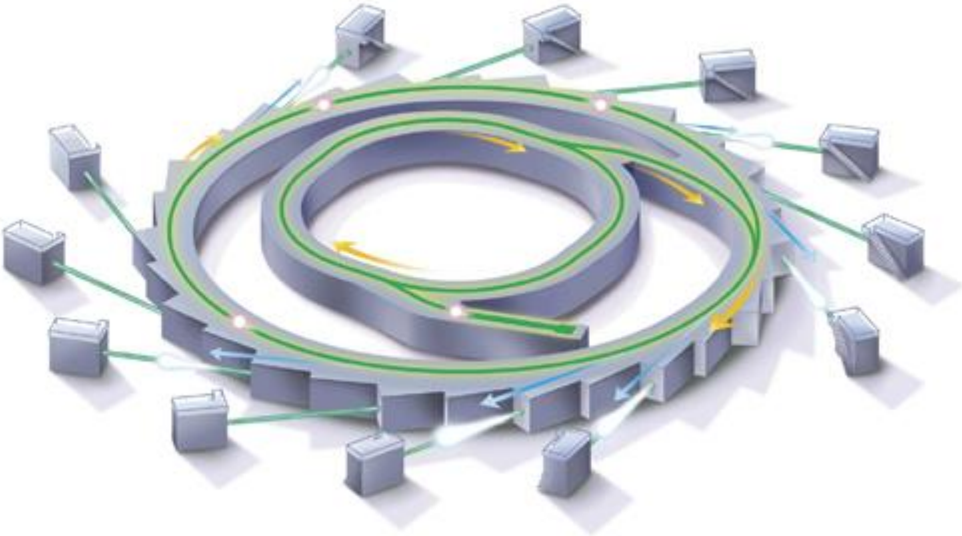
Unit 1 / 2 Physics Program



Unit 1: What ideas explain the physical world?

Ideas in physics are dynamic. As physicists explore concepts, theories evolve. Often this requires the detection, description and explanation of things that cannot be seen. In this unit students explore how physics explains phenomena, at various scales, which are not always visible to the unaided human eye. They examine some of the fundamental ideas and models used by physicists in an attempt to understand and explain the world. Students consider thermal concepts by investigating heat, probe common analogies used to explain electricity and consider the origins and formation of matter.

Students use thermodynamic principles to explain phenomena related to changes in thermal energy. They apply thermal laws when investigating energy transfers within and between systems, and assess the impact of human use of energy on the environment. Students examine the motion of electrons and explain how it can be manipulated and utilised. They explore current scientifically accepted theories that explain how matter and energy have changed since the origins of the Universe.

Students undertake quantitative investigations involving at least one independent, continuous variable.

Area of Study 1

How can thermal effects be explained?

In this area of study students investigate the thermodynamic principles related to heating processes, including concepts of temperature, energy and work. Students examine the environmental impacts of Earth's thermal systems and human activities with reference to the effects on surface materials, the emission of greenhouse gases and the contribution to the enhanced greenhouse effect. They analyse the strengths and limitations of the collection and interpretation of thermal data in order to consider debates related to climate science.

Outcome 1

On completion of this unit the student should be able to apply thermodynamic principles to analyse, interpret and explain changes in thermal energy in selected contexts, and describe the environmental impact of human activities with reference to thermal effects and climate science concepts.

To achieve this outcome the student will draw on key knowledge outlined in Area of Study 1 and the related key science skills on pages 11 and 12 of the study design.

Key knowledge

Thermodynamics principles

- convert temperature between degrees Celsius and kelvin
- describe the Zeroth Law of Thermodynamics as two bodies in contact with each other coming to a thermal equilibrium
- describe temperature with reference to the average kinetic energy of the atoms and molecules within a system
- investigate and apply theoretically and practically the First Law of Thermodynamics to simple situations: $Q = U + W$
- explain internal energy as the energy associated with random disordered motion of molecules
- distinguish between conduction, convection and radiation with reference to heat transfers within and between systems
- investigate and analyse theoretically and practically the energy required to:
  - —raise the temperature of a substance: $Q = mc\Delta T$
  - —change the state of a substance: $Q = mL$
- explain why cooling results from evaporation using a simple kinetic energy model.

Thermodynamics and climate science

- identify regions of the electromagnetic spectrum as radio, microwave, infrared, visible, ultraviolet, x-ray and gamma waves
- describe electromagnetic radiation emitted from the Sun as mainly ultraviolet, visible and infrared
- calculate the peak wavelength of the re-radiated electromagnetic radiation from Earth using Wien's Law: $\lambda_{max}T$ = constant
- compare the total energy across the electromagnetic spectrum emitted by objects at different temperatures such as the Sun

- describe power radiated by a body as being dependent on the temperature of the body according to the Stefan-Boltzmann Law, $P \propto T^4$
- explain the roles of conduction, convection and radiation in moving heat around in Earth's mantle (tectonic movement) and atmosphere (weather)
- model the greenhouse effect as the flow and retention of thermal energy from the Sun, Earth's surface and Earth's atmosphere
- explain how greenhouse gases in the atmosphere (including methane, water and carbon dioxide) absorb and re-emit infrared radiation
- analyse changes in the thermal energy of the surface of Earth and of Earth's atmosphere
- analyse the evidence for the influence of human activity in creating an enhanced greenhouse effect, including affecting surface materials and the balance of gases in the atmosphere.

Issues related to thermodynamics

- apply thermodynamic principles to investigate at least one issue related to the environmental impacts of human activity with reference to the enhanced greenhouse effect:
  - —proportion of national energy use due to heating and cooling of homes
  - —comparison of the operation and efficiencies of domestic heating and cooling systems: heat pumps; resistive heaters; reverse-cycle air conditioners; evaporative coolers; solar hot water systems; and/or electrical resistive hot water systems
  - —possibility of homes being built that do not require any active heating or cooling at all
  - —use of thermal imaging and infrared thermography in locating heating losses in buildings and/or system malfunctions; cost savings implications
  - —determination of the energy ratings of home appliances and fittings: insulation; double glazing; window size; light bulbs; and/or electrical gadgets, appliances or machines
  - —cooking alternatives: appliance options (microwave, convection, induction); fuel options (gas, electricity, solar, fossil fuel)
  - —automobile efficiencies: fuel options (diesel petrol, LPG and electric); air delivery options (naturally aspirated, supercharged and turbocharged); and fuel delivery options (common rail, direct injection and fuel injection)
- explain how concepts of reliability, validity and uncertainty relate to the collection, interpretation and communication of data related to thermodynamics and climate science.

Area of Study 2

How do electric circuits work?

Modelling is a useful tool in developing concepts that explain physical phenomena that cannot be directly observed. In this area of study students develop conceptual models to analyse electrical phenomena and undertake practical investigations of circuit components. Concepts of electrical safety are developed through the study of safety mechanisms and the effect of current on humans. Students apply and critically assess mathematical models during experimental investigations of DC circuits.

Outcome 2

On completion of this unit the student should be able to investigate and apply a basic DC circuit model to simple battery-operated devices and household electrical systems, apply mathematical models to analyse circuits, and describe the safe and effective use of electricity by individuals and the community.

To achieve this outcome the student will draw on key knowledge outlined in Area of Study 2 and the related key science skills on pages 11 and 12 of the study design.

Key knowledge

Concepts used to model electricity

- apply concepts of charge (Q), electric current (I), potential difference (V), energy (E) and power (P), in electric circuits
- explore different analogies used to describe electric current and potential difference
- investigate and analyse theoretically and practically electric circuits using the relationships: ,,
- justify the use of selected meters (ammeter, voltmeter, multimeter) in circuits
- apply the kilowatt-hour (kW h) as a unit of energy.

Circuit electricity

- model resistance in series and parallel circuits using
  - —current versus potential difference (I–V) graphs

—resistance as the potential difference to current ratio, including R = constant for ohmic devices

—equivalent effective resistance in arrangements in

• series: $R_T = R_1 + R_2 + ... + R_n$ and

• parallel:

• calculate and analyse the effective resistance of circuits comprising parallel and series resistance and voltage dividers
• model household (AC) electrical systems as simple direct current (DC) circuits
• compare power transfers in series and parallel circuits
• explain why the circuits in homes are mostly parallel circuits.

Using electricity
• investigate and apply theoretically and practically concepts of current, resistance, potential difference (voltage drop) and power to the operation of electronic circuits comprising resistors, light bulbs, diodes, thermistors, light dependent resistors (LDRs), light-emitting diodes (LEDs) and potentiometers (quantitative analysis restricted to use of $VIR=$ and $PVI=$)
• investigate practically the operation of simple circuits containing resistors, variable resistors, diodes and other non-ohmic devices
• describe energy transfers and transformations with reference to transducers.

Electrical safety
• model household electricity connections as a simple circuit comprising fuses, switches, circuit breakers, loads and earth
• compare the operation of safety devices including fuses, circuit breakers and residual current devices (RCDs)
• describe the causes, effects and treatment of electric shock in homes and identify the approximate danger thresholds for current and duration.

Area of Study 3

What is matter and how is it formed?

In this area of study students explore the nature of matter, and consider the origins of atoms, time and space. They examine the currently accepted theory of what constitutes the nucleus, the forces within the nucleus and how energy is derived from the nucleus.

Outcome 3

On completion of this unit the student should be able explain the origins of atoms, the nature of subatomic particles and how energy can be produced by atoms.

To achieve this outcome the student will draw on key knowledge outlined in Area of Study 3 and the related key science skills on pages 11 and 12 of the study design.

Key knowledge
Origins of atoms
• describe the Big Bang as a currently held theory that explains the origins of the Universe
• describe the origins of both time and space with reference to the Big Bang Theory
• explain the changing Universe over time due to expansion and cooling
• apply scientific notation to quantify and compare the large ranges of magnitudes of time, distance, temperature and mass considered when investigating the Universe
• explain the change of matter in the stages of the development of the Universe including inflation, elementary particle formation, annihilation of anti-matter and matter, commencement of nuclear fusion, cessation of fusion and the formation of atoms.

Particles in the nucleus
• explain nuclear stability with reference to the forces that operate over very small distances
• describe the radioactive decay of unstable nuclei with reference to half-life
• model radioactive decay as random decay with a particular half-life, including mathematical modelling with reference to whole half-lives
• apply a simple particle model of the atomic nucleus to explain the origin of α, β_-, β_+ and γ radiation, including changes to the number of nucleons
• explain nuclear transformations using decay equations involving α, β_-, β_+ and γ radiation
• analyse decay series diagrams with reference to type of decay and stability of isotopes

• relate predictions to the subsequent discoveries of the neutron, neutrino, positron and Higgs boson
• describe quarks as components of subatomic particles
• distinguish between the two types of forces holding the nucleus together: the strong nuclear force and the weak nuclear force
• compare the nature of leptons, hadrons, mesons and baryons
• explain that for every elementary matter particle there exists an antimatter particle of equal mass and opposite charge, and that if a particle and its antiparticle come into contact they will annihilate each other to create radiation.

Energy from the atom

• explain nuclear energy as energy resulting from the conversion of mass: $E = mc^2$
• compare the processes of nuclear fusion and nuclear fission
• explain, using a binding energy curve, why both fusion and fission are reactions that produce energy
• explain light as an electromagnetic wave that is produced by the acceleration of charges
• describe the production of synchrotron radiation by an electron radiating energy at a tangent to its circular path
• model the production of light as a result of electron transitions between energy levels within an atom.

Unit 2: What do experiments reveal about the physical world?

In this unit students explore the power of experiments in developing models and theories. They investigate a variety of phenomena by making their own observations and generating questions, which in turn lead to experiments. Students make direct observations of physics phenomena and examine the ways in which phenomena that may not be directly observable can be explored through indirect observations.

In the core component of this unit students investigate the ways in which forces are involved both in moving objects and in keeping objects stationary. Students choose one of twelve options related to astrobiology, astrophysics, bioelectricity, biomechanics, electronics, flight, medical physics, nuclear energy, nuclear physics, optics, sound and sports science. The option enables students to pursue an area of interest by investigating a selected question.

Students design and undertake investigations involving at least one independent, continuous variable. A student-designed practical investigation relates to content drawn from Area of Study 1 and/or Area of Study 2 and is undertaken in Area of Study 3.

Area of Study 1

How can motion be described and explained?

In this area of study students observe motion and explore the effects of balanced and unbalanced forces on motion. They analyse motion using concepts of energy, including energy transfers and transformations, and apply mathematical models during experimental investigations of motion. Students model how the mass of finite objects can be considered to be at a point called the centre of mass. They describe and analyse graphically, numerically and algebraically the motion of an object, using specific physics terminology and conventions.

Outcome 1

On completion of this unit the student should be able to investigate, analyse and mathematically model the motion of particles and bodies.

To achieve this outcome the student will draw on key knowledge outlined in Area of Study 1 and the related key science skills on pages 11 and 12 of the study design.

Key knowledge

Concepts used to model motion

- identify parameters of motion as vectors or scalars
- analyse graphically, numerically and algebraically, straight-line motion under constant acceleration:
- graphically analyse non-uniform motion in a straight line
- apply concepts of momentum to linear motion: $p = mv$.

Forces and motion

- explain changes in momentum as being caused by a net force: $F_{net}\Delta t=\Delta p$
- model the force due to gravity, F_g, as the force of gravity acting at the centre of mass of a body, $F_g = mg$, where g is the gravitational field strength ($9.8\ N\ kg^{-1}$ near the surface of Earth)
- model forces as vectors acting at the point of application (with magnitude and direction), labelling these forces using the convention 'force on A by B' or $F_{\text{on A by B}} = -F_{\text{on B by A}}$
- apply Newton's three laws of motion to a body on which forces act: $F_{net}=ma$, $F_{\text{on A by B}} = -F_{\text{on B by A}}$
- apply the vector model of forces, including vector addition and components of forces, to readily observable forces including the force due to gravity, friction and reaction forces
- calculate torque: $F=r\ \tau_{\perp}$
- investigate and analyse theoretically and practically translational forces and torques in simple structures that are in rotational equilibrium.

Energy and motion

- apply the concept of work done by a constant force using:
  - —work done = constant force × distance moved in direction of force: $W = Fs$
  - —work done = area under force-distance graph
- investigate and analyse theoretically and practically Hooke's Law for an ideal spring: $F = -k\Delta x$
- analyse and model mechanical energy transfers and transformations using energy conservation:
  - —changes in gravitational potential energy near Earth's surface: $E_g = mg\Delta h$
  - —potential energy in ideal springs: $_{212s}Ekx=\Delta$
  - —kinetic energy:
- analyse rate of energy transfer using power: $EPt=$
- calculate the efficiency of an energy transfer system:
- analyse impulse (momentum transfer) in an isolated system (for collisions between objects moving in a straight line): $I = \Delta p$
- investigate and analyse theoretically and practically momentum conservation in one dimension.

Area of Study 2

Options

Twelve options are available for selection in Area of Study 2. Each option is based on a different observation of the physical world. One option is to be selected by the student from the following:

- What are stars?
- How do instruments make music?
- How can performance in ball sports be improved?
- How does the human body use electricity?
- Is there life beyond Earth's Solar System?
- How do forces act on the human body?
- How can AC electricity charge a DC device?
- How do heavy things fly?
- How do fusion and fission compare as viable nuclear energy power sources?
- How is radiation used to maintain human health?
- How do particle accelerators work?
- How can human vision be enhanced?

Area of Study 3

Practical investigation

Systematic experimentation is an important aspect of physics inquiry. In this area of study students design and conduct a practical investigation related to knowledge and skills developed in Area of Study 1 and/or Area of Study 2.

The investigation requires the student to develop a question, plan a course of action that attempts to answer the question, undertake an investigation to collect the appropriate primary qualitative and/or quantitative data, organise and interpret the data, and reach a conclusion in response to the question. The student designs and undertakes an investigation involving two independent variables one of which should be a continuous variable. A practical logbook must be maintained by the student for recording, authentication and assessment purposes.

Outcome 3

On completion of this unit the student should be able to design and undertake an investigation of a physics question related to the scientific inquiry processes of data collection and analysis, and draw conclusions based on evidence from collected data.

To achieve this outcome the student will draw on key knowledge outlined in Area of Study 3 and the related key science skills on pages 11 and 12 of the study design.

Key knowledge

- the physics concepts specific to the investigation and their significance, including definitions of key terms, and physics representations
- the characteristics of scientific research methodologies and techniques of primary qualitative and quantitative data collection relevant to the selected investigation, including experiments (thermodynamics, construction of electric circuits, mechanics), and/or the evaluation of a device; precision, accuracy, reliability and validity of data; and identification of uncertainty
- identification and application of relevant health and safety guidelines
- methods of organising, analysing and evaluating primary data to identify patterns and relationships including sources of error and uncertainty, and limitations of data and methodologies
- observations and experiments that are consistent with, or challenge, current physics models or theories
- the nature of evidence that supports or refutes a hypothesis, model or theory
- the key findings of the selected investigation and their relationship to key physics concepts
- the conventions of scientific report writing including physics terminology and representations, symbols, equations and formulas, units of measurement, significant figures, standard abbreviations and acknowledgment of references.

Unit 1/2 Calendar

Term 1

Week 1		30/01/2018	31/01/2018	1/02/2018	2/02/2018
	Outcome 1 : Thermodynamic Principles				
		• convert temperature between degrees Celsius and kelvin • describe the Zeroth Law of Thermodynamics as two bodies in contact with each other coming to a thermal equilibrium • describe temperature with reference to the average kinetic energy of the atoms and molecules within a system			
Week 2	5/02/2018	6/02/2018	7/02/2018	8/02/2018	9/02/2018
	Thermodynamic Principles				
	• investigate and apply theoretically and practically the First Law of Thermodynamics to simple situations: Q = U + W • explain internal energy as the energy associated with random disordered motion of molecules • distinguish between conduction, convection and radiation with reference to heat transfers within and between systems				
Week 3	12/02/2018	13/02/2018	14/02/2018	15/02/2018	16/02/2018
	Thermodynamic Principles				
	• investigate and analyse theoretically and practically the energy required to: – raise the temperature of a substance: Q = mcΔT – change the state of a substance: Q = mL • explain why cooling results from evaporation using a simple kinetic energy model.			SAC Revision	SAC 1
Week 4	19/02/2018	20/02/2018	21/02/2018	22/02/2018	23/02/2018
	Thermodynamics and Climate Science				
	• identify regions of the electromagnetic spectrum as radio, microwave, infrared, visible, ultraviolet, x-ray and gamma waves • describe electromagnetic radiation emitted from the Sun as mainly ultraviolet, visible and infrared • calculate the peak wavelength of the re-radiated electromagnetic radiation from Earth using Wien's Law: λmaxT = constant • compare the total energy across the electromagnetic spectrum emitted by objects at different temperatures such as the Sun				
Week 5	26/02/2018	27/02/2018	28/02/2018	1/03/2018	2/03/2018
	Thermodynamics and Climate Science				
	• describe power radiated by a body as being dependent on the temperature of the body according to the Stefan-Boltzmann Law, 4 P T ∝ • explain the roles of conduction, convection and radiation in moving heat around in Earth's mantle (tectonic movement) and atmosphere (weather) • model the greenhouse effect as the flow and retention of thermal energy from the Sun, Earth's surface and Earth's atmosphere				
Week 6	5/03/2018	6/03/2018	7/03/2018	8/03/2018	9/03/2018
	Thermodynamics and Climate Science				
	• explain how greenhouse gases in the atmosphere (including methane, water and carbon dioxide) absorb and re-emit infrared radiation • analyse changes in the thermal energy of the surface of Earth and of Earth's atmosphere • analyse the evidence for the influence of human activity in creating an enhanced greenhouse effect, including affecting surface materials and the balance of gases in the atmosphere.			SAC Revision	SAC 2
Week 7	12/03/2018	13/03/2018	14/03/2018	15/03/2018	16/03/2018
	Issues related to thermodynamics				
	• Presentation on the environmental impact of one of the following human activities: o Energy ratings of home appliances and fittings o Cooking alternatives				Presentation Submitted
Week 8	19/03/2018	20/03/2018	21/03/2018	22/03/2018	23/03/2018
	Outcome 2: Concepts used to model electricity				
	• apply concepts of charge (Q), electric current (I), potential difference (V), energy (E) and power (P), in electric circuits • explore different analogies used to describe electric current and potential difference • investigate and analyse theoretically and practically electric circuits using the relationships: I=Q/t, V=E/Q, P=E/t=VI • justify the use of selected meters (ammeter, voltmeter, multimeter) in circuits • apply the kilowatt-hour (kW h) as a unit of energy.				
Week 9	26/03/2018	27/03/2018	28/03/2018	29/03/2018	30/03/2018
	Circuit Electricity				
	• model resistance in series and parallel circuits using – current versus potential difference (I–V) graphs – resistance as the potential difference to current ratio, including R = constant for ohmic devices – equivalent effective resistance in arrangements in • series: RT = R1 + R2 + ... + Rn and • parallel: 1/Rt=1/R1+1/R2+.....+1/Rn • calculate and analyse the effective resistance of circuits comprising parallel and series resistance and voltage dividers • model household (AC) electrical systems as simple direct current (DC) circuits				

<table>
<tr><td></td><td colspan="5">Term 2</td></tr>
<tr><td>Week 1</td><td>16/04/2018</td><td>17/04/2018</td><td>18/04/2018</td><td>19/04/2018</td><td>20/04/2018</td></tr>
<tr><td></td><td colspan="5">Circuit Electricity; Electrical Safety</td></tr>
<tr><td></td><td colspan="5">• compare power transfers in series and parallel circuits
• explain why the circuits in homes are mostly parallel circuits.
• model household electricity connections as a simple circuit comprising fuses, switches, circuit breakers, loads and earth
• compare the operation of safety devices including fuses, circuit breakers and residual current devices (RCDs)
• describe the causes, effects and treatment of electric shock in homes and identify the approximate danger thresholds for current and duration.</td></tr>
<tr><td>Week 2</td><td>23/04/2018</td><td>24/04/2018</td><td>25/04/2018</td><td>26/04/2018</td><td>27/04/2018</td></tr>
<tr><td></td><td colspan="5">Using Electricity</td></tr>
<tr><td></td><td>SAC Revision</td><td>SAC</td><td colspan="3">Students investigate and apply theoretically and practically concepts of current, resistance, potential difference of one of the following components:
light bulbs, diodes, thermistors, light dependent resistors (LDRs), light-emitting diodes (LEDs) and potentiometers (quantitative analysis restricted touse of V=IR and P=VI)</td></tr>
<tr><td>Week 3</td><td>30/04/2018</td><td>1/05/2018</td><td>2/05/2018</td><td>3/05/2018</td><td>4/05/2018</td></tr>
<tr><td></td><td colspan="3"></td><td colspan="2">Outcome 3: Particles of the Nucleus Part 1</td></tr>
<tr><td></td><td colspan="3">Students to write up investigation using poster format and submitted.</td><td colspan="2">• distinguish between the two types of forces holding the nucleus together: the strong nuclear force and the weak nuclear force
• explain nuclear stability with reference to the forces that operate over very small distances
• describe the radioactive decay of unstable nuclei with reference to half-life
• model radioactive decay as random decay with a particular half-life, including mathematical modelling with reference to whole half-lives</td></tr>
<tr><td>Week 4</td><td>7/05/2018</td><td>8/05/2018</td><td>9/05/2018</td><td>10/05/2018</td><td>11/05/2018</td></tr>
<tr><td></td><td colspan="5">Particles of the Nucleus Part 1; Energy of the Nucleus</td></tr>
<tr><td></td><td colspan="5">• apply a simple particle model of the atomic nucleus to explain the origin of α, β-, β+ and γ radiation, including changes to the number of nucleons
• explain nuclear transformations using decay equations involving α, β-, β+ and γ radiation
• analyse decay series diagrams with reference to type of decay and stability of isotopes
• explain nuclear energy as energy resulting from the conversion of mass: E = mc2
• compare the processes of nuclear fusion and nuclear fission
• explain, using a binding energy curve, why both fusion and fission are reactions that produce energy</td></tr>
<tr><td>Week 5</td><td>14/05/2018</td><td>15/05/2018</td><td>16/05/2018</td><td>17/05/2018</td><td>18/05/2018</td></tr>
<tr><td></td><td colspan="2"></td><td colspan="3">Energy of the Nucleus; Particles of the Nucleus Part 2</td></tr>
<tr><td></td><td>SAC Revision</td><td>SAC</td><td colspan="3">• explain light as an electromagnetic wave that is produced by the acceleration of charges
• describe the production of synchrotron radiation by an electron radiating energy at a tangent to its circular path
• model the production of light as a result of electron transitions between energy levels within an atom.</td></tr>
<tr><td>Week 6</td><td>21/05/2018</td><td>22/05/2018</td><td>23/05/2018</td><td>24/05/2018</td><td>25/05/2018</td></tr>
<tr><td></td><td colspan="5">Particles of the Nucleus Part 2</td></tr>
<tr><td></td><td colspan="5">• relate predictions to the subsequent discoveries of the neutron, neutrino, positron and Higgs boson
• describe quarks as components of subatomic particles
• distinguish between the two types of forces holding the nucleus together: the strong nuclear force and the weak nuclear force
• compare the nature of leptons, hadrons, mesons and baryons
• explain that for every elementary matter particle there exists an antimatter particle of equal mass and opposite charge, and that if a particle and its antiparticle come into contact they will annihilate each other to create radiation.</td></tr>
<tr><td>Week 7</td><td>28/05/2018</td><td>29/05/2018</td><td>30/05/2018</td><td>31/05/2018</td><td>1/06/2018</td></tr>
<tr><td></td><td colspan="5"></td></tr>
<tr><td></td><td>SAC Revision</td><td>SAC</td><td colspan="3">EXAM REVISION</td></tr>
<tr><td>Week 8</td><td>4/06/2018</td><td>5/06/2018</td><td>6/06/2018</td><td>7/06/2018</td><td>8/06/2018</td></tr>
<tr><td></td><td colspan="2">EXAM REVISION</td><td colspan="3">EXAMS</td></tr>
<tr><td>Week 9</td><td>11/06/2018</td><td>12/06/2018</td><td>13/06/2018</td><td>14/06/2018</td><td>15/06/2018</td></tr>
<tr><td></td><td colspan="4">EXAMS</td><td>Report Writing Day</td></tr>
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	SEMESTER 2				
Week 10	18/06/2018	19/06/2018	20/06/2018	21/06/2018	22/06/2018
	Unit 2: AOS 1: How can Motion be described and Explained (Concepts used to model motion)				
	• identify parameters of motion as vectors or scalars • graphically analyse non-uniform motion in a straight line • apply concepts of momentum to linear motion: p = mv.				
Week 11	25/06/2018	26/06/2018	27/06/2018	28/06/2018	29/06/2018
	Concepts used to model motion				
	• analyse graphically, numerically and algebraically, straight-line motion under constant acceleration:v=u+at, v2=u2+2as, s=0.5(u+v)t, s=ut+0.5at2, s=vt-0.5at2				

	Term 3				
Week 1	16/07/2018	17/07/2018	18/07/2018	19/07/2018	20/07/2018
	Concepts used to model motion				
	• explain changes in momentum as being caused by a net force: net p F t Δ = Δ • model the force due to gravity, Fg , as the force of gravity acting at the centre of mass of a body, Fg = mg, where g is the gravitational field strength (9.8 N kg-1 near the surface of Earth)				
Week 2	23/07/2018	24/07/2018	25/07/2018	26/07/2018	27/07/2018
	Forces and Motion				
	• explain changes in momentum as being caused by a net force: Fnet= Δp / Δt • model the force due to gravity, Fg, as the force of gravity acting at the centre of mass of a body, Fg = mg, where g is the gravitational field strength (9.8 N kg-1 near the surface of Earth) • model forces as vectors acting at the point of application (with magnitude and direction), labelling these forces using the convention 'force on A by B' or Fon A by B = –Fon B by A				
Week 3	30/07/2018	31/07/2018	1/08/2018	2/08/2018	3/08/2018
	Forces and Motion				
	• apply Newton's three laws of motion to a body on which forces act: Fnet a m = , Fon A by B = –Fon B by A • apply the vector model of forces, including vector addition and components of forces, to readily observable forces including the force due to gravity, friction and reaction forces				
Week 4	6/08/2018	7/08/2018	8/08/2018	9/08/2018	10/08/2018
	Forces and Motion				
	• calculate torque: τ = r F⊥ • investigate and analyse theoretically and practically translational forces and torques in simple structures that are in rotational equilibrium.			SAC REVISION	SAC
Week 5	13/08/2018	14/08/2018	15/08/2018	16/08/2018	17/08/2018
	Energy and Motion				
	• apply the concept of work done by a constant force using: – work done = constant force × distance moved in direction of force: W = Fs – work done = area under force-distance graph • investigate and analyse theoretically and practically Hooke's Law for an ideal spring: F = –kΔx				
Week 6	20/08/2018	21/08/2018	22/08/2018	23/08/2018	24/08/2018
	Energy and Motion				
	• analyse and model mechanical energy transfers and transformations using energy conservation: – changes in gravitational potential energy near Earth's surface: Eg = mgΔh – potential energy in ideal springs: Es = 0.5kΔx – kinetic energy: Ek=0.5mv2				
Week 7	27/08/2018	28/08/2018	29/08/2018	30/08/2018	31/08/2018
	Energy and Motion				
	• analyse rate of energy transfer using power: E = P/t • calculate the efficiency of an energy transfer system: η = useful energy out / total energy in • analyse impulse (momentum transfer) in an isolated system (for collisions between objects moving in a straight line): I = Δp • investigate and analyse theoretically and practically momentum conservation in one dimension.				

Week 8	3/09/2018	4/09/2018	5/09/2018	6/09/2018	7/09/2018
	SAC REVISION	SAC	Introduce topics availability for AOS 3		
Week 9	10/09/2018	11/09/2018	12/09/2018	13/09/2018	14/09/2018
	Feasability study of practical investigation. Write assessment grid for Poster assessment				
Week 10	17/09/2018	18/09/2018	19/09/2018	20/09/2018	21/09/2018
	Assessment: 1 page abstract introduction for AOS 3				

	Term 4				
Week 1	8/10/2018	9/10/2018	10/10/2018	11/10/2018	12/10/2018
					INTRO SUBMITTED
Week 2	15/10/2018	16/10/2018	17/10/2018	18/10/2018	19/10/2018
	Outcome 3: Practical Investigation				
	Students to use their introduction from AOS 2 to conduct an investigation on 1 of the following topics: o What are stars? o How do forces act on the human body? o How do heavy things fly? o How do instruments make music?				
Week 3	22/10/2018	23/10/2018	24/10/2018	25/10/2018	26/10/2018
	PRACTICAL INVESTIGATION CONT.				
Week 4	29/10/2018	30/10/2018	31/10/2018	1/11/2018	2/11/2018
	STUDENTS TO START WORKING ON POSTER				
Week 5	5/11/2018	6/11/2018	7/11/2018	8/11/2018	9/11/2018
	POSTER SUBMITTED				
Week 6	12/11/2018	13/11/2018	14/11/2018	15/11/2018	16/11/2018
	EXAM REVISION				
Week 7	19/11/2018	20/11/2018	21/11/2018	22/11/2018	23/11/2018
	EXAMS				

Assessment

School Based Assessment:

Your marks will be generated from a series of School Assessed Coursework (SAC) tasks undertaken over the course of the year addressing the dot points within each Area of Study. You must be present for **ALL** SACs unless a valid medical certificate is provided. They will consist of several of the following types of tasks:

- Topic Tests
- Media Response
- Data Analysis
- Practical Analysis

SAC Dates

SAC dates are provided below but are able to be moved as required. This will be accompanied by written confirmation to be given to students.

Unit 1
Term 1 Week 3 AOS 1 SAC 1
Term 1 Week 7 AOS 1 SAC 2
Term 2 Week 2 AOS 2 SAC 1
Term 2 Week 3 AOS 2 SAC 2
Term 2 Week 5 AOS 3 SAC 1
Term 2 Week7 AOS 3 SAC 2
Unit 2
Term 3 Week 5 AOS 1 SAC 1
Tern 3 Week 8 AOS 1 SAC 2
Term 4 Week 5 AOS 3 SAC

Obtaining an S:

To obtain an 'S' you need to demonstrate understanding of the dot points during class time to be observed by your teacher. This can be achieved by class discussion and in class work that is your own e.g. textbook questions, practical activities and quizzes.

If this has not been observed prior to the SAC for the content you will be warned that you are at risk of an N and that you will need to demonstrate the knowledge on the SAC by achieving a mark >30%.

If this is still not achieved you will be given an 'N' and will have failed the Unit and Area of Study in question.

EXAM:

You will undertake an exam for Unit 1 and Unit 2.

Each exam consists of 10 minutes reading time and 90 minutes of writing time.

Permissable materials are pens, pencils, erasers, scientific calulators and rulers 1 double sided A4 summary sheet.

The Unit 1 exam covers Unit 1 AOS 1 & AOS 2

The Unit 2 exam covers Unit 1 AOS 3 & Unit 2 AOS 1