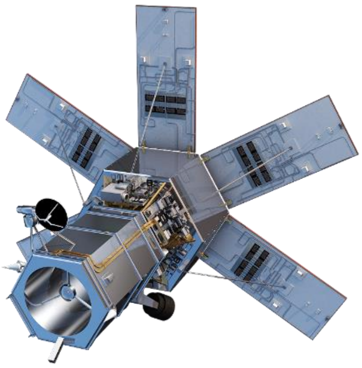
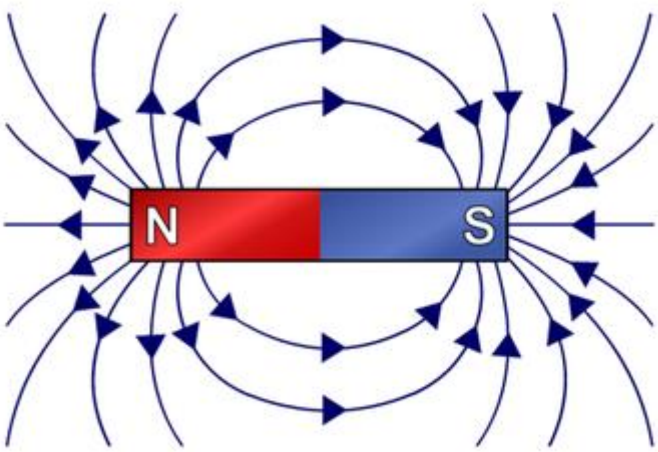
Unit 3 / 4 Physics Program





Unit 3: How do fields explain motion and electricity?

In this unit students explore the importance of energy in explaining and describing the physical world. They examine the production of electricity and its delivery to homes. Students consider the field model as a construct that has enabled an understanding of why objects move when they are not apparently in contact with other objects. Applications of concepts related to fields include the transmission of electricity over large distances and the design and operation of particle accelerators. They explore the interactions, effects and applications of gravitational, electric and magnetic fields. Students use Newton's laws to investigate motion in one and two dimensions, and are introduced to Einstein's theories to explain the motion of very fast objects. They consider how developing technologies can challenge existing explanations of the physical world, requiring a review of conceptual models and theories. Students design and undertake investigations involving at least two continuous independent variables.

Area of Study 1

How do things move without contact?

In this area of study students examine the similarities and differences between three fields: gravitational, electric and magnetic. Field models are used to explain the motion of objects when there is no apparent contact. Students explore how positions in fields determine the potential energy of an object and the force on an object. They investigate how concepts related to field models can be applied to construct motors, maintain satellite orbits and to accelerate particles.

Outcome 1

On completion of this unit the student should be able to analyse gravitational, electric and magnetic fields, and use these to explain the operation of motors and particle accelerators and the orbits of satellites.

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

Fields and interactions

- describe gravitation, magnetism and electricity using a field model
- investigate and compare theoretically and practically gravitational, magnetic and electric fields, including directions and shapes of fields, attractive and repulsive fields, and the existence of dipoles and monopoles
- investigate and compare theoretically and practically gravitational fields and electrical fields about a point mass or charge (positive or negative) with reference to:
  - –the direction of the field
  - –the shape of the field
  - –the use of the inverse square law to determine the magnitude of the field
  - –potential energy changes (qualitative) associated with a point mass or charge moving in the field
- investigate and apply theoretically and practically a vector field model to magnetic phenomena, including shapes and directions of fields produced by bar magnets, and by current-carrying wires, loops and solenoids
- identify fields as static or changing, and as uniform or non-uniform.

Effects of fields

- analyse the use of an electric field to accelerate a charge, including:
  - –electric field and electric force concepts:
  - –potential energy changes in a uniform electric field
  - –the magnitude of the force on a charged particle due to a uniform electric field:
- analyse the use of a magnetic field to change the path of a charged particle, including:
  - –the magnitude and direction of the force applied to an electron beam by a magnetic field: $F = qvB$, in cases where the directions of v and B are perpendicular or parallel
  - –the radius of the path followed by a low-velocity electron in a magnetic field: $_{2}mvqvBr=$
- analyse the use of gravitational fields to accelerate mass, including:
  - –gravitational field and gravitational force concepts:
  - –potential energy changes in a uniform gravitational field

––the change in gravitational potential energy from area under a force-distance graph and area under a field-distance graph multiplied by mass.

Application of field concepts

- apply the concepts of force due to gravity, F_g, and normal reaction force, F_N, including satellites in orbit where the orbits are assumed to be uniform and circular
- model satellite motion (artificial, Moon, planet) as uniform circular orbital motion:
- describe the interaction of two fields, allowing that electric charges, magnetic poles and current carrying conductors can either attract or repel, whereas masses only attract each other
- investigate and analyse theoretically and practically the force on a current carrying conductor due to an external magnetic field, , where the directions of I and B are either perpendicular or parallel to each other
- investigate and analyse theoretically and practically the operation of simple DC motors consisting of one coil, containing a number of loops of wire, which is free to rotate about an axis in a uniform magnetic field and including the use of a split ring commutator
- model the acceleration of particles in a particle accelerator (limited to linear acceleration by a uniform electric field and direction change by a uniform magnetic field).

Area of Study 2

How are fields used to move electrical energy?

The production, distribution and use of electricity has had a major impact on human lifestyles. In this area of study students use empirical evidence and models of electric, magnetic and electromagnetic effects to explain how electricity is produced and delivered to homes. They explore magnetic fields and the transformer as critical to the performance of electrical distribution systems.

Outcome 2

On completion of this unit the student should be able to analyse and evaluate an electricity generation and distribution system.
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

Generation of electricity

- calculate magnetic flux when the magnetic field is perpendicular to the area, and describe the qualitative effect of differing angles between the area and the field:
- investigate and analyse theoretically and practically the generation of electromotive force (emf) including AC voltage and calculations using induced emf:, with reference to:
  - ––rate of change of magnetic flux
  - ––number of loops through which the flux passes
  - ––direction of induced emf in a coil
- explain the production of DC voltage in DC generators and AC voltage in alternators, including the use of split ring commutators and slip rings respectively.

Transmission of electricity

- compare sinusoidal AC voltages produced as a result of the uniform rotation of a loop in a constant magnetic field with reference to frequency, period, amplitude, peak-to-peak voltage (V_{p-p}) and peak-to-peak current (I_{p-p})
- compare alternating voltage expressed as the root-mean-square (rms) to a constant DC voltage developing the same power in a resistive component
- convert between rms, peak and peak-to-peak values of voltage and current
- analyse transformer action with reference to electromagnetic induction for an ideal transformer:
- analyse the supply of power by considering transmission losses across transmission lines
- identify the advantage of the use of AC power as a domestic power supply.

Area of Study 3

How fast can things go?

In this area of study students use Newton's laws of motion to analyse relative motion, circular motion and projectile motion. Newton's laws of motion give important insights into a range of motion both on Earth and beyond. At very high speeds, however, these laws are insufficient to model motion and Einstein's theory of special relativity provides a better model. Students compare Newton's and Einstein's explanations of motion and evaluate the circumstances in which they can be applied. They explore the relationships between force, energy and mass.

Outcome 3

On completion of this unit the student should be able to investigate motion and related energy transformations experimentally, analyse motion using Newton's laws of motion in one and two dimensions, and explain the motion of objects moving at very large speeds using Einstein's theory of special relativity.
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

Newton's laws of motion

- investigate and apply theoretically and practically Newton's three laws of motion in situations where two or more coplanar forces act along a straight line and in two dimensions
- investigate and analyse theoretically and practically the uniform circular motion of an object moving in a horizontal plane: including:
  - –a vehicle moving around a circular road
  - –a vehicle moving around a banked track
  - –an object on the end of a string
- model natural and artificial satellite motion as uniform circular motion
- investigate and apply theoretically Newton's second law to circular motion in a vertical plane (forces at the highest and lowest positions only)
- investigate and analyse theoretically and practically the motion of projectiles near Earth's surface, including a qualitative description of the effects of air resistance
- investigate and apply theoretically and practically the laws of energy and momentum conservation in isolated systems in one dimension.

Einstein's theory of special relativity

- describe Einstein's two postulates for his theory of special relativity that:
  - –the laws of physics are the same in all inertial (non-accelerated) frames of reference
  - –the speed of light has a constant value for all observers regardless of their motion or the motion of the source
- compare Einstein's theory of special relativity with the principles of classical physics
- describe proper time (t_0) as the time interval between two events in a reference frame where the two events occur at the same point in space
- describe proper length (L_0) as the length that is measured in the frame of reference in which objects are at rest
- model mathematically time dilation and length contraction at speeds approaching c using the equations
- explain why muons can reach Earth even though their half-lives would suggest that they should decay in the outer atmosphere.

Relationships between force, energy and mass

- investigate and analyse theoretically and practically impulse in an isolated system for collisions between objects moving in a straight line: $F\Delta t = m\Delta v$
- investigate and apply theoretically and practically the concept of work done by a constant force using:
  - –work done = constant force × distance moved in direction of net force
  - –work done = area under force-distance graph
- analyse transformations of energy between kinetic energy, strain potential energy, gravitational potential energy and energy dissipated to the environment (considered as a combination of heat, sound and deformation of material):
  - –kinetic energy at low speeds: $_{2}12_{k}Emv=$; elastic and inelastic collisions with reference to conservation of kinetic energy
  - –strain potential energy: area under force-distance graph including ideal springs obeying Hooke's Law: $_{2}12_{s}Ekx=\Delta$
  - –gravitational potential energy: $E_g = mg\Delta h$ or from area under a force-distance graph and area under a field-distance graph multiplied by mass
- interpret Einstein's prediction by showing that the total 'mass-energy' of an object is given by: $E_{tot} = E_k + E_0 = \gamma mc^2$ where $E_0 = mc^2$, and where kinetic energy can be calculated by: $E_k = (\gamma - 1)mc^2$

• describe how matter is converted to energy by nuclear fusion in the Sun, which leads to its mass decreasing and the emission of electromagnetic radiation.

Unit 4: How can two contradictory models explain both light and matter?

A complex interplay exists between theory and experiment in generating models to explain natural phenomena including light. Wave theory has classically been used to explain phenomena related to light; however, continued exploration of light and matter has revealed the particle-like properties of light. On very small scales, light and matter – which initially seem to be quite different – have been observed as having similar properties.

In this unit, students explore the use of wave and particle theories to model the properties of light and matter. They examine how the concept of the wave is used to explain the nature of light and explore its limitations in describing light behaviour. Students further investigate light by using a particle model to explain its behaviour. A wave model is also used to explain the behaviour of matter which enables students to consider the relationship between light and matter. Students learn to think beyond the concepts experienced in everyday life to study the physical world from a new perspective. Students design and undertake investigations involving at least two continuous independent variables.

A student-designed practical investigation related to waves, fields or motion is undertaken either in Unit 3 or Unit 4, or across both Unit 3 and Unit 4, and is assessed in Unit 4, Outcome 3. The findings of the investigation are presented in a scientific poster format as outlined in the template on page 13.

Area of Study 1

How can waves explain the behaviour of light?

In this area of study students use evidence from experiments to explore wave concepts in a variety of applications. Wave theory has been used to describe transfers of energy, and is important in explaining phenomena including reflection, refraction, interference and polarisation. Do waves need a medium in order to propagate and, if so, what is the medium? Students investigate the properties of mechanical waves and examine the evidence suggesting that light is a wave. They apply quantitative models to explore how light changes direction, including reflection, refraction, colour dispersion and polarisation.

Outcome 1

On completion of this unit the student should be able to apply wave concepts to analyse, interpret and explain the behaviour of light.

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

Properties of mechanical waves

- explain a wave as the transmission of energy through a medium without the net transfer of matter
- distinguish between transverse and longitudinal waves
- identify the amplitude, wavelength, period and frequency of waves
- calculate the wavelength, frequency, period and speed of travel of waves using:
- investigate and analyse theoretically and practically constructive and destructive interference from two sources with reference to coherent waves and path difference
- explain qualitatively the Doppler effect
- explain resonance as the superposition of a travelling wave and its reflection, and with reference to a forced oscillation matching the natural frequency of vibration
- analyse the formation of standing waves in strings fixed at one or both ends
- investigate and explain theoretically and practically diffraction as the directional spread of various frequencies with reference to different gap width or obstacle size, including the qualitative effect of changing the $w\lambda$ ratio.

Light as a wave

- describe light as an electromagnetic wave which is produced by the acceleration of charges, which in turn produces changing electric fields and associated changing magnetic fields
- identify that all electromagnetic waves travel at the same speed, c, in a vacuum
- compare the wavelength and frequencies of different regions of the electromagnetic spectrum, including radio, microwave, infrared, visible, ultraviolet, x-ray and gamma, and identify the distinct uses each has in society

• explain polarisation of visible light and its relation to a transverse wave model
• investigate and analyse theoretically and practically the behaviour of waves including:
  – refraction using Snell's Law: $n_1 \sin(\theta_1) = n_2 \sin(\theta_2)$ and $n_1 v_1 = n_2 v_2$
  – total internal reflection and critical angle including applications: $n_1 \sin(\theta_c) = n_2 \sin(90°)$
• investigate and explain theoretically and practically colour dispersion in prisms and lenses with reference to refraction of the components of white light as they pass from one medium to another
• explain the results of Young's double slit experiment with reference to:
  – evidence for the wave-like nature of light
  – constructive and destructive interference of coherent waves in terms of path differences: $n\lambda$ and 12nλ⍰⍰−⍰⍰⍰⍰ respectively
  – effect of wavelength, distance of screen and slit separation on interference patterns: Ldxλ∆=

Area of Study 2

How are light and matter similar?

In this area of study students explore the design of major experiments that have led to the development of theories to describe the most fundamental aspects of the physical world – light and matter.

When light and matter are probed they appear to have remarkable similarities. Light, which was previously described as an electromagnetic wave, appears to exhibit both wave-like and particle-like properties. Findings that electrons behave in a wave-like manner challenged thinking about the relationship between light and matter, where matter had been modelled previously as being made up of particles.

Outcome 2

On completion of this unit the student should be able to provide evidence for the nature of light and matter, and analyse the data from experiments that supports this evidence.

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

Behaviour of light

• investigate and describe theoretically and practically the effects of varying the width of a gap or diameter of an obstacle on the diffraction pattern produced by light and apply this to limitations of imaging using light
• analyse the photoelectric effect with reference to:
  – evidence for the particle-like nature of light
  – experimental data in the form of graphs of photocurrent versus electrode potential, and of kinetic energy of electrons versus frequency
  – kinetic energy of emitted photoelectrons: $E_{k\,max} = hf - \varphi$, using energy units of joule and electron-volt
  – effects of intensity of incident irradiation on the emission of photoelectrons
• describe the limitation of the wave model of light in explaining experimental results related to the photoelectric effect.

Matter as particles or waves

• interpret electron diffraction patterns as evidence for the wave-like nature of matter
• distinguish between the diffraction patterns produced by photons and electrons
• calculate the de Broglie wavelength of matter: hpλ=.

Similarities between light and matter

• compare the momentum of photons and of matter of the same wavelength including calculations using: hpλ=
• explain the production of atomic absorption and emission line spectra, including those from metal vapour lamps
• interpret spectra and calculate the energy of absorbed or emitted photons: $\Delta E = hf$
• analyse the absorption of photons by atoms, with reference to:
  – the change in energy levels of the atom due to electrons changing state
  – the frequency and wavelength of emitted photons: $hcEhf$λ==
• describe the quantised states of the atom with reference to electrons forming standing waves, and explain this as evidence for the dual nature of matter
• interpret the single photon/electron double slit experiment as evidence for the dual nature of light/matter
• explain how diffraction from a single slit experiment can be used to illustrate Heisenberg's uncertainty principle
• explain why classical laws of physics are not appropriate to model motion at very small scales.

Production of light from matter

• compare the production of light in lasers, synchrotrons, LEDs and incandescent lights.

Area of Study 3

Practical investigation

A student-designed practical investigation related to waves, fields or motion is undertaken either in Unit 3 or Unit 4, or across both Units 3 and 4. The investigation relates to knowledge and skills developed across Units 3 and 4 and is undertaken by the student through practical work.

The investigation requires the student to develop a question, formulate a hypothesis and plan a course of action to answer the question and that complies with safety and ethical guidelines. Students then undertake an experiment that involves the collection of primary quantitative data, analyse and evaluate the data, identify limitations of data and methods, link experimental results to science ideas, reach a conclusion in response to the question and suggest further investigations that may be undertaken. The student is expected to design and undertake an investigation involving two continuous independent variables. Results are communicated in a scientific poster format according to the template provided on page 13. A practical logbook must be maintained by the student for record, authentication and assessment purposes.

Outcome 3

On completion of this unit the student should be able to design and undertake a practical investigation related to waves or fields or motion, and present methodologies, findings and conclusions in a scientific poster.

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

• independent, dependent and controlled variables

• 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 (gravity, magnetism, electricity, Newton's laws of motion, waves) and/or the construction and evaluation of a device; precision, accuracy, reliability and validity of data; and the identification of, and distinction between, uncertainty and error

• 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 uncertainty and error, and limitations of data and methodologies

• models and theories, and their use in organising and understanding observed phenomena and physics concepts including their limitations

• the nature of evidence that supports or refutes a hypothesis, model or theory

• the key findings of the selected investigation and their relationship to concepts associated with waves, fields and/or motion

• the conventions of scientific report writing and scientific poster presentation, including physics terminology and representations, symbols, equations and formulas, units of measurement, significant figures, standard abbreviations and acknowledgment of references.

2018 Unit 3/4 Physics Calendar

Orientation week	Unit 3 AOS 3: Newton's Laws of Motion			
4/12/2017	5/12/2017	6/12/2017	7/12/2017	8/12/2017
Going over exam, VCAA Process	Unit 2 Motion Revision	5.1 Newton's Laws		Set Holiday Homework

Term 1				
Week 1	Unit 3 AOS 3: Newton's Laws of Motion			
29/01/2018	30/01/2018	31/01/2018	1/02/2018	2/02/2018
	5.5 Horizontal Projection			5.6 Oblique Projectile Motion
Week 2	Unit 3 AOS 3: Newton's Laws of Motion			
5/02/2018	6/02/2018	7/02/2018	8/02/2018	9/02/2018
Projectile Motion Quiz. 5.2	5.3 Circular motion on banked tracks	5.4 Circular motion in a vertical plane		Circular motion quiz
Week 3	Unit 3 AOS 3: Relationships between force, energy and mass			
12/02/2018	13/02/2018	14/02/2018	15/02/2018	16/02/2018
7.1-7.2 Impulse Momentum	Conservation of energy 5.6, 7.3	House Swimming Sports		7.4 Work Done
Week 4	Unit 3 AOS 3: Relationships between force, energy and mass			
19/02/2018	20/02/2018	21/02/2018	22/02/2018	23/02/2018
Conservation of Energy Quiz	Revision	Practise SAC		Topic Test Chapter 5 & 7
Week 5	Unit 3 AOS 1: All key knowledge			
26/02/2018	27/02/2018	28/02/2018	1/03/2018	2/03/2018
1.1 Newton Universal Gravitation	1.2 Gravitational Field Strength	1.3 Work in a Gravitational Field		Gravitational Fields Quiz 3.1
Week 6	Unit 3 AOS 1: All key knowledge			
5/03/2018	6/03/2018	7/03/2018	8/03/2018	9/03/2018
2.1 Electric Fields	2.2 Coulombs Law			2.3 Magnetic Fields. Basic Pracs
Week 7	Unit 3 AOS 1: All key knowledge			
12/03/2018	13/03/2018	14/03/2018	15/03/2018	16/03/2018
Labour Day	2.4 Forces on charged objects	2.5 Summary of Fields		3.2 DC Motors
Week 8	Unit 3 AOS 1: All key knowledge			
19/03/2018	20/03/2018	21/03/2018	22/03/2018	23/03/2018
	House Athletics Carnival	3.3 Particle Accelerators		Fields Quiz
Week 9	Unit 3 AOS 1: All key knowledge			
26/03/2018	27/03/2018	28/03/2018	29/03/2018	30/03/2018
Revision	Practise SAC	Parent Teacher Interviews	Topic Test Chapter 1& 2	Good Friday

Term 2				
Week 1				
16/04/2018	17/04/2018	18/04/2018	19/04/2018	20/04/2018
4.1 Inducing an EMF in a magnetic field	4.2 Induced EMF from a changing mag. Flux	4.3 Lenz's Law		4.3 AC and DC Generators RMS
Week 2				
23/04/2018	24/04/2018	25/04/2018	26/04/2018	27/04/2018
Lenz's Law Quiz		ANZAC Day		4.4 Transformers and power distribution
Week 3				
30/04/2018	1/05/2018	2/05/2018	3/05/2018	4/05/2018
Transformers Quiz	Revision	Practise SAC		Topic Test Ch. 4
Week 4				
7/05/2018	8/05/2018	9/05/2018	10/05/2018	11/05/2018
Practical SAC	Practical Writeup	6.1 Einstein Special Relativity		
Week 5				
14/05/2018	15/05/2018	16/05/2018	17/05/2018	18/05/2018
6.2 Time Dilation		6.3 Length Contraction		7.5 Einstein Mass-Energy Relationship
Week 6				
21/05/2018	22/05/2018	23/05/2018	24/05/2018	25/05/2018
Revision	Practice SAC	Media Response SAC		
Week 7				
28/05/2018	29/05/2018	30/05/2018	31/05/2018	1/06/2018
Mop-Up Week.				Unit 3 Revision
Week 8				
4/06/2018	5/06/2018	6/06/2018	7/06/2018	8/06/2018
Unit 3 Revision	Unit 3 Practice Exam			
Week 9				
11/06/2018	12/06/2018	13/06/2018	14/06/2018	15/06/2018
Queen's Birthday	Start Unit 4. Ch 8.1 L & T Waves	Year 12 GAT	Ripple Tank	Report Writing Day
Week 10				
18/06/2018	19/06/2018	20/06/2018	21/06/2018	22/06/2018
Ch 8.2 Wave properties		8.3 Wave Interactions		8.4 Resonance
Week 11				
25/06/2018	26/06/2018	27/06/2018	28/06/2018	29/06/2018
Resonance Prac	Resonance Writeup	9.1 Light as a wave		E.I Intro. Accuracy, Precision Error,Topics

Term 3				
Week 1				
16/07/2018	17/07/2018	18/07/2018	19/07/2018	20/07/2018
9.2 Interference of light		Light as a wave Quiz		Electromagnetic Spectrum
Week 2				
23/07/2018	24/07/2018	25/07/2018	26/07/2018	27/07/2018
Practical SAC	Writeup			10.2 Photoelectric Effect
Week 3				
30/07/2018	31/07/2018	1/08/2018	2/08/2018	3/08/2018
	10.2 Quantum nature of light and matter			10.3 Light and Matter
Week 4				
6/08/2018	7/08/2018	8/08/2018	9/08/2018	10/08/2018
		10.3 Comparing different light sources		10.4 Heisenberg Uncertainty Principle
Week 5				
13/08/2018	14/08/2018	15/08/2018	16/08/2018	17/08/2018
Ch 10 Quiz. Revision	Practise SAC	Data Analysis SAC		E.I Topic Submitted
Week 6				
20/08/2018	21/08/2018	22/08/2018	23/08/2018	24/08/2018
Curriculum Day	E.I Research and Design			
Week 7				
27/08/2018	28/08/2018	29/08/2018	30/08/2018	31/08/2018
				E.I Poster Submitted
Week 8				
3/09/2018	4/09/2018	5/09/2018	6/09/2018	7/09/2018
EXAM Revision	Practice Exam	EXAM Revision		EXAM Revision
Week 9				
10/09/2018	11/09/2018	12/09/2018	13/09/2018	14/09/2018
EXAM Revision	Practice Exam	EXAM Revision		EXAM Revision
Week 10				
17/09/2018	18/09/2018	19/09/2018	20/09/2018	21/09/2018
EXAM Revision	EXAM Revision	7-11 Parent Teacher Interviews		

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

This will be used to contribute to your overall mark and generate your study score in Physics. Your SAC contributes 40% of your mark for your study score with the remaining 60% coming from your exam. Unit 3 will contribute 19% with Unit 4 contributing 21% of your final mark.

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 3
Term 1 Week 4 AOS 3 SAC 1
Term 1 Week 9 AOS 1 SAC
Term 2 Week 4 AOS 2 SAC
Term 2 Week 6 AOS 3 SAC 2
Unit 4
Term 3 Week 2 AOS 1 SAC
Tern 3 Week 5 AOS 2 SAC
Term 3 Week 7 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 be removed from the course.

EXAM:

The final exam consists of a written 2.5 hour exam with 15 minutes reading time. You are allowed : scientific calculator, pens, pencils, rulers and erasers.

Whiteout and correction tape is explicitly prohibited.

The exam consists of 20 multiple choice questions worth 1 mark each and short answer and extended response totalling 110 marks.

The multiple choice is to be completed in pencil and the short answer and extended response section in blue or black pen. Due to the nature of the marking process **DO NOT** answer the short answer and extended response section in pencil or erasable pens.

Unit 3/4 Physics Homework Checklist

	Checkpoints 2017 Questions
Orientation	Chapter 2 Q 1, 4, 6, 8, 12, 13, 14a, 14b, 19, 21, 22, 23, 24, 25, 26, 27, 29

TERM 1

Week 1	Chapter 5 Q 1, 5, 6, 14, 15, 18, 22, 24, 26, 27
Week 2	Chapter 6 Q 2, 3, 5, 12, 14, 20, 21, 22, 23, 27, 28
Week 3	Chapter 4 Q 3, 4, 5, 6, 7, 9, 10, 14, 17, 21, 23, 26
Week 4	Chapter 3 Q 1, 5, 6, 7, 8, 9, 13, 23, 24, 25, 26, 29
Week 5	Chapter 9 Q 3, 4, 7, 8, 11, 17, 19, 25, 26, 28, 32
Week 6	Chapter 8 Q 13, 14, 15, 16, 20. Chapter 10 Q 3, 7, 12, 13, 19, 20
Week 7	Chapter 11 Q 1, 5, 6, 7, 8, 11, 15, 21, 25. Chapter 12 Q 10, 14, 15, 16, 17
Week 8	MOP UP
Week 9	MOP UP

TERM 2

Week 1	Chapter 13 1, 3, 7, 10, 11, 12, 13, 14, 15
Week 2	Chapter 13 Q 16, 17, 19, 20, 21, 23, 24, 25, 28, 30
Week 3	Chapter 14 Q 1, 5, 7, 10, 12, 14, 15, 17, 18, 20, 22, 25
Week 4	Chapter 7 Q 1, 4, 7, 8, 10, 13, 14, 15, 16, 20, 21, 22, 25
Week 5	Chapter 7 Q 31, 32, 36, 37, 39, 41, 42, 48, 52,58
Week 6	MOP-UP
Week 7	Revision
Week 8	Revision
Week 9	Chapter 15 Q 1, 3, 4, 5, 15, 20, 23, 26, 29, 32, 35, 45
Week 10	MOP-UP
Week 11	Chapter 16 Q 1, 3, 6, 7, 8, 14, 20, 24, 28, 30, 32, 38

TERM 3

Week 1	Chapter 17 Q 1, 6, 7, 9, 10, 12, 16, 22, 23, 24, 28, 32, 35, 36, 39, 41
Week 2	MOP-UP
Week 3	Chapter 18 Q 2, 4, 8, 9, 13, 18, 20, 21, 22, 24, 26
Week 4	Chapter 19 Q 2, 10, 16, 18, 22, 27 Chapter 20 Q 1, 2, 10, 13, 15, 18, 21
Week 5	MOP-UP