AS PHYSICS

	HALF TERM 1	HALF TERM 2	HALF TERM 3	HALF TERM 4	HALF TERM 5	HALF TERM 6
	Y12					
	3.1 Measurements and their errors Content in this section is a continuing study for a student of physics. A working knowledge of the specified fundamental (base) units of measurement is vital. Likewise, practical work in the subject needs to be underpinned by an awareness of the nature of measurement errors and of their numerical treatment. The ability to carry through reasonable estimations is a skill that is required throughout the course and beyond. **3.4 Mechanics and materials** Vectors and their treatment are introduced followed by development of the student's knowledge and understanding of forces, energy and momentum. The section continues with a study of materials considered in terms of their bulk properties and tensile strength. As with earlier topics, this section and also the following section Electricity would provide a good starting point for students who prefer to begin by consolidating work.		**3.5 Electricity** This section builds on and develops earlier study of these phenomena from GCSE. It provides opportunities for the development of practical skills at an early stage in the course and lays the groundwork for later study of the many electrical applications that are important to society.	**3.3 Waves** GCSE studies of wave phenomena are extended through a development of knowledge of the characteristics, properties, and applications of travelling waves and stationary waves. Topics treated include refraction, diffraction, superposition and interference.	**3.2 Particles and radiation** This section introduces students both to the fundamental properties of matter, and to electromagnetic radiation and quantum phenomena. Teachers may wish to begin with this topic to provide a new interest and knowledge dimension beyond GCSE. Through a study of these topics, students become aware of the way ideas develop and evolve in physics. They will appreciate the importance of international collaboration in the development of new experiments and theories in this area of fundamental research.	**Revision of all 5 units and catch up of any missed RP ready for Mock 1 AS Level Exams (May/June)**
KNOWLEDGE	**3.1.1 Use of SI units and their prefixes** **3.1.2 Limitation of physical measurements** **3.1.3 Estimation of physical quantities** **3.4.1 Force, energy and momentum**	**3.4.2 Materials**	**3.5.1 Current electricity**	**3.3.1 Progressive and stationary waves** **3.3.2 Refraction, diffraction and interference**	**3.2.1 Particles** **3.2.2 Electromagnetic radiation and quantum phenomena**	3.6.1 Periodic motion (A2 content) see A2 tab for long term plan and info
	Students should be able to: • be able to use the prefixes: T, G, M, k, c, m, μ, n, p, f • convert between different units of the same quantity, eg J and eV, J and kW h.	Students should be able to: • Describe plastic behaviour, fracture and brittle behaviour linked to force–extension graphs • Interpret simple stress–strain curves • Use stress–strain graphs to find the Young modulus	Students should be able to: • understand and perform calculations for circuits in which the internal resistance of the supply is not negligible	Students should be able to: • know the direction of displacement of particles/fields relative to the direction of energy propagation and that all electromagnetic waves travel at the same speed in a vacuum • show awareness of safety issues associated with using lasers • describe and explain interference produced with sound and electromagnetic waves • recall that the refractive index of air is approximately 1 • understand the principles and consequences of pulse broadening and absorption	Students should be able to: • be familiar with the ZXA notation for an atom and isotopes • know that the positron, antiproton, antineutron and antineutrino are the antiparticles of the electron, proton, neutron and neutrino respectively • recognise that energy and momentum are conserved in interactions. • eV into J and vice versa. • know that electron diffraction suggests that particles possess wave properties and the photoelectric effect suggests that electromagnetic waves have a particulate nature • explain how and why the amount of diffraction changes when the momentum of the particle is changed.	
PRACTICAL SKILLS	PS 2.3 - Students should be able to identify random and systematic errors and suggest ways to reduce or remove them. PS 3.3 - Students should understand the link between the number of significant figures in the value of a quantity and its associated uncertainty. PS 1.1 - Investigation of the conditions for equilibrium for three coplanar forces acting at a point using a force board. ***Required practical 3: Determination of g by a freefall method.*** AT d - Students should be able to identify random and systematic errors in the experiment and suggest ways to remove them. PS 2.2, 3.1 - Investigation of the factors that determine the motion of an object through a fluid. PS 4.1 AT a, b, d - Students can verify Newton's second law of motion. PS 3.3, 4.1 / AT a, b, f. - Investigate the efficiency of an electric motor being used to raise a mass through a measured height. Students should be able to identify random and systematic errors in the experiment and suggest ways to remove them.	PS 3.3, 4.1 Students can compare the use of analogue and digital meters. AT e Estimate the volume of an object leading to an estimate of its density. ***Required practical 4: Determination of the Young modulus by a simple method.***	AT b, f Students can construct circuits from the range of components. PS 1.2 / AT a, b, f, g Investigation of the variation of resistance of a thermistor with temperature. PS 4.1 / AT a, b, f, g Students can construct circuits with various component configurations and measure currents and potential differences. ***Required practical 5: Determination of resistivity of a wire using a micrometer, ammeter and voltmeter.*** PS 4.1 / AT f Students can investigate the behaviour of a potential divider circuit. AT g Students should design and construct potential divider circuits to achieve various outcomes. ***Required practical 6: Investigation of the emf and internal resistance of electric cells and batteries by measuring the variation of the terminal pd of the cell with current in it. - MS 3.1, 3.3 / PS 2.2, 3.1 / AT f***	PS 2.3 / AT a, b Laboratory experiment to determine the speed of sound in free air using direct timing or standing waves with a graphical analysis. PS 2.2, 2.4 / AT i Students can investigate the factors that determine the speed of a water wave. PS 1.2, 2.1 / AT i Students can investigate the factors that determine the frequency of stationary wave patterns of a stretched string. ***Required practical 1: Investigation into the variation of the frequency of stationary waves on a string with length, tension and mass per unit length of the string.*** AT i Investigation of two-source interference with sound, light and microwave radiation. ***Required practical 2: Investigation of interference effects to include the Young's slit experiment and interference by a diffraction grating.***	AT i - Demonstration of the range of alpha particles using a cloud chamber, spark counter or Geiger counter. AT i - Detection of gamma radiation. PS 1.2 - Momentum transfer of a heavy ball thrown from one person to another. AT k - Use of computer simulations of particle collisions. ATl - Cosmic ray showers as a source of high energy particles including pions and kaons; observation of stray tracks in a cloud chamber; use of two Geiger counters to detect a cosmic ray shower. PS 3.2 - Demonstration of the photoelectric effect using a photocell or an electroscope with a zinc plate attachment and UV lamp. AT j - Observation of line spectra using a diffraction grating. PS 1.2 - Demonstration using an electron diffraction tube.	
MATHEMATICAL SKILLS	• MS 1.5 - Students should be able to combine uncertainties in cases where the measurements that give rise to the uncertainties are added, subtracted, multiplied, divided, or raised to powers. Combinations involving trigonometric or logarithmic functions will not be required. • MS 1.4 - Students should be able to estimate approximate values of physical quantities to the nearest order of magnitude. Students should be able to use these estimates together with their knowledge of physics to produce further derived estimates also to the nearest order of magnitude. • MS 0.6, 4.2, 4.4, 4.5 - Investigation of the conditions for equilibrium for three coplanar forces acting at a point using a force board. • MS 3.6, 3.7 - Distinguish between instantaneous velocity and average velocity. • MS 3.5, 3.6 - Measurements and calculations from displacement–time, velocity–time and acceleration–time graphs. • MS 0.5, 2.2, 2.3, 2.4 - Calculations involving motion in a straight line. • MS 3.9 - Determine g from a graph. • MS 4.1, 4.2 - Students can use free-body diagrams. • MS 2.2, 2.3 - Students can apply conservation of momentum and rate of change of momentum to a range of examples. • MS 0.4, 2.2 - Estimate the energy that can be derived from food consumption.	MS 0.2, 4.3 Students can compare the use of analogue and digital meters. MS 0.4, 4.3 Estimate the volume of an object leading to an estimate of its density. MS 3.1 Young modulus = tensile stress/tensile strain = FL/A Δ L Use of stress–strain graphs to find the Young modulus.	MS 3.2, 4.3 nvestigation of the variation of resistance of a thermistor with temperature. MS 0.3 Students can construct circuits with various component configurations and measure currents and potential differences. MS 3.2 Students can investigate the behaviour of a potential divider circuit. MS 3.2 Students should design and construct potential divider circuits to achieve various outcomes.	PS 2.3 / AT a, b Laboratory experiment to determine the speed of sound in free air using direct timing or standing waves with a graphical analysis. MS 1.2, 3.2, 3.4, 3.5 Students can investigate the factors that determine the speed of a water wave. MS 4.7 Students can investigate the factors that determine the frequency of stationary wave patterns of a stretched string. MS 0.6, 4.1 - Use of snells law of refraction for a boundary and TIR	MS 0.2 Use of prefixes for small and large distance measurements. MS 1.1, 2.2 Students could determine the frequency and wavelength of the two gamma photons produced when a 'slow' electron and a 'slow' positron annihilate each other. The PET scanner could be used as an application of annihilation. MS 2.3 Demonstration of the photoelectric effect using a photocell or an electroscope with a zinc plate attachment and UV lamp. MS 0.1, 0.2 Observation of line spectra using a diffraction grating. MS 1.1, 2.3 Use prefixes when expressing wavelength values.	