BROOK 6TH FORM
& ACADEMY
A UNIVERSITY TECHNOLOGY COLLEGE

02-09-2024

Physics **SOW** & **Required Practical** (2024-2025): **Y12**

AQA A-level Physics: 7408

Year 12: *(green=covered)*

1. **Particles and radiation**
2. **EM radiation and Q phenomena**
3. **Waves**
4. **Mechanics**
5. **Materials**
6. **Electricity**

(Y13):

7. *Further mechanics*
8. *Gravitational and electric field*
9. *Electromagnetism*
10. *Capacitors*
11. *Nuclear physics*
12. *Thermal physics*
13. *Astrophysics (option)*

SEPTEMBER 2024

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OCTOBER 2024

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NOVEMBER 2024

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DECEMBER 2024

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JANUARY 2025

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FEBRUARY 2025

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MARCH 2025

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APRIL 2025

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MAY 2025

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JUNE 2025

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JULY 2025

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AUGUST 2025

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Curriculum intent:

The A-Level Physics course is designed to consolidate and expand upon foundational concepts introduced at the GCSE level, fostering interest in innovative fields of research such as theoretical physics, quantum physics, and cosmology. It deepens students' understanding of established areas, including electricity and forces, while reinforcing connections between essential topics that bridge into related subjects like, Mathematics, Computer Science, Engineering and Chemistry.

A mandatory component of the course includes assessed practicals and a lab book, which must meet exam board criteria to secure the A-Level with the "practical endorsement" recognized by universities. Through these practicals, students develop crucial analytical and evaluative skills and gain experience in statistical analysis, providing a strong foundation for university-level study.

Our selection of the AQA A-Level Physics course aligns with our academy’s STEM commitment to interdisciplinary education. The curriculum’s practical and industry-relevant elements complement other STEM subjects, supporting cross-curricular teaching methods. AQA Physics, with its focus on practical applications, prepares students effectively for both apprenticeship programs and university degrees in scientific and technical fields.

Curriculum Implementation:

The course is delivered as 5 lessons weekly (5 hours). The curriculum is designed to build on and extend concepts from GCSE such as forces (Kinetic energy and gravitational potential energy), motion of equations (distance time graphs, acceleration, projectile motion) but with an introduction to complex and newer areas of Science such as Cosmology and wave particle duality. **We have built in assessment points to allow feedback for students and parents on progress and address weaknesses early on in the course and put in place support if needed.**

Curriculum impact:

Students will deepen their understanding of an extensive range of applications of Physics in the real world and gain insight into the fundamental laws of nature governing the functioning of the universe. They will enhance their scientific research techniques, both physical and analytical, by applying higher GCSE level mathematical skills (with a minimum 40% application of mathematical skills) and acquiring new proficiency in statistical mathematics.

Moreover, students will expand their knowledge and understanding of the impact of forces, including areas like automotive design, material science, and the fundamental laws that govern the formation of atoms to galaxies. They will come to appreciate the significance and importance of physicists and their roles in medicine and the NHS.

Furthermore, students will develop independent learning techniques, including research and essay writing, to prepare themselves for university-based assessments.

Most students should attain grade C or above to progress to A-level Physics. Those who score below grade C will have a formal meeting with the HoD and principals to ascertain their next step in the A-level programme (at the end of Year 12).

Week (5h/week)	Date	Spec ref	Topic	Lessons Objectives	Skill development	Cross-curricular	Additional notes/assessments
W1	02-09-24		• N/A • N/A				**Monday (2th) INSET day**
W2	09-09-24	**3.11, - 3.1.3**	• N/A • Introduction of A Level Physics • Introduction to Experimentation	A brief introduction to A Level Physics: an introduction to curriculum, contents & its location, number of guided learning hours and number of papers A level student will sit in the external exams. To name and use standard prefixes. To be able to convert between different units for the same quantity. To recognise the terms: precision, repeatability, reproducibility, and accuracy. To be able to estimate absolute uncertainties and to calculate fractional and percentage uncertainties. To be able to combine absolute and percentage uncertainties. To understand and to use orders of magnitude. To derive estimates using knowledge of physics.	• ***Baseline assessment.*** • *Use of dimensional analysis to predict relationships between quantities eg the speed of a wave, v, in water in terms of depth, d, and g* • *Students develop skills to make order of magnitude estimates.*	Experimental techniques in A-level Biology, Chemistry & Physics *All 3 science practical skills such measurement of length, volume, mass, conversion of units and error analysis,* PS 1.1 to PS 4.1 *and mathematical skills* MS 0.0 to MS 4.3	Baseline test (using GCSE materials) A booklet is given to be done over next few weeks on "Experimentation" and level 4 mathematic.
1. Particles and radiation (spec_ref: 3.2.1.1 to 3.2.1.7)							
W3	16-09-24	3.2.1.1	• 1.1 Atomic Structure	• State what is inside of atom	• Develop the knowledge of size comparison of atom	Chemistry: Atomic structure 3.1.1.1 to 3.1.2.2	Prior knowledge: GCSE Atomic physics.

		3.2.1.2 3.2.1.3	• 1.2 Stable and Unstable Nuclei • 1.3 Antiparticles and Photons	• State what are isotopes and able to use isotropic data • Recognise & write convention of nuclide (atom) notation • Able to describe what keeps the protons and neutrons in a nucleus together • Able to explain why some nuclei are stable and others are unstable • Able to what happens when an unstable nucleus emits radiation • State what is photon model of radiation • State what is antimatter and what happens to matter & antimatter when they interact • Able explain pair production and annihilation processes	and its constitutes in Armstrong and fm • Compare the charges and masses of protons, neutrons and electrons in SI and relative units. • Introduce specific charge and practice calculations involving the specific charges of protons and electrons and of nuclei and ions. • Show the graph of the variation of the strong nuclear force with distance. • Discuss the key features of the graph, contrasting it with the electromagnetic interaction between two point charges. • Explain what is meant by unstable nuclei and contrast alpha and beta decay. • Practise writing equations to represent alpha and beta decay. • Introduce the photon as a particle of light whose energy depends on frequency. • Calculations involving photon energy using both frequencies and wavelengths. • Look at examples of annihilation of matter and antimatter. • Calculations linking the frequencies of photons produced in the annihilation of matter and antimatter.		*Why was specific charge important in the discovery of the electron by J.J. Thomson?*

		3.2.1.5, 3.2.1.6	• 1.4 Classifications	• Able to draw the map of particle classification • Able to describe the properties: hadrons, baryons, mesons, leptons • Able to use conservation of baryon and lepton number to balance nuclear equations	• Practise dividing particles into hadrons and leptons and then hadrons into baryon and mesons. • Give examples of baryons and emphasise that the proton is the only stable baryon. • Provide the opportunity to analyse baryon decay equations. • Provide the opportunity to analyse the decay routes of the mesons such as the kaon. • Give practise at identifying possible decays of mesons and baryons by applying conservation laws. • Give examples of strange particles and demonstrate how strangeness is conserved in the strong interaction but does not have to be in the weak interaction.		
W4	23-09-24	3.2.1.6 3.2.1.7 (1.5 &.1.6)	• 1.5 Quarks	• State different flavours of quarks • Describe the composition of hadrons • Explain what is quark confinement & strangeness	• A table of properties of quarks and antiquarks are provided. • The opportunity to deduce the quark structure of a wide range of particles are provided.		
		3.2.1.4	• 1.6 Particle Interaction	• Understand the concept of virtual particles, describe the interaction of particles • **Able to draw particle interaction using Feynman diagram**	• Give examples of the weak interaction and let students verifying that charge, lepton number and baryon number are conserved in these interactions. • Practise the construction of simple Feynman		

					diagrams. Emphasise the importance of the conservation laws at the points where lines in the diagrams meet.		
W5	30-09-24		• Summary and review • Revision & summary: Pre-test • EOU test				**EOU test**
2. EM radiation and Q phenomena (Spec_ref: 3.2.1.1 to 3.2.2.4)							
W6	07-10-24	3.2.2.1 3.2.2.2, 3.2.2.3	• Evaluation of EOU test • 2.1 The Photoelectric effect • 2.2 Energy Levels in Atom	• Able to define photoelectric effect and explain how photoelectric effect provide evidence for particle nature of light • Able to explain why KE of electrons vary photoelectric effect • Able to explain and calculate the energy and frequency of photons when an electron transmission takes place • State what is excitation and ionization and explain how florescent tube works ○ Explain how the existence of spectral lines are evidence of quantization of	• Outline the photon model of light and how this explains threshold frequency. • Practise using the photoelectric equation to calculate the maximum kinetic energy of emitted electrons. • **Demonstrate the photoelectric effect** using a zinc plate on the cap of an electroscope and an ultraviolet light source. • Show examples of line spectra with the use of discharge tubes and diffraction gratings or direct view spectroscopes. • Examine the structure of the fluorescent tube. • Practise calculations converting energy from joules to electron volts.	Chemistry Electron configuration: 3.1.1.3 Energy levels in atom and shells	

				energy			
W7	14-10-24	3.2.2.4	• 2.3 Wave - Particle Duality • Summary and Review • **EOU Test**	• Able to describe the diffraction is a property of waves • Able to describe that particles exhibit both wave & particle like behaviour and waves exhibit particle & wave like behaviour • Able to describe wave like nature of electrons and be able to calculate the wavelength of electrons and explain how this attribute is used in electron microscopes	• Discuss the photoelectric effect and how it provides evidence of the dual nature of light. • Practise calculations using the de Broglie equation.		**Q:** *Why do electron microscopes have a much better resolving power than optical microscopes?* **EOU Test** **FD and review will take place after HT**
W8	21-10-24		○ FD and review ○ Buffer ○ Buffer				**INSET day 25th**
W9	HT (28-10-24)						
W10	HT (04-11-24)						
3. Waves (Spec_ref: 3.3.1.1 to 3.3.2.3)							
W11	11-11-24		○ 3.1 Recap of KS4 Waves		• Animation of transverse on a string		

		3.3.1.1 (3..3.1.2) 3.3.1.2	○ 3.2 Nature of Waves ○ 3.3 Transverse and Longitudinal Waves	• Describe how the oscillation of particles enables to propagate waves • State the characteristics of waves, such as *A, f, T ,λ & v* • Able to describe that waves transfers energy (at certain speed) and • be able to calculate the speed • Understand that all EM waves are transverse waves & that sound waves are longitudinal waves and how they propagate. • State what is polarization and that explain why only transverse waves can be polarised ○ able to state examples of the application of polarisation and explain how polarisation lead to annulation of EM signals	• Practise calculations to calculate frequencies, periods and wavelengths of waves. • • Use a slinky to demonstrate transverse and longitudinal waves. • Give details of electromagnetic waves and identify their key properties. • **Demonstrate** the polarisation of light using polarisation. • Research the uses of polarisers *What affect does the motion of a light source have on the speed of light emitted from the source? What are the consequences of this?*		
W12	18-11-24	3.3.1.3 (3.3.1.2.)	• Superposition and Interference	• Know the principle of superposition of waves and able to describe when Superposition happens	• Look at historical development of the understanding of the nature of electromagnetic		

				• State what interference is and able to describe what is constructive interference, destructive interference and total destructive interference. • Explain when two waves are in phase or out of phase	radiation has changed over time. • Demonstrate with a laser the interference pattern produced by a double slit. Use measurements from the pattern to determine the wavelength of the laser light.		
		3.3.1.3	• 3.5 Stationary Waves	• State the condition for the formation of stationary waves, able to graphically represent stationary waves and identify nodes and antinodes of stationary waves • State what is resonance and describe the properties of first harmonics of stationary waves • State examples of stationary waves and explain the use of standing waves in applications (to demonstrate standing waves).	• Demonstrate examples of stationary waves using strings. • Practise calculations to determine the frequency of the first harmonic. • Demonstrate examples of stationary waves using microwaves.		
		3.3.2.1, 3.3.2.2	• 3.6 Diffraction and standing Waves	• State what is diffraction and describe how diffraction patterns are formed when monochromatic light passes through a single slit • Able to describe how changes to wavelength and slit-width changes the central diffraction maximum • Investigating resonance frequency: RP1,	• Examine how path difference determines whether interference is constructive or destructive. • Examine the interference produced by a white light source and identify the differences between this pattern and the pattern produced by monochromatic light. • Investigating resonance frequency using a rubber string to find the mass of the string		

				able to describe the method for investigating variation of frequency as tension changes on a vibrating string	Develop CPAC 1a CPAC 2a, CPAC 2b, & CPAC 3a & CPAC 3b competency		
W13	25-11-24	3.3.1.3. 3.3.2.1	• RP1: Investigating Resonance frequency • 3.7 Interference	*Determining the mass of a string by investigation the variation of frequency as function of tension on a vibrating string* • Know the concept of coherence and path difference, -able describe how two sources produces interference -and explain how monochromatic light produces dark and light fringes • Describe how monochromatic laser produces the interference pattern and how mechanical waves produces pattern when interfering (such as water or sound). Also, state the safety issues when working with laser	***Develop skills:*** **ATa**. use appropriate analogue apparatus to record a range of measurements (to include length/distance) **ATh.** Use signal generator and oscilloscope, including volts/division and time-base **ATi.** generate and measure waves using vibration transducer Note: ATb. use appropriate digital instruments to obtain a range of measurements (to include mass)-mass is given, but students may need to weigh them to establish the uncertainty. • Examine how path difference determines whether interference is constructive or destructive. • Demonstrate with a laser the interference pattern produced by a double slit.		*First required practical.* To assess: CPAC 2a, 2b, 2c, 2d & CPAC 4a & 4b

		3.3.2.1, 3.3.2.2.	• 3.8 Diffraction grating	• **Describe how diffraction grating works** ○ State and derive diffraction grating formula • **Explain the diffraction of white light and give examples of application of diffraction grating**	• Derive the equation for normal incidence on a plane diffraction grating. • Use the diffraction grating equation to determine the wavelength of a light source. • Practise calculations using the diffraction grating. • Investigate applications of the diffraction grating.		
W14	02-12-24		• RP2: Determinatior wavelength of a RE Light using Double interference • RP2: Determinatior wavelength of a RE Light using Diffracti Grating • FD on Practicals				*Will take place on W15* To assess: A range of CPACs assessed, see Tracker
W15	09-12-24	3.3.2.3 3.3.2.3	• 3.9 Refractive Index • 3.10 Critical Angle and TIR	• **State what is refraction & describe how refraction changes speed and thus direction of waves** • **State the law of refraction (Snell's law), what is refractive index of materials and how to calculate it** ○ Given the apparatus, measure the refractive index of glass • Know what critical angle is & able to calculate critical angle • State what is TIR & able to calculate TIR (between two boundaries), also able to	• Define refractive index and practice calculations calculating refractive indices from wave speeds. • Define Snell's law. • Practise calculations using Snell's law. • Use Snell's law to determine the refractive index of a rectangular glass block.		Blended learning: Friday 13th Prior knowledge: The refraction of light.

			• Review and recap	apply Snell's law for critical angle and TIR • Explain how fibre optics works and how it is used in communication	• Practise calculations involving the critical angle and the refractive indices of the materials either side of the boundary. • Demonstrate optic fibres, pointing out the importance of cladding. • Define material and modal dispersion and point out the consequences of pulse broadening and absorption.		
W16	16-12-24		• EOU test • FD and Evaluation of EOU test • Buffer				EOU test
W17	HT (23-12-24)						**Winter break:** BANK holiday Monday 25th and Tuesday 26th
W18	HT (30-12-24)						BANK holiday Monday 1st
4. Mechanics (spec_ref: 3.4.1.1 to 3.4.1.8)							
W19	06-01-25	3.4.1.1	• 4.1 Scalars and Vectors	• State what are scalars and vectors and able to give examples • Able to add vectors geometrically and algebraically to find resultant vector • Able to resolve a vector into two components, including perpendicular to an inclined plane	• *Provide a list of scalar and vector quantities.* • *Investigate the parallelogram law for combining vectors.* • *Practise calculations involving resolving forces into two components.* **AO1, AO2, MS0.6, MS4.5**	A-level maths: Applied maths have already covered some basics mechanics, before we start mechanics in Physics Edexcel 9MA0	**Schools opens Tuesday 6th of Jan**

		3.4.1.2 3.4.1.2	• 4.2 Forces in Equilibrium • 4.3 Moments	• Know the **condition for a body to be in equilibrium** • Able to show a body is in equilibrium by constructing **'closed force triangle'** • Able to demonstrate a body is in **equilibrium by resolving vectors** • State what is moment • State the principle of moment (POM), use POM to calculate and analyse when a system is in equilibrium. • State what is couple and calculate the moment of a couple	• *Construct free body diagrams to show equilibrium when two or three coplanar forces act at a point.* • *Practise calculations combining vectors using vector triangles*. **AO1, AO2,** MS4.2 • *Explain what is meant by the moment of a **force and a couple.*** • *Practise calculations of moments of a force.* • *Calculations involving couples produced by coplanar forces.* • *Experimental investigation of the principle of moments.* • *Determine the centre of gravity and hence the centre of mass by using pieces of card and a plumb line*.	Section 2.7: Kinematics Section 2.8: Forces and Newton's laws Section 2.9: Moments	**Q:** *Are the centre of mass and centre of gravity of a body always in the same position?*
W20	13-01-25	3.4.1.3	• 4.4 Acceleration / Acceleration Time graph	• Know all four SUVAT equation and state the definition of *s, v* & *a.* • Derivation savat equations and solve savat equations for uniform acceleration	• *Practise calculations using the equations of uniform acceleration.* • *Practise plotting and analysing motion graphs*.		Blended learning: Friday 17th

				• Able to plot acceleration-time graph and describe the motion of an object from acceleration-time graph			
		3.4.1.3	• 4.5 Displacement Time graph & Velocity Time graph	• Able to represent uniform and non-uniform acceleration on **displacement-time graph** and able to calculate **average & instantaneous velocity** from the graph • Able to represent uniform and non-uniform acceleration on **velocity-time graph** and able to calculate **displacement & acceleration** from the graph	• *Highlight the link between displacement time, velocity time and acceleration time graphs.* • *Practise calculations using the definitions of displacement, speed, velocity and acceleration.*		Q: **What is the average velocity of a cyclist who cycles at a constant speed of 20 m s^{-1}, around a circular track of circumference 400 m when they are a quarter of the way around the track?**
		3.4.1.5	• 4.6 Newton's Law of Motion	• Able to give a historical context of Newton's law • Define and describe the three Laws • Able to perform calculation using three Laws of Newton to solve suvat equations for constant ***m***	• Give examples of Newton's first and second laws. • Practise examples of free-body diagrams and relate these to Newton's first and second laws. • Practise examples using the equation *F=ma* . • Give examples of Newton's third law. • Should be clear how ***F=ma*** changes when ***m*** is not constant **AO1, AO2, AO3, MS2.3, PS4.1,**		Prior knowledge: Force = mass × acceleration Q: How is the equation, *F=ma*, modified when mass is changing?

W21	20-01-25		• 4.1 Half-way Summary and Review • Buffer • Exam Type Qs				
W22	27-01-25	3.4.1.4 3.4.1.5	• 4.7 Acceleration due Gravity & Projectile Motion • Buffer: more practice on projectile motion • Exam Type Qs	• **State** what is freefall and able to **describe** how understanding of freefall led to discovery that $s \propto t^2$ • Apply the condition for freefall to simplify and solve suvat equation • **State** what s projectile motions and **apply** suvat equation & resolving forces to **solve for range and height** of projectile motions	• *Consider the effects of air resistance on the horizontal and vertical motion of a projectile.* • *Demonstrate the monkey and hunter experiment.* • *Investigate the motion of different shaped objects through a tall column of viscous fluid.* • *Practise examples of projectile motion.* **AO1, AO2, AO3, MS0.6, PS2.1, 2.3**		http://www.nationalstemcentre.org.uk/elibrary/resource/2084/monkey-and-hunter http://www.instructables.com/id/MONKEY-HUNTER-PHYSICS/
W23	03-02-25	3.4.1.4	• 4.8 Drag, Lift and Terminal Velocity	• State what is meant by lift, friction & drag and how they oppose motions • State what is meant by terminal velocity and describe how terminal velocity is reached as body fall through atmosphere • Able to describe a method to measure the terminal velocity of a body falling through a fluid	• *Consider the effects of air resistance on the horizontal and vertical motion of a projectile.* • *Experiment to investigate air resistance and terminal velocity using different numbers of stacked coffee filters or cupcake cases.*		**INSET day Thursday 8th and Friday 9th** To assess: A range of CPACs assessed, see Tracker

					• *Investigate the motion of different shaped objects through a tall column of viscous fluid.* • *Outline the nature of lift and drag forces.* **AO1, AO2: AO3, PS2.1**		
		3.4.1.6	• 4.9 Conservation of Momentum	• State what is momentum • State what is principle of momentum (PM) and use PM to solve collision problems in one dimension • Use the principle of momentum to distinguish between elastic and inelastic collisions and calculate momenta and energy after an explosion	• *Give the definition of momentum and state the principle of the conservation of momentum.* • *Link rate of change of momentum to Newton's second law and demonstrate how this leads to F=ma* • *Explain the difference between elastic and inelastic collisions and investigate inelastic collisions by dropping different balls from the same height and measuring the height of rebound.* • *Practise examples using the conservation of momentum in explosions.* **AO1, AO3, MS2.2, 2.3**		Q: **Prove that an object of mass, *m*, must be stationary after an elastic collision with a stationary object also of mass *m*.** http://hyperphysics.phy-astr.gsu.edu/hbase/elacol.html http://www.animations.physics.unsw.edu.au/jw/momentum.html
			• RP3: Determining acceleration due to gravity.	Determination of g by a free-fall method	**ATa** use appropriate analogue apparatus to		CPACs to assess:

					record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings. **ATc** use methods to increase accuracy of measurements, such as timing over multiple oscillations, or use of fiducial marker, set square or plumb line **ATd** use stopwatch or light gates for timing		CPAC 1a, 2a, 2b, 2d & CPAC 4a, 4b & CPAC 5b
W24	10-02-25	3.4.1.6 3.4.1.7	• 4.10 Force, Momentum and Impulse • 4.11 Work and power	• Know ***F*** is rate of change of momentum and how it leads to *F=ma* • Know impulse is change in momentum and describe how conservation of momentum (Ft) is used for safer transport design • Know the area under ***force-time*** graph is equal to impulse, thus able to calculate change in momentum for non-uniform acceleration ($F \neq$constant) • State what is work & energy and able to calculate work	• Link rate of change of momentum to Newton's second law and demonstrate how this leads to *F=ma* • Give examples of impulse and link this to the relationship between impact forces and contact time. **AO1, AO3** • Review the relationship between work and		Q: Explain how the design of a typical egg carton reduces the likelihood of damage. Prior knowledge: Calculating work and power.

				done when the force is line or at an angle to line of displacement • Know that Power is rate of work done (Wd), *area under F-s* graph is Wd and able to calculate Wd when force is variable using calculus or using area under graph	energy transfer from GCSE. • Practise calculations for work done including situations where force and displacement do not act in the same direction. • Derive the equation linking power, force and velocity. • Construct force displacement graphs and work out the area under the graph. **Student must learn the following (and not look at Eq sheet)** $W = F cos\theta$ $P = \frac{\Delta W}{\Delta t} = Fv$ **AO1, AO2**		http://hyperphysics.phy-astr.gsu.edu/hbase/work.html https://phet.colorado.edu/en/simulations/category/physics/work-energy-and-power
		3.4.1.7	• 4.12 Conservation of energy	• State the principle of energy and efficiency when work is done • Able to solve conversion of energy problems involving KE & GPE and calculating efficiency of energy transfer • Investigation the efficiency of a motor	• Review the principle of conservation of energy. • Define efficiency and practice calculations for efficiency in practical situations. • Practise calculations using gravitational potential energy and kinetic energy. • Investigate energy changes in a bouncing ball.		http://hyperphysics.phy-astr.gsu.edu/hbase/conser.html http://www.nuffieldfoundation.org/node/1842

					• Estimate the energy that can be derived from food consumption. **AO1, AO2, MS0.4, MS2.2**		
W25	HT (17-02-25)						
W26	24-02-25		• Recap of Section 4 & appraisal of work in coming weeks • EOU test • FD & Evaluation of Test				**End of the Unit test**
5. Materials Spec_ref: 3.4.2.1 to 3.4.2.2)							
W27	03-03-25	3.4.2.1 3.4.2.1	• 5.1 Density	• State what is meant by density of a material and able to calculate *m*, *V* & *ρ*, using $\rho = \frac{m}{V}$ • Able to recall Hooke's Law and be able to calculate force, extension and stiffness of an elastic material using Hooke's equation • Define Hooke's Law and explain when it no longer accurately describes the	• *Define density and do calculations using the density equation.* • *Determine the density of different objects, including ordinary matter like earth to densest objects like neutron stars.* • *State Hooke's law and explain what is meant by the stiffness or spring constant.* **AO1, AO2**		**INSET day Friday 7th** **Q: why is the density of water is exactly 1** (gcm^{-3}) Seen density of nuclear density in section 1, we revisit density of nuclear material here and will do in Section 13 (Astrophysics) again, when we will study neutron stars.

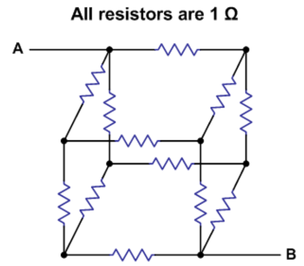
			• 5.2 Hooke's Law	relationship between force and extension as the load increases. • Define the elastic limit and explain why Hooke's Law no longer applies once the material exceeds this limit • Investigate Hooke's Law to determine the spring constant of a given spring	• *Review Hooke's law and elastic limit.* • *Investigate the elastic behaviour of various materials such as metals in the form of wires and springs.* **AO1, AO2**		
		3.4.2.1	• 5.3 Stress and Strain	• Define stress, strain and breaking stress • State what is meant by elastic stress energy and calculate stress energy stored in a stretch material • State the conservation energy of a elastically deformed system and explain the conservation energy of a mass-spring system	• *Give definitions of tensile stress and tensile strain and practice using both these quantities in calculations.* • *Explain what is meant by elastic strain energy.* • *Practise calculations involving energy conservation involving elastic strain energy and energy to deform.* • *Describe the energy changes that take place when a mass is attached to a vibrating spring.* • *Consider energy conservation issues in the context of ethical transport design* **AO1, AO2, AO3**		

W28	10-03-25	3.4.2.1	• 5.4 The Young Modulus • RP4: Determining the Young Modulus of a material • Evaluation of RP	• Define Young's modulus and explain what it signifies about the properties of a material • Able to calculate Young's modulus from stress-strain graph • Able to describe an experimental method to measuring the Young modulus Determination of the Young modulus by a simple method: the objective of the experiment is to measure the Young Modulus of a metal in the form of a wire, which requires a clamped horizontal wire over a pulley	• *Define the Young modulus and practice using this property in calculations.* • *Carry out an experiment to determine the Young modulus of the metal in a wire.* **AO1, AO2, MS3.1** **Ata**: *use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings* **Ate:** *use calipers and micrometers for small distances, using digital or vernier scales*		https://www.tes.co.uk/teaching-resource/Young-Modulus-AS-Physics-6130086/ CPACs to assess: CPAC 1a, 2a, 2b, & CPAC 4b, & CPAC 5a, CPAC 5b
W29	17-03-25		• 5.5 Stress-Strain and Force-Extension Graph • 5.6 Brittle material	• Describe a stress-strain plot and determine material properties from the graph • Describe a force-extension plot and determine material properties from the graph • Able to calculate and describe strain energy using stress-strain graph or force-extension graph • State What is meant by brittle material • Explain Brittle and ductile behaviour using molecular bonding	• *Analyse stress – strain curves.* • *Illustrate plastic behaviour, elastic behaviour, fracture and brittle behaviour using a*		

			• Review and Summary	• Able to identify Brittle, fracture and ductile behaviour from strain-stress graph	*variety of stress strain graphs for a variety of materials*. **AO1, AO2, MS3.1**		
W30	24-03-25		• EOU test • Evaluation of EOU test • "Buffer"				**End of the Unit test**
6. Electricity (Spec_ref: 3.5.1.1 to 3.5.1.6)							
W31	31-04-25		• 6.1 Introduction to electricity • 6.2 Circuits and recaps • 6.3 *I-V* Characteristics	Evaluation of GCSE questions, marking, gap analysis and FD • Define what is current, charge and calculate current using $I = \frac{\Delta Q}{\Delta t}$ • Define what is Potential difference and able to calculate how much work is done by a charge of one coulomb when it passes through a Pd of 1V • Recall Ohms law, define resistance and able to identify Ohmic & non Ohmic conductors from IV graphs • Sketch *I-V* graphs of ohmic conductors and semiconductors • Able to define resistivity and qualitatively describe the resistivity of conductors and	• *Review current as a flow of charge and practice calculations.* • *Review potential difference is the work done per unit charge and practice calculations. Practise resistance calculations* **AO1, AO2** • Define resistivity and practise using the definition in calculations. • Determine the resistivity of the metal in a wire. • Explain how temperature affects the resistance of metal conductors.		Prior knowledge: Electric current as a flow of charge. Definitions of current, potential difference and resistance. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/elecur.html http://hyperphysics.phy-astr.gsu.edu/hbase/electric/resis.html https://teachers.web.cern.ch/teachers/archiv/HST2001/accelerators/supercond

				semiconductors (like thermistors) • State what is superconductor and research their applications	• Explain how temperature affects the resistance of a thermistor. • Investigate applications of thermistors. • Explain what is meant by superconductivity and explain the significance of critical temperature. • Investigate some of the uses of superconductors. **AO1, AO2, MS4.3, MS3.2**		uctivity/superconductivity.htm
W32	HT (07-04-25)						**Easter break:**
W33	HT (14-04-25)						Bank holiday 18th
W34	21-04-25		• RP5: Determining the Resistivity of a Wire • Evaluation of the practical	• Determination of resistivity of a wire using a micrometre, ammeter and voltmeter: **the objective of the experiment is to determine the resistivity of a meter constantan wire**	**Ata:** Use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings **Ate:** Use calipers and micrometers for small distances, using digital or vernier scales **ATf:** Correctly construct circuits from circuit diagrams using DC power supplies, cells, and a range of circuit components, including those where polarity is important		Bank holiday 21st CPACs to assess: CPAC 1a, 2a, 2b, & CPAC 4b, & CPAC 5a, CPAC 5b

W35	28-04-25		• 6.4 Power, electrical energy and emf	• Able to calculate the power of a component and find how energy is transferred in a circuit, by applying $P = IV$, $V = IR$ and $E = ItV$ • State what is **internal resistance, *r*** and electromotive force, ***e.m.f*** of a power source • Able to calculate ***internal r*** and ***emf*** of a power source (using $\varepsilon = \frac{E}{Q}$ and $\varepsilon = I(R + r)$) • Investigation of the emf and internal resistance of a battery: measure ***emf*** and ***r*** (of a DC circuit) - **RP6**	• *Explain what is meant by emf, internal resistance and terminal pd.* • *Practise calculations using the equation* $\in = I(R + r)$ • *Determine the internal resistance of a cell by measuring the terminal pd when the cell is connected to an external resistor with variable resistance.* **AO1, AO2, MS3.3, MS3.4**		
			• RP6: Measuring the Internal Resistance and e.m.f of a Cell • Write-up of RP6	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: the objective of the experiment is to determine the emf and the internal r of a battery.	**ATb:** *Use appropriate digital instruments, including electrical multimeters, to obtain a range of measurements (to include time, current, voltage, resistance, mass)* **ATf:** *Correctly construct circuits from circuit diagrams using DC power supplies, cells, and a range of circuit components, including those where polarity is important*		
W36	05-05-25		• 6.5 Conservation of Energy and Charge in a Circuit	• State and describe the conservation of energy and charge in DC circuit • Use Kirchhoff's laws to derive the equation for resistance in series and parallel	• *Explain how resistance in series and resistances in parallel combine.* • *Explain why the total resistance of a parallel combination of resistors is always less than the*		BANK holiday Monday 5th **Q:** What is the resistance between A and B?

			• 6.6 The Potential Divider • Review and Summary	• Able to calculate the emf of cells in series and parallel • Able to **state** what is a potential divider and **explain** how a potential divider can be used to supply constant or variable Pd from a power source • **State** examples of potential dividers and **explain** their functions as a potential divider.	*smallest resistance resistor in the combination.* • *Practise calculations involving series and parallel arrangements of components.* • *Outline how the cells in series and in parallel combine.* **AO1, AO2, MS0.3** • *Investigate potential divider circuits.* • *Investigate how sensors can be used in potential divider circuits.* **AO1, AO2, MS0.3, MS2.3** .		 http://tap.iop.org/electricity/circuits/118/page_46038.html
W37	12-05-25		• EOU test • Evaluation of EOU test • Buffer				**End of the Unit test**
W38	19-05-25		• Revision • Revision • Revision				
W39	HT (26-05-25)						BANK holiday Monday 26^{th}
W40	02-06-25		• Review and catch-up • Review and catch-up				

			• Review and catch-up				
W41	09-06-25		• **Y13 material** • **Y13 material** • Revision & catch-up				
W42	16-06-25	• Exam • Exam • Exam					
W43	23-06-25						
W44	30-06-25		• FD • FD • **Y13 material**				
W45	07-07-25		• **Y13 material** • **Y13 material** • **Y13 material**				
W46	14-07-25		• Extra-curricular practical activities • Extra-curricular practical activities				
W47-52	21-07-25 END of the academic Year				**Summer break:** ***School breaks Friday 19th***		

Assessment objectives

Assessment objectives (AOs) are set by Ofqual.
The exams will measure how students have achieved the following assessment objectives.

AO1: Demonstrate knowledge and understanding of scientific ideas, processes, techniques and procedures.

AO2: Apply knowledge and understanding of scientific ideas, processes, techniques and procedures:

- in a theoretical context
- in a practical context
- when handling qualitative data
- when handling quantitative data.

AO3: Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to:

- make judgements and reach conclusions
- develop and refine practical design and procedures.

Weighting of assessment objectives for A-level Physics

Assessment objectives (AOs)	Component weightings (approx %)			Overall weighting (approx %)
	Paper 1	Paper 2	Paper 3	
AO1	34	32	31	33
AO2	38	53	35	42
AO3	28	15	32	25