ABBEY COLLEGE

Aspire & Challenge

Year 10 Physics Curriculum Overview

Topic	Timing	Key knowledge and skills	Progression and links	SEND/ More able	Assessment & recording; factual recall checks
Electricity	Autumn Term	Students should: • Compare the electrical properties of protons, neutrons, electrons, and ions. • Use the concept of electric fields to explain why charged objects interact. • Describe how objects become charged in terms of electron transfer. • Describe the operation of a variable resistor and a diode and their effects on current. • Calculate the charge transferred by a steady current in a given time. • Construct an electrical circuit and accurately measure the current. • Calculate the potential difference. • Calculate the resistance of a component. • Measure the effect of changing the length of a wire on its resistance in a controlled experiment. • Describe the resistance characteristics of a filament lamp. • Describe the characteristics of a diode and light-emitting diode. • Investigate the resistance characteristics of a thermistor and a LDR. • Find the potential difference across a component in a circuit by using the p.d. rule. • Calculate the current in a series circuit containing more than one resistor. • Investigate the resistance of series circuits with several components. • Measure the p.d. across parallel circuits and explain any discrepancies. • Describe the effect on the resistance in a circuit of adding a resistor in parallel.	Numeracy • Graph drawing Literacy • Use of tier three words • Extended writing opportunities	Challenge: • Mastery – Ohn's Law. • Higher level questions – explaining trends in current-potential difference graphs. Scaffold: • Pre prepared results tables • Knowledge organisers • Scaffold for extended writing	• 5 questions to start – recall activity every lesson. • Close the gap questions • Self and peer feedback on tasks completed • Structure strip • Past paper exam Qs. • Summative assessment at the end of the unit

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Electricity	Autumn Term	• Investigate the effect of adding resistors in parallel on the size of the current in a circuit. • Describe the characteristics of the UK mains supply. • Compare a.c. traces in terms of period and amplitude (voltage). • Operate a cathode ray oscilloscope to display an a.c. trace. • Discuss the choices of materials used in cables and plugs in terms of their physical and electrical properties. • Describe why a short circuit inside a device presents a hazard. • Identify a variety of electrical hazards associated with plugs and sockets. • Calculate the power of systems. • Calculate the power of electrical devices. • Select an appropriate fuse for a device. • Calculate the charge transferred by a current in a given time. • Calculate the energy transferred by a charge passing through a potential difference. • Apply the law of conservation of energy in a circuit. • Calculate energy transfer in kilowatt-hours. • Convert between efficiencies stated in percentages and those stated in decimal forms. • Calculate the power rating of a device from the energy transferred and the time of operation.			

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Forces	Spring Term	Students should: • Use the gradients of distance-time graphs to compare the speeds of objects. • Describe the motion of an object by interpreting distance-time graphs. • Calculate the speed of an object and the time taken to travel a given distance, • Identify the features of a velocity-time graph. • Rearrange the acceleration equations in calculations. • Calculate the change in velocity for an object under constant acceleration for a given period of time. • Describe sections of velocity-time graphs, and compare the acceleration in these sections. • Calculate the distance travelled using information taken from a velocity-time graph for one section of motion. • Use a series of repeat measurements to find an accurate measurement of the acceleration of a moving object. • Calculate the speed of an object by extracting data from a distance-time graph. • Use a tangent to determine the speed of an object from a distance-time graph. • Use the equation v2 – u2 = 2as in calculations where the initial or final velocity is zero. • Describe the effect of changing the mass or the force acting on an object on the acceleration of that object. • Perform calculations involving the rearrangement of the F = ma equation. • Combine separate experimental conclusions to form an overall conclusion. • State factors which affect the stopping distance of a car. • Calculate the thinking distance for a car from the initial speed and reaction time.	Numeracy • Graphs • Rearranging equations Literacy • Use of tier three words • Extended writing opportunities	Challenge: • Higher level questions – explaining conservation of momentum • Calculating distance travelled from a speed-time graph. Scaffold: • Pre prepared axes for graphs • Knowledge organisers • Scaffold for extended writing	• 5 questions to start – recall activity every lesson. • Close the gap questions • Self and peer feedback on tasks completed • Structure strip • Past paper exam Qs. • Summative assessment at the end of the unit

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Forces	Spring Term	• Estimate the relative effects of changing factors which affect the stopping distance of cars. • Apply the equation p = mv to find the momentum, velocity or mass of an object. • Describe how the principle of conservation of momentum can be used to find the velocities of objects. • Investigate the behaviour of objects during explosions to verify the conservation of momentum. • Apply the law of conservation of momentum to find the momentum before and after impacts. • Calculate the momentum of a combination of objects after an impact. • Evaluate data used to verify the law of conservation of momentum. • Describe collisions in terms of forces and conservation of momentum. • Calculate the force involved in an impact from the change in momentum and time. • Design features that will reduce the size of impact forces in a collision. • Describe the operation of some safety features of a car in simple terms. • Identify critical data which can be used to examine the cause of an accident. • Report on the differences in safety features between expensive and inexpensive cars. • Calculate forces or areas of contact. • Use SI prefixes in expressions for pressure as appropriate.			

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Waves	Summer Term	Students should: • Investigate wave motion through a spring model. • Compare transverse and longitudinal waves in terms of direction of vibration and propagation. • Compare electromagnetic and mechanical waves in terms of the need for a medium. • Outline the derivation of the wave speed equation. • Calculate the period of a wave from its frequency. • Calculate the wave speed from the frequency and wavelength. • Describe refraction at a boundary in terms of wave fronts. • Describe refraction including the reflected rays. • Explain partial absorption as a decrease in the amplitude of a wave and therefore the energy carried. • Explain how insulating materials can be used to absorb sound waves. • Explain why sound waves cannot travel through a vacuum. • Plan an experiment to measure the speed of sound in air. • Describe the properties of a sound in terms of amplitude and frequency. • Identify the range of frequencies that humans can hear. • Measure the frequency of a sound wave using an oscilloscope and the relationship frequency = 1/period. • Compare ultrasound and audible sound waves in terms of frequency. • Outline some uses of ultrasound in distance measurement. • Describe the operation of an ultrasound transducer in terms of partial reflection. • Describe the internal structure of the Earth. • Compare the three types of seismic waves (P, S, L) in terms of the speed they travel and whether they are transverse or longitudinal. • Describe the operation of a seismometer. • Describe the relationship between the energy being transferred by an electromagnetic wave and the frequency of the wave.	Numeracy • Standard form Literacy • Use of tier three words • Extended writing opportunities	Challenge: • Required Practicals – Waves and Refraction of Light • Higher level questions – Explaining refraction. • Explaining the use of lenses in glasses. Scaffold: • Pre prepared tables • Knowledge organisers • Scaffold for extended writing	• 5 questions to start – recall activity every lesson. • Close the gap questions • Self and peer feedback on tasks completed • Structure strip • Past paper exam Qs. • Summative assessment at the end of the unit

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Waves	Summer Term	• Calculate the frequency and the wavelength of an electromagnetic wave. • Explain why the range of wavelengths detected by the human eye is limited. • Describe how a range of electromagnetic waves are used in a variety of scenarios. • Explain why a particular wave is suited to its application. • Determine whether the law of reflection applies to a microwave signal. • Compare the rate of information transfer through optical fibres and radio signals. • Outline the operation of a mobile phone network and the waves used. • Discuss the evidence for mobile phone signals causing damage to humans. • Describe the penetrating powers of gamma rays, X-rays, and ultraviolet rays. • Compare X-rays and gamma radiation in terms of their origin. • Describe the ionisation of atoms in simple terms. • Describe the operation of an X-ray machine. • Explain why contrast media can be used during X-rays. • Describe the factors that affect the radiation doses received by people. • Construct accurate ray diagrams showing the reflection of light rays. • Explain why some surfaces form images during reflection but other do not. • Investigate the law of reflection through practical techniques. • Construct a ray diagram showing the refraction of a ray of light at a boundary between two different media. • Describe the dispersion of white light as it passes through a prism. • Investigate the refraction of light through a glass or Perspex block. • Describe the colours of objects in different colours of light. • Describe how combinations of filters transmit light. • Determine the appearance of a white object when illuminated by combinations of primary coloured light. • Identify real and virtual images by using ray diagrams. • Calculate the magnification of a lens based on object and image size. • Investigate the image-forming properties of a converging lens. • Construct ray diagrams showing the formation of images by a convex lens and a concave lens. • Describe the image formed by a magnifying glass. • Describe the image formed by a camera lens.			

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Space	Summer Term	Students should: • Describe the formation of a protostar and planets. • Explain why a star radiates light in terms of nuclear fusion. • Describe how evidence for the early solar system is gathered. • Compare the life cycle of small and large stars, identifying the names of the stages. • Describe the formation of 'light' elements by stars in their main sequence. • Describe the forces that are acting when a star is in its main sequence. • State that, for a greater radius of orbit, the object must travel at a slower speed and orbit in a longer period. • Describe the forces acting on an object that cause it to travel in a circular path. • Describe the different orbits of a variety of satellites. • Describe how the frequency or wavelength of a wave can be altered by the movement of the source through the Doppler effect. • Compare galaxies in terms of their red-shift and distance from us. • State that all galaxies are moving away from each other and that this shows the universe is expanding. • Discuss why scientists were initially reluctant to accept the Big Bang model. • Describe the origin of the cosmic microwave background radiation (CMBR). • Describe changes in the universe from the time of the Big Bang to the present day.	Literacy • Use of tier three words • Extended writing opportunities	Challenge: • Explaining centripetal force. • Higher level questions – Future of the universe. • Explaining how red shift provides evidence of an expanding universe. Scaffold: • Cloze passages • Knowledge organisers • Scaffold for extended writing	• 5 questions to start – recall activity every lesson. • Close the gap questions • Self and peer feedback on tasks completed • Structure strip • Past paper exam Qs. • Summative assessment at the end of the unit