in parallel circuits	Worked example 6.2		
	Combination circuits	Reading pages 179–82 Worked example 6.3		Question set 6.1
	Voltage dividers Voltage and potential difference	Reading pages 183–5 Worked example 6.4		Question set 6.2
14	Electronic components	Reading pages 185–93 Worked example 6.5	Scientific literacy: New technology inspires a rethinking of light	
		Experiment 6.2 Testing the effect of temperature on the resistance of a thermistor		
15	Applications of electronic circuits Telecommunications	Worked example 6.6 Reading page 194 Reading page 195		Question set 6.3
	Household electricity	Reading pages 197–9 Question set 6.4		Chapter review questions Revision sheet
			Chapter 6 test	

End of semester 1

Revision and mid-year exams: two weeks allowed

Chapter 7 Motion

Semester Two				
Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
1	Movement along a straight line	Reading pages 206–16 Worked example 7.1 Worked example 7.2		Prior knowledge sheet
		Experiment 7.1 The speeds of common objects		
		Worked example 7.3 Worked example 7.4 Worked example 7.5		Question set 7.1
2	Constant acceleration along a straight line	Reading pages 216–26 Worked example 7.6 Worked example 7.7 Worked example 7.8 Worked example 7.9		
	Reaction time	Activity 7.2 Measuring reaction time		Question set 7.2
3	Projectile motion	Reading pages 226–36	Experiment 7.2 Gravitational acceleration	Scientific literacy: NASA's Voyager missions
		Worked example 7.10 Worked example 7.11 Worked example 7.12 Experiment 7.3 Launch velocity Question set 7.3		Apollo 15 Commander David Scott dropped a feather and a hammer on the Moon in 1971. See the weblink on page 226. Case study: Dr Brian Schmidt – Australian Nobel Prize Winner Chapter review questions Revision sheet
			Chapter 7 test	

Chapter 8 Force

Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
4	Force: actions by one thing on another	Reading pages 242–4		Prior knowledge sheet
	Contact and non-contact forces	Reading pages 244–5 Worked example 8.1		Question set 8.1
	Gravitational effects on <ul style="list-style-type: none"> • mass • weight • terminal velocity • gravity 	Reading pages 246–50 Worked example 8.2 Question set 8.2	Scientific literacy: Weight of the world	
	Newton's Laws			Question set 8.3
		Reading pages 251–7 Worked example 8.3 Worked example 8.4 Try these yourself		

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Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
5	Scalar and vector quantities	Reading pages 258–65		
	Addition and subtraction of forces	Experiment 8.1 Addition of forces in a plane Worked example 8.5 Worked example 8.6		Case study: Road safety research – Gordon Trinca
	Contact forces: friction and normal	Reading pages 265–7		
	Components of forces		Experiment 8.2 Static friction	
		Worked example 8.7 Worked example 8.8		
6	Acceleration down a slope	Question set 8.4		Reading pages 271 Chapter review questions
			Chapter 8 test	

Chapter 9 Work–energy and impulse–momentum

Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
7	Energy Relation between work and energy Potential energy	Reading pages 280–1 Worked example 9.1		Prior knowledge sheet Question set 9.1
	Work: force acting while moving over a distance	Reading pages 283–8 Worked example 9.2 Question set 9.2	Experiment 9.1 The potential energy stored in springs	
8	Work and energy transfers near the Earth of forces	Reading pages 289–92 Worked example 9.3		Scientific literacy: Getting to Mars faster
	Power	Reading pages 293–4 Question set 9.3		Case study: Associate Professor Rod Cross – using physics to solve crime, and the mystery of sports
	Impulse force acting over time Collisions	Reading pages 295–303 Worked example 9.4	Experiment 9.2 Momentum during a collision	
		Activity 9.1 Newton's Cradle Worked example 9.5 Investigation 9.1: Weighing a skateboard rider without a balance		
9	The physics of car safety Combining energy and momentum	Reading pages 303–6 Worked example 9.6		Crashing a smart car at 110 km h ⁻¹ weblink, page 303 Question set 9.4 Revision sheet Chapter review questions
			Chapter 9 test	

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Chapter 10 Mechanical models of waves

Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
10	The mechanical wave model Transverse wave model Longitudinal wave model	Reading pages 312–18		Prior knowledge sheet An excellent tutorial on the fundamental properties of mechanical waves, weblink, page 313
	Describing sound waves	Activity 10.1 Investigating wave properties Worked example 1.1		Question set 10.1
		Reading pages 319–21 Experiment 10.1 Measuring the frequencies of tuning forks		Question set 10.2
11	Wave behaviour Speed of sound Diffraction Refraction Reflection	Reading pages 323–5		Scientific literacy: Bats hunt using echolocation
	Diffraction of sound waves Reflection (continued) Refraction (continued)	Question set 10.3 Reading pages 327–9 Worked example 10.2		Question set 10.3
	The law of superposition			View the animation of the law of superposition at the weblink on page 331.
		Reading pages 330–3		View footage of the destruction of the Tacoma Narrows Bridge by visiting the weblink on page 333. Question set 10.4
	Modes of vibration			Question set 10.5
	Vibrations in air columns	Reading pages 334–5 Worked example 10.3	Experiment 10.2 Finding the speed of sound by air column resonance	Question set 10.6
12	Objective and subjective measures of sound	Reading pages 337–41 Worked example 10.4 Worked example 10.5 Reading pages 343–6		Question set 10.7
	Imaging with mechanical waves	Reading pages 347–51		Scientific literacy: Road noise pollution and acoustic design Case study Professor David Blair
	Ultrasound in medicine	Reading page 351 Question set 10.7		Revision sheet Chapter review questions
			Chapter 10 test	

Chapter 11 Wave model and light phenomena

Week	Curriculum material to be covered	Activities to be completed in class	Assessment activities	Student managed learning
13	The behaviour of light	Reading pages 358–60 Question set 11.1		Prior knowledge sheet Measuring the speed of light weblink, page 360
	Electromagnetic wave model	Reading pages 361–7 Investigation 11.1 Polarisation around you		
		Worked example 11.1 Worked example 11.2		Question set 11.2
14	The ray model: reflection	Reading pages 368–70 Question set 11.3		
	The ray model: refraction	Reading pages 371–9 Experiment 11.1 Snell's Law Worked example 11.3		Question set 11.4
15	Images formed by refraction and reflection	Reading pages 381–7 Worked example 11.4 Worked example 11.5	Experiment 11.2 Images in a convex lens	
16	Images formed by reflection in curved mirrors	Reading pages 388–90 Worked example 11.6		Case study: Professor Joanne Wood Question set 11.5
	Diffraction Young's double-slit experiment	Reading pages 392–7		Question set 11.6
		Activity 11.1 Everyday evidence for the wavelike behaviour of light.		Revision sheet Chapter review questions
		Worked example 11.7	Chapter 11 Test	
End of semester 2				
Revision week and exam weeks				