A LEVEL PHYSICS

	HALF TERM 1	HALF TERM 2	HALF TERM 3	HALF TERM 4	HALF TERM 5	HALF TERM 6
KNOWLEDGE	**3.6 Further mechanics and thermal physics;** The earlier study of mechanics is further advanced through a consideration of circular motion and simple harmonic motion (the harmonic oscillator). A further section allows the thermal properties of materials, the properties and nature of ideal gases, and the molecular kinetic theory to be studied in depth.	**3.7 Fields and their consequences;** The concept of field is one of the great unifying ideas in physics. The ideas of gravitation, electrostatics and magnetic field theory are developed within the topic to emphasise this unification. Many ideas from mechanics and electricity from earlier in the course support this and are further developed. Practical applications considered include: planetary and satellite orbits, capacitance and capacitors, their charge and discharge through resistors, and electromagnetic induction. These topics have considerable impact on modern society.	**3.8 Nuclear physics;** This section builds on the work of Particles and radiation to link the properties of the nucleus to the production of nuclear power through the characteristics of the nucleus, the properties of unstable nuclei, and the link between energy and mass. Students should become aware of the physics that underpins nuclear energy production and also of the impact that it can have on society	**3.11 Engineering physics;** This option offers opportunities for students to reinforce and extend the work of core units by considering applications in areas of engineering and technology. It extends the student's understanding in areas of rotational dynamics and thermodynamics. The emphasis in this option is on an understanding of the concepts and the application of physics. Questions can be set in novel or unfamiliar contexts, but in such cases the scene is set and any relevant required information is given.		**Revision of all units** **A Level Exams (May/June)**
	3.6.1 Periodic motion **3.6.2 Thermal physics**	**3.7.1 Fields** **3.7.2 Gravitational fields** **3.7.3 Electric fields** **3.7.4 Capacitance** **3.7.5 Magnetic fields**	**3.8.1 Radioactivity**	**3.11.1 Rotational dynamics** **3.11.2 Thermodynamics and engines**	**AS Revision:** **3.1 Measurements and their errors** **3.2 Particles and radiation** **3.3 Waves** **3.4 Mechanics and materials** **3.5 Electricity**	
	Students should be able to: • understand that the gas laws are empirical in nature whereas the kinetic theory model arises from theory.	Students should be able to: • recognise that a force field can be represented as a vector, the direction of which must be determined by inspection. • describe the action of a simple polar molecule that rotates in the presence of an electric field.	Students should be able to: • be familiar with the Coulomb equation for the closest approach estimate • d be familiar with the graph of intensity against angle for electron diffraction by a nucleus • identify, on the plot, the regions where nuclei will release energy when undergoing fission/fusion.	Students should be able to: • aware of the analogy between rotational and translational dynamics.	Refer to AS Long term plan	
PRACTICAL SKILLS	AT i, k Data loggers can be used to produce s – t, v – t and a – t graphs for SHM. AT g, i, k Investigation of the factors that determine the resonant frequency of a driven system. ***Required practical 7: Investigation into simple harmonic motion using a mass–spring system and a simple pendulum.*** PS 2.3 / AT a, b, d, f Investigate the factors that affect the change in temperature of a substance using an electrical method or the method of mixtures. Students should be able to identify random and systematic errors in the experiment and suggest ways to remove them. PS 1.1, 4.1 / AT k Investigate, with a data logger and temperature sensor, the change in temperature with time of a substance undergoing a phase change when energy is supplied at a constant rate. ***Required practical 8: Investigation of Boyle's law (constant temperature) and Charles's law (constant pressure) for a gas. AT a*** Investigate the factors that affect the change in temperature of a substance using an electrical method or the method of mixtures. PS 1.1, 4.1, PS 2.3	PS 1.2, 2.2 / AT b Investigate the patterns of various field configurations using conducting paper (2D) or electrolytic tank (3D). PS 1.2, 2.2, 4.3 / AT f, g Determine the relative permittivity of a dielectric using a parallel-plate capacitor. Investigate the relationship between C and the dimensions of a parallel-plate capacitor eg using a capacitance meter ***Required practical 9: Investigation of the charge and discharge of capacitors. Analysis techniques should include log-linear plotting leading to a determination of the time constant, RC*** ***PS 2.2, 2.3 / AT f, k*** AT b, h Investigate relationships between currents, voltages and numbers of coils in transformers ***Required practical 10: Investigate how the force on a wire varies with flux density, current and length of wire using a top pan balance.*** ***Required practical 11: Investigate, using a search coil and oscilloscope, the effect on magnetic flux linkage of varying the angle between a search coil and magnetic field direction.***	PS 3.1, 3.2 Investigate the decay equation using a variety of approaches (including the use of experimental data, dice simulations etc) and a variety of analytical methods ***Required practical 12: Investigation of the inverse-square law for gamma radiation.***	No practical requirements for option topic	Refer to AS Long term plan	
MATHEMATICAL SKILLS	MS 0.4 Estimate the acceleration and centripetal force in situations that involve rotation. MS 1.5 Students should be able to identify random and systematic errors in the experiment and MS 3.6, 3.8, 3.9, 3.12 Sketch relationships between x, v, a and a – t for simple harmonic oscillators. MS 4.6 Students should recognise the use of the small-angle approximation in the derivation of the time period for examples of approximate SHM ***Req Prac 8 - MS 3.3, 3.4, 3.14***	MS 0.4 Students can estimate the gravitational force between a variety of objects. MS 3.8, 3.9 Students use graphical representations to investigate relationships between v, r and g. MS 0.4 Estimate various parameters of planetary orbits, eg kinetic energy of a planet in orbit. MS 3.11 Use logarithmic plots to show relationships between T and r for given data. MS 0.3, 2.3 Students can estimate the magnitude of the electrostatic force between various charge configurations. ***Req Prac 9 - MS 3.8, 3.10, 3.11***	MS 1.3, 3.10, 3.11 Investigate the decay equation using a variety of approaches (including the use of experimental data, dice simulations etc) and a variety of analytical methods MS 1.4 Make order of magnitude calculations of the radius of different atomic nuclei.	MS 0.2 Recognise and use expressions in decimal and standard form MS 2.2 Change the subject of an equation, including non-linear equations MS 2.3 Substitute numerical values into algebraic equations using appropriate units for physical quantities	Refer to AS Long term plan	