# Physics Unit 1 and 2

Rossmoyne Senior High School

2017

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# Rationale

Physics is a fundamental science that endeavours to explain all the natural phenomena that occur in the universe. Its power lies in the use of a comparatively small number of assumptions, models, laws and theories to explain a wide range of phenomena, from the incredibly small to the incredibly large. Physics has helped to unlock the mysteries of the universe and provides the foundation of understanding upon which modern technologies and all other sciences are based.

The Physics ATAR course uses qualitative and quantitative models and theories based on physical laws to visualise, explain and predict physical phenomena. Models, laws and theories are developed from, and their predictions are tested by, making observations and quantitative measurements. In this course, students gather, analyse and interpret primary and secondary data to investigate a range of phenomena and technologies using some of the most important models, laws and theories of physics, including the kinetic particle model, the atomic model, electromagnetic theory, and the laws of classical mechanics.

Students investigate how the unifying concept of energy explains diverse phenomena and provides a powerful tool for analysing how systems interact throughout the universe on multiple scales. Students learn how more sophisticated theories, including quantum theory, the theory of relativity and the Standard Model, are needed to explain more complex phenomena, and how new observations can lead to models and theories being refined and developed.

Students learn how an understanding of physics is central to the identification of, and solutions to, some of the key issues facing an increasingly globalised society. They consider how physics contributes to diverse areas in contemporary life, such as engineering, renewable energy generation, communication, development of new materials, transport and vehicle safety, medical science, an understanding of climate change, and the exploration of the universe.

Studying senior secondary science provides students with a suite of skills and understandings that are valuable to a wide range of further study pathways and careers. Studying physics will enable students to become citizens who are better informed about the world around them and who have the critical skills to evaluate and make evidence-based decisions about current scientific issues. The Physics ATAR course will also provide a foundation in physics knowledge, understanding and skills for those students who wish to pursue tertiary study in science, engineering, medicine and technology.

# Aims

The Physics ATAR course aims to develop students':

- appreciation of the wonder of physics and the significant contribution physics has made to contemporary society
- understanding that diverse natural phenomena may be explained, analysed and predicted using concepts, models and theories that provide a reliable basis for action
- understanding of the ways in which matter and energy interact in physical systems across a range of scales
- understanding of the ways in which models and theories are refined and new models and theories are developed in physics; and how physics knowledge is used in a wide range of contexts and informs personal, local and global issues
- investigative skills, including the design and conduct of investigations to explore phenomena and solve problems, the collection and analysis of qualitative and quantitative data, and the interpretation of evidence
- ability to use accurate and precise measurement, valid and reliable evidence, and scepticism and intellectual rigour to evaluate claims
- ability to communicate physics understanding, findings, arguments and conclusions using appropriate representations, modes and genres.

# Unit 1 – Thermal, nuclear and electrical physics

## Unit description

An understanding of heating processes, nuclear reactions and electricity is essential to appreciate how global energy needs are met. In this unit, students explore the ways physics is used to describe, explain and predict the energy transfers and transformations that are pivotal to modern industrial societies. Students investigate heating processes, apply the nuclear model of the atom to investigate radioactivity, and learn how nuclear reactions convert mass into energy. They examine the movement of electrical charge in circuits and use this to analyse, explain and predict electrical phenomena.

Contexts that can be investigated in this unit include technologies related to nuclear, thermal, or geothermal energy, the greenhouse effect, electrical energy production, large-scale power systems, radiopharmaceuticals, and electricity in the home; and related areas of science, such as nuclear fusion in stars and the Big Bang theory.

Through the investigation of appropriate contexts, students understand how applying scientific knowledge to the challenge of meeting world energy needs requires the international cooperation of multidisciplinary teams and relies on advances in ICT and other technologies. They explore how science knowledge is used to offer valid explanations and reliable predictions, and the ways in which it interacts with social, economic, cultural and ethical factors.

Students develop skills in interpreting, constructing and using a range of mathematical and symbolic representations to describe, explain and predict energy transfers and transformations in heating processes, nuclear reactions and electrical circuits. They develop their inquiry skills through primary and secondary investigations, including analysing heat transfer, heat capacity, radioactive decay and a range of simple electrical circuits.

## Learning outcomes

By the end of this unit, students:

- understand how the kinetic particle model and thermodynamics concepts describe and explain heating processes
- understand how the nuclear model of the atom explains radioactivity, fission, fusion and the properties of radioactive nuclides
- understand how charge is involved in the transfer and transformation of energy in electrical circuits
- understand how scientific models and theories have developed and are applied to improve existing, and develop new, technologies
- use science inquiry skills to design, conduct and analyse safe and effective investigations into heating processes, nuclear physics and electrical circuits, and to communicate methods and findings
- use algebraic and graphical representations to calculate, analyse and predict measurable quantities associated with heating processes, nuclear reactions and electrical circuits
- evaluate, with reference to empirical evidence, claims about heating processes, nuclear reactions and electrical technologies
- communicate physics understanding using qualitative and quantitative representations in appropriate modes and genres.

# Unit 2 – Linear motion and waves

## Unit description

Students develop an understanding of motion and waves which can be used to describe, explain and predict a wide range of phenomena. Students describe linear motion in terms of position and time data, and examine the relationships between force, momentum and energy for interactions in one dimension.

Students investigate common wave phenomena, including waves on springs, and water, sound and earthquake waves.

Contexts that can be investigated in this unit include technologies such as accelerometers, motion detectors, global positioning systems (GPS), energy conversion buoys, music, hearing aids, echo locators, and related areas of science and engineering, such as sports science, car and road safety, acoustic design, noise pollution, seismology, bridge and building design.

Through the investigation of appropriate contexts, students explore how international collaboration, evidence from a range of disciplines and many individuals, and the development of ICT and other technologies have contributed to developing understanding of motion and waves and associated technologies. They investigate how scientific knowledge is used to offer valid explanations and reliable predictions, and the ways in which it interacts with social, economic, cultural and ethical factors.

Students develop their understanding of motion and wave phenomena through laboratory investigations. They develop skills in relating graphical representations of data to quantitative relationships between variables, and they continue to develop skills in planning, conducting and interpreting the results of primary and secondary investigations.

## Learning outcomes

By the end of this unit, students:

- understand that Newton's Laws of Motion describe the relationship between the forces acting on an object and its motion
- understand that waves transfer energy and that a wave model can be used to explain the behaviour of sound
- understand how scientific models and theories have developed and are applied to improve existing, and develop new, technologies
- use science inquiry skills to design, conduct and analyse safe and effective investigations into linear motion and wave phenomena, and to communicate methods and findings
- use algebraic and graphical representations to calculate, analyse and predict measurable quantities associated with linear and wave motion
- evaluate, with reference to evidence, claims about motion and sound related phenomena and associated technologies
- communicate physics understanding using qualitative and quantitative representations in appropriate modes and genres.

# School-based assessment

The Western Australian Certificate of Education (WACE) Manual contains essential information on principles, policies and procedures for school-based assessment that needs to be read in conjunction with this syllabus.

Teachers design school-based assessment tasks to meet the needs of students. The table below provides details of the assessment types for the Physics ATAR Year 11 syllabus and the weighting for each assessment type.

## Assessment table – Year 11

| Type of assessment | Weighting |
|---|---|
| **Science Inquiry**<br>There must be at least one experiment, one investigation and one evaluation and analysis completed for each unit.<br>Appropriate strategies should be used to authenticate student achievement on an out-of-class assessment task.<br>**Experiment**<br>Practical tasks designed to develop or assess a range of laboratory related skills and conceptual understanding of physics principles, and skills associated with representing data; organising and analysing data to identify trends and relationships; recognising error, uncertainty and limitations in data; and selecting, synthesising and using evidence to construct and justify conclusions.<br>Tasks can take the form of practical skills tasks, laboratory reports and short in-class tests to validate the knowledge gained.<br>**Investigation**<br>Activities in which ideas, predictions or hypotheses are tested and conclusions are drawn in response to a question or problem. Investigations can involve experimental testing, field work, locating and using information sources, conducting surveys, and using modelling and simulations.<br>Assessment tasks can take the form of an experimental design brief, a formal investigation report requiring qualitative and/or quantitative analysis of the data and evaluation of physical information, or exercises requiring qualitative and/or quantitative analysis of second-hand data.<br>**Evaluation and analysis**<br>Involves interpreting a range of scientific and media texts; evaluating processes, claims and conclusions by considering the accuracy and precision of available evidence; and using reasoning to construct scientific arguments.<br>Assessment tasks can take the form of answers to specific questions based on individual research; exercises requiring analysis; and interpretation and evaluation of physics information in scientific and media texts. | 30% |
| **Test**<br>Tests typically consist of questions requiring short answers, extended answers and problem solving.<br>This assessment type is conducted in supervised classroom settings. | 30% |
| **Examination**<br>Examinations require students to demonstrate use of terminology, understanding and application of concepts and knowledge of factual information. It is expected that questions would allow students to respond at their highest level of understanding.<br>Typically conducted at the end of each semester and/or unit. In preparation for Unit 3 and Unit 4, the examination should reflect the examination design brief included in the ATAR Year 12 syllabus for this course. This assessment type is conducted in supervised classroom settings. | 40% |

Physics Unit 1 & 2 Year 11 Programme 2017

| Semester and Week | Content | Science as a Human Endeavour | STAWA | Experiments, Investigations and Evaluations | Text Book Nelson |
|---|---|---|---|---|---|
| **Term 1**<br><br>**Monday & Tuesday SDD**<br><br>**Week 1**<br><br>**01/02** | **Heating Processes**<br><br>• the kinetic particle model describes matter as consisting of particles in constant motion, except at absolute zero<br>• all substances have internal energy due to the motion and separation of their particles<br>• temperature is a measure of the average kinetic energy of particles in a system | | **Set 1**<br><br>Qts.1 - 12 | STAWA Exp 1.1: Achieving thermal equilibrium | Pages 1 - 9<br><br>Pages 10 –13<br><br>Set 1.2 |
| **Term 1**<br><br>**Week 2**<br><br>**06/02** | • provided a substance does not change state, its temperature change is proportional to the amount of energy added to or removed from the substance; the constant of proportionality describes the heat capacity of the substance<br>*This includes applying the relationship*<br>• $Q = m c \Delta T$ | | **Set 3**<br><br>Qts.1 - 25 | STAWA Exp 3.2: The specific heat capacity of a metal | Pages 15- 20<br><br>Set 1.3 |
| **Term 1**<br><br>**Week 3**<br><br>**13/02** | • change of state involves separating particles which exert attractive forces on each other; latent heat is the energy required to be added to or removed from a system to change the state of the system<br>*This includes applying the relationship*<br>$Q = m L$ | | **Set 4**<br><br>Excluding Qt. 14 | **<u>Experiment Assessment:</u> Heat**<br><br>STAWA Exp 4.2: Melting ice | Set 1.4<br>Pages 20 – 30<br><br>P 33, 34 review questions |

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|---|---|---|---|---|---|
| **Term 1**<br><br>**Week 4**<br><br>**20/02** | • heat transfer occurs between and within systems by conduction, convection and/or radiation<br><br>• energy transfers and transformations in mechanical systems always result in some heat loss to the environment, so that the usable energy is reduced and the system cannot be 100 percent efficient<br><br>*This includes applying the relationship*<br><br>$efficiency\ \eta = \frac{energy\ \ output}{energy\ \ input} \times \frac{100}{1}\%$ | The development of heating technologies that use conduction, convection, radiation and latent heat have had, and continue to have, significant social, economic and environmental impacts. These technologies include:<br>o passive solar design for heating and cooling of buildings<br>o the development of the refrigerator over time<br>o the use of the sun for heating water engine cooling systems in cars. | **Set 2**<br><br>Qts. 1 – 13, 15- 19 | STAWA Exp 2.1: Convection currents<br><br>STAWA Exp 2.2: Insulators<br><br>STAWA Exp 2.3: Why do coffee cups have lids?<br><br>Exp 2.2 p40 | Set 2.1<br>Pages 36 – 47<br><br>Pages 48 – 50<br><br>Pages 52 – 60<br><br>Pages 61 -67<br><br>Set 2.3 |
| **Term 1**<br><br>**Week 5**<br><br>**27/02** | • a system with thermal energy has the capacity to do mechanical work [to apply a force over a distance]; when work is done, the internal energy of the system changes<br><br>• because energy is conserved, the change in internal energy of a system is equal to the energy added by heating, or removed by cooling, plus the work done on or by the system<br><br>**Ionising radiation and nuclear reactions**<br>• the nuclear model of the atom describes the atom as consisting of an extremely small nucleus which contains most of the atom's mass, and is made up of positively charged protons and uncharged neutrons surrounded by negatively charged electrons | | | STAWA Exp 5.2: Range of alpha and beta particles (DEMO) | Set 2.5<br><br>Pages 74- 84<br><br>Set 3.3 |

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|---|---|---|---|---|---|
| **Term 1**<br><br>**Week 6**<br><br>**6 March Labour Day Holiday**<br><br>**07/03** | • nuclear stability is the result of the strong nuclear force which operates between nucleons over a very short distance and opposes the electrostatic repulsion between protons in the nucleus<br>• some nuclides are unstable and spontaneously decay, emitting alpha, beta (+/-) and/or gamma radiation over time until they become stable nuclides<br>• alpha and beta decay are examples of spontaneous transmutation reactions, while artificial transmutation is a managed process that changes one nuclide into another<br>• alpha, beta and gamma radiation have different natures, properties and effects | | **Set 5**<br><br>Qts.1 -17 | STAWA Exp 5.1: Radiation tracks in a cloud chamber (DEMO)<br><br>STAWA Exp 5.3: Penetration power of radiation (DEMO)<br><br>STAWA Exp 5.4: Deflecting alpha and beta radiation (DEMO)<br><br>STAWA Exp 7.1: Radiation and distance (DEMO)<br>**Also see Spice resources** | Pages85– 89<br><br>Set 3.4<br><br>Pages 90- 94<br><br>Set 3.5 |
| **Term 1**<br><br>**Week 7**<br><br>**13/03** | • each species of radionuclide has a half-life which indicates the rate of decay<br>*This includes applying the relationship*<br>$N = N_0 \left(\frac{1}{2}\right)^n$ | ○ | **Set 6**<br><br>Qts.1 -12 | STAWA Exp 6.1: Simulated radioactive decay (M&Ms) | Pages 95- 99<br><br>Set 3.6 |
| **Period Zero Test 1 Week 7 - Thursday 16/03 (Heating & Cooling + Nuclear)** | | | | | |
| **Term 1**<br><br>**Week 8**<br><br>**20/03** | Einstein's mass/energy relationship relates the binding energy of a nucleus to its mass defect<br>*This includes applying the relationship*<br>$\Delta E = \Delta mc^2$<br>• Einstein's mass/energy relationship also applies to all energy changes and enables the energy released in nuclear reactions to be determined from the mass change in the reaction<br>*This includes applying the relationship*<br>$\Delta E = \Delta mc^2$ | ○ | **Set 8**<br><br>Qts.1 -11,13-16 | | Pages 108-116 |

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| **Term 1**<br><br>**Week 9**<br><br>**27/03** | • the measurement of absorbed dose and dose equivalence enables the analysis of health and environmental risks<br>*This includes applying the relationships*<br>$absorbed\ \ dose = \frac{E}{m}$<br>*dose equivalent = absorbed dose x quality factor* | Qualitative and quantitative analyses of relative risk (including half-life, absorbed dose, dose equivalence) are used to inform community debates about the use of radioactive materials and nuclear reactions for a range of applications and purposes, including:<br>radioisotopes are used as diagnostic tools and for tumour treatment in<br>o medicine | **Set 7**<br><br>Qts.1 -14,17 | <u>**Evaluation Assessment:**</u><br>**Nuclear**<br><br>Nelson - Pages 117- 137 provide a useful reference | Pages 131 – 134 |
| **Term 1**<br><br>**Week 10**<br><br>**03/04** | • neutron-induced nuclear fission is a reaction in which a heavy nuclide captures a neutron and then splits into smaller radioactive nuclides with the release of energy<br>• a fission chain reaction is a self-sustaining process that may be controlled to produce thermal energy, or uncontrolled to release energy explosively if its critical mass is exceeded<br>• nuclear fusion is a reaction in which light nuclides combine to form a heavier nuclide, with the release of energy<br>• more energy is released per nucleon in nuclear fusion than in nuclear fission because a greater percentage of the mass is transformed into energy | o nuclear power stations employ a variety of safety mechanisms to prevent nuclear accidents, including shielding, moderators, cooling systems and radiation monitors.<br><br>o the management of nuclear waste is based on the knowledge of the behaviour of radiation. | | STAWA Exp 8.1: Simulating a chain reaction (Lighting matches)<br><br>**Nuclear validation assessment** | Pages 117- 127<br><br>Pages 128 - 131 |

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| | | **Term 1 Break DATES: 10/04 – 21/04** | | | |
| **Term 2**<br><br>**Week 1**<br>**24/04**<br>**Anzac Day**<br>**25/04** | **Electrical Circuits**<br>• there are two types of charge that exert forces on each other<br>• electric current is carried by discrete charge carriers; charge is conserved at all points in an electrical circuit<br>*This includes applying the relationship*<br>$I = \frac{q}{t}$<br>• electrical circuits enable electrical energy to be transferred and transformed into a range of other useful forms of energy, including thermal and kinetic energy, and light<br>• the energy available to charges moving in an electrical circuit is measured using electric potential difference, which is defined as the change in potential energy per unit charge between two defined points in the circuit<br>*This includes applying the relationship*<br>$V = \frac{W}{q}$ | | **Set 9**<br>Excluding Qt.1 | STAWA Exp 9.1: Creating and storing electric charges<br><br>Van de Graaff generator demonstration<br><br>STAWA Exp 10.1: Measuring electrical energy<br><br>STAWA Exp 10.2: The mechanical power of an electric motor | Pages 140 – 143<br><br>Set 5.1<br><br>Pages 146 – 149<br><br>Pages 150 - 153 |
| **Term 2**<br><br>**Week 2**<br><br>**01/05** | • resistance for ohmic and non-ohmic components is defined as the ratio of potential difference across the component to the current in the component<br>*This includes applying the relationship*<br>$R = \frac{V}{I}$<br>• resistance depends upon the nature and dimensions of a conductor | | **Set 11**<br><br>Qts.1 - 9 | STAWA Exp 11.1: Potential difference, current and resistance<br><br>STAWA Exp 11.2: Incandescent globes<br><br>Experiment 5.1 | Pages 157 - 162 |

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| **Term 2**<br><br>**Week 3**<br><br>**08/05** | • power is the rate at which energy is transformed by a circuit component; power enables quantitative analysis of energy transformations in the circuit<br><br>*This includes applying the relationship*<br><br>$P = \frac{W}{t} = V\ I$ | The supply of electricity to homes has had an enormous impact on society and the environment. An understanding of electrical circuits informs the design of effective safety devices for the safe operation of:<br>o lighting<br>o power points<br>o stoves<br>other household electrical devices | **Set 10**<br><br>Qts.1 -14 | **<u>ASSESSMENT</u>: Resistance Investigation** | Pages 163 - 167<br><br>Review Questions P169-170 |
| **Period Zero Test 2 Week 3 - Wednesday 10/05(Nuclear +Electricity)** | | | | | |
| **Term 2**<br><br>**Week 4**<br><br>**15/05** | • circuit analysis and design involve calculation of the **potential difference** across the **current** in, and the **power** supplied to, components in series, parallel, and **series/parallel circuits**<br><br>*This includes applying the relationships*<br><br>series components<br>I = constant<br>$V_t = V_1 + V_2 + V_3 + \ldots$<br>$R_t = R_1 + R_2 + R_3 + \ldots$<br><br>parallel components<br>V = constant<br>$I_t = I_1 + I_2 + I_3 + \ldots$<br>$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$ | | **Set 12**<br><br>Qts.1 -14 | STAWA Exp 12.1: Resistors in series<br><br>STAWA Exp 12.2: Resistors in parallel<br><br>STAWA Exp 12.2: Sources of EMF in series and parallel | Pages 154 – 155<br><br>Pages 172 – 174<br><br>Pages 175 - 182<br><br>Set 6.1 |

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|---|---|---|---|---|---|
| **Term 2**<br><br>**Week 5**<br><br>**22/05** | • energy is conserved in the energy transfers and transformations that occur in an electrical circuit<br><br>• there is an inherent danger involved with the use of electricity that can be reduced by using various safety devices, including fuses, residual current devices (RCD), circuit breakers, earth wires and double insulation | | **Set 13**<br><br>Qts.1 -15 | STAWA Exp 13.1: Fuses | Review Questions P 201<br><br>Pages 197 - 199 |
| **Week 6 & 7**<br>**29/05 SDD**<br><br>**WA Day 05/06** | **Year 11 Semester 1 Examinations 30/5 – 09/06** | | | | |
| **Term 2**<br><br>**Week 8**<br><br>**12/06** | **Analysis and revision of Unit 1 exam**<br><br>**Linear Motion and Force**<br><br>• Distinguish between vector and scalar quantities, and add and subtract vectors in two dimensions | | **Set 14**<br><br>Qts.1 -14 | STAWA Exp 14.1: Navigating Vectors | Pages 206 - 210 |
| **Term 2**<br><br>**Week 9**<br><br>**19/06** | • Uniformly accelerated motion is described in terms of relationships between measurable scalar and vector quantities, including displacement, speed, velocity and acceleration | | **Set 15**<br><br>Qts.1 -16 | STAWA Exp 15.1: Going faster<br><br>STAWA Exp 15.2: Reaction time | Pages 212 - 225 |

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| | *This includes applying the relationships*<br>$v_{av} = \frac{s}{t}, \quad a = \frac{v-u}{t}, \quad v = u + at,$<br>$s = ut + \frac{1}{2}at^2, \quad v^2 = u^2 + 2as$<br>• Vertical motion is analysed by assuming the acceleration due to gravity is constant near Earth's surface | | | | Pages 228 - 233<br><br>Review questions P 239, 240 |
| **Term 2**<br><br>**Week 10 26/06** | • Representations, including graphs and vectors, and/or equations of motion, can be used qualitatively and quantitatively to describe and predict linear motion | | **Set 15**<br><br>Qts.1 -16 | **<u>Investigation assessment:</u>**<br>Motion | |
| | | **Term 2 Break DATES: 03/07 – 14/07** | | | |
| **Term 3**<br><br>**Week 1 17/07 SDD**<br><br>**18/07** | • Newton's Three Laws of Motion describe the relationship between the force or forces acting on an object, modelled as a point mass, and the motion of the object due to the application of the force or forces<br>• Draw free body diagrams, showing the forces and net force acting on objects, from descriptions of real life situations involving forces acting in one or two dimensions<br>*This includes applying the relationship*<br>$F = ma, \quad F_{weight} = mg$ | | **Set 16**<br><br>Qts.1 -15 | STAWA Exp 16.1: Newton's second law | Pages 251 – 257<br><br>Pages 258 – 269<br><br>Pages 247 – 250 |

| Semester and Week | Content | Science as a Human Endeavour | STAWA | Experiments, Investigations and Evaluations | Text Book Nelson |
|---|---|---|---|---|---|
| **Term 3**<br><br>**Week 2**<br><br>**24/07** | • Energy is conserved in isolated systems and is transferred from one object to another when a force is applied over a distance; this causes work to be done and changes the kinetic and/or potential energy of objects<br><br>*This includes applying the relationships*<br><br>$E_k = \frac{1}{2}mv^2, \quad E_p = mg\Delta h, \quad W = Fs, \quad W = \Delta E$ | | **Set 18**<br><br>Qts.1 - 23 | STAWA Exp 18.1: Roller coaster | Set 9.1<br><br>Pages 280-285<br><br>Pages 289 -294 |
| **Period Zero Test 3 Week 2 - Wednesday 26/07(Motion & Forces)** | | | | | |
| **Term 3**<br><br>**Week 3**<br><br>**31/07** | Power is the rate of doing work or transferring energy<br><br>*This includes applying the relationships*<br><br>• $P = \frac{W}{t} = \frac{\Delta E}{t} = Fv_{av}$<br><br>• Momentum is a property of moving objects; it is conserved in a closed system and may be transferred from one object to another when a force acts over a time interval<br><br>*This includes applying the relationships*<br><br>$p = mv, \quad \sum mv_{before} = \sum mv_{after}$<br>$mv - mu = \Delta p = F\Delta t$ | o | **Set 17**<br><br>Excluding Qt.20 | STAWA Exp 17.1: Conservation of momentum in an explosion<br><br>STAWA Exp 17.2: Conservation of momentum in a collision<br><br>Investigation 9.1 | Pages 295-299 |
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|---|---|---|---|---|---|
| Term 3<br><br>Week 4<br><br>07/08 | • Collisions may be elastic and inelastic; kinetic energy is conserved in elastic collisions<br><br>*This includes applying the relationship*<br><br>$\sum \frac{1}{2}mv^2_{before} = \sum \frac{1}{2}mv^2_{after}$ | Safety for motorists and other road users has been substantially increased through application of Newton's laws and conservation of momentum by the development and use of devices, including:<br>o helmets<br>o seatbelts<br>o crumple zones<br>o airbags<br>o safety barriers. | | | Page 300<br><br>Pages 303-306 |
| Term 3<br>Week 5<br><br>14/08 | • Evaluating car crashes | | | **Evaluation assessment:** video analysis of momentum | |
| Term 3<br><br>Week 6<br><br>21/08 | **Waves**<br><br>• waves are periodic oscillations that transfer energy from one point to another<br><br>• waves may be represented by displacement/time and displacement/distance wave diagrams and described in terms of relationships between measurable quantities, including period, amplitude, wavelength, frequency and velocity<br><br>*This includes applying the relationships*<br><br>$v = f\lambda$, $T = \frac{1}{f}$<br><br>• mechanical waves transfer energy through a medium; longitudinal and transverse waves are distinguished by the relationship between the directions of oscillation of particles relative to the direction of the wave velocity | | **Set 19**<br><br>Qts.1-14, 17 - 25 | STAWA Exp 20.1: Observing wave pulses<br>Part A and B | Pages 312 - 314<br><br>Pages 316-319<br><br>Pages 319-321 |

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|---|---|---|---|---|---|
| **Term 3**<br><br>**Week 7**<br><br>**28/08** | • the mechanical wave model can be used to explain phenomena related to reflection and refraction, including echoes and seismic phenomena | | **Set 20**<br>Qts.1-12 | STAWA Exp 20.1: Observing wave pulses<br>Part C<br><br>STAWA Exp 20.2: Diffraction and interference<br>(Diffraction of Light waves NOT in course) | Set 10.3<br><br>Pages 323-324<br><br>Pages 326-329 |
| **Term 3**<br><br>**Week 8**<br><br>**04/09** | • a mechanical system resonates when it is driven at one of its natural frequencies of oscillation; energy is transferred efficiently into systems under these conditions<br><br>• the superposition of waves in a medium may lead to the formation of standing waves and interference phenomena, including standing waves in pipes and on stretched strings<br><br>*This includes applying the relationships for*<br><br>Strings attached at both ends and pipes open at both ends<br><br>$\lambda = \frac{2\ell}{n}$<br><br>Pipes closed at one end<br><br>$\lambda = \frac{4\ell}{(2n-1)}$ | | **Set 20**<br>Q13 onwards | **<u>Experiment Assessment:</u>**<br>STAWA Exp 20.4: Resonance in air columns<br>Experiment 10.2<br><br>Haunted tubes<br>Ruebens tube | Set 10.4<br><br>Pages 330 - 332<br><br>Set 10.5<br><br>Pages 334 - 340<br><br>Set 10.6 |
| **Term 3**<br><br>**Week 9**<br><br>**11/09** | • the intensity of a wave decreases in an inverse square relationship with distance from a point source<br><br>*This includes applying the relationship*<br><br>$I \ \alpha \ \frac{1}{r^2}$ | | | | Page 343 |

| Semester and Week | Content | Science as a Human Endeavour | STAWA | Experiments, Investigations and Evaluations | Text Book Nelson |
|---|---|---|---|---|---|
| **Term 3**<br>**Week 10**<br>**18/09** | | Application of the wave model has enabled the visualisation of imaging techniques. These can include:<br>o medical applications, such as ultrasound<br>o geophysical exploration, such as seismology.<br><br>Noise pollution comes from a variety of sources and is often amplified by walls, buildings and other built structures. Acoustic engineering, based on an understanding of the behaviour of sound waves, is used to reduce noise pollution. It focuses on absorbing sound waves or planning structures so that reflection and amplification do not occur. | | | Set 10.8 questions Pages 354<br><br>Pages 347-351 |
| **Period Zero Test 4 Week 10 - Monday 18/09(Motion & Waves)** | | | | | |
| **Term 3 Break DATES: 25/09 – 06/10** | | | | | |
| **Term 4**<br>**Week 1**<br>**And**<br>**Week 2**<br>**09/10 – 20/10** | • Completion of course and revision for Exams | | | | |
| **Term 4**<br>**Week 3&4** | **Year 11 Semester 2 Examinations 23/10 – 3/11** | | | | |

# YEAR 11 PHYSICS Unit 1 and 2 — 2017 ASSESSMENT

## Unit 1

| | Weighting (whole year) |
|---|---|
| **Science Inquiry** | **15%** |
| Experiment: Heat | 5% |
| Investigation: Factors affecting resistance lab report | 5% |
| Evaluation and Analysis: Nuclear | 5% |
| **TESTS** | **15%** |
| Test 1 (Heating Processes and Ionising Radiation) | 7.5% |
| Test 2 (Nuclear Reactions and Electrical Circuits) | 7.5% |
| **SEMESTER 1 EXAMINATION** | **20%** |
| **SEMESTER 1 TOTAL:** | **50%** |

## Unit 2

| | Weighting (whole year) |
|---|---|
| **Science Inquiry** | **15%** |
| Experiment: Resonance in pipes lab test | 5% |
| Investigation: Motion | 5% |
| Evaluation and Analysis: (analysis of momentum from high speed video) | 5% |
| **TESTS** | **15%** |
| Test 3 (Linear Motion and Force) | 7.5% |
| Test 4 (Waves) | 7.5% |
| **SEMESTER 2 EXAMINATION** | **20%** |
| **SEMESTER 2 TOTAL:** | **50%** |

IMPORTANT NOTES:

**Note: Internal moderation of these scores may occur if required.**

- The semester 1 and 2 exams contribute most significantly to your final overall assessment. Revising regularly and keeping up to date with problem sets and review exercises will make revision easier. Remember there is typically very little time for revision in the last weeks before the exam so plan to start your revision well ahead of the exams.