Year 10 GCSE Physics	Autumn term 1	Autumn term 2	Spring term 1	Spring term 2	Summer term 1	Summer term 2
	Students will know that					
Static electricity and electrical circuits **Electricity in the home** **Molecules and matter** **Radioactivity** **Forces and motion**	Atoms consist of protons neutrons and electrons and be able to state their respective charges. When insulators are rubbed together electrons are transferred from one to another, leaving the insulators with equal and opposite charges. Charged objects exert a force on each other due to an electric field. An electric field around a charged object. Like charges repel and like charges attract. Electric current is a flow of electrons. Electrons flow in a closed circuit due to a force from the interaction with an electric field. $\frac{Charge\ (C)}{Time\ (s)} = Current\ (A)$	Current and potential difference behave differently in series and parallel circuits. Resistors in series affect the total resistance of the circuit differently to those in parallel. Alternating current is used throughout mains circuits in the UK. DC current only comes from batteries. The national grid is the UK distribution network. Plugs and sockets contain 3 wires. We use a variety of safety features in our electrical circuits at home. Short circuits can be dangerous. The Earth wire prevents harm from short circuits. Power = energy/time. Power = current x potential difference. Power = current^2 x resistance. Charge = current x time. Energy = potential difference x charge.	Density = mass/volume. Matter exists in three states. Particles are arranged differently in solids liquids and gases. The kinetic energy of particles depends on their temperature. When substances change state (melt, freeze, boil, evaporate, condense or sublimate), mass is conserved. Internal energy is the total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system. Forces of attraction between particles are different in different states of matter. Energy needed to change the state of 1kg of matter from solid to liquid is called	Atoms consist of protons, electrons and neutrons. The model of the atom has changed over time. Atoms are very small. Atoms that have lost or gained electrons become ions. Isotopes are atoms of the same element with different number of neutrons. Radioactive decay is a random process. Alpha, Beta and Gamma radiation are ionising. Ionising radiation can be dangerous to living things. Neutron radiation is non ionising. The activity of a radioactive sample can be measured by a Geiger counter. Activity of a substance is the number of unstable nuclei that decay per second. The half-life is the time taken for a radioactive	Vector quantities have direction and magnitude, but scalar only have magnitude. Forces are interactions between objects. Forces can be contact or non-contact. Newton's third law applies to all force interactions between objects. Multiple forces can be replaced with one single resultant force. Newton's first law states if the resultant force on an object is zero then there is no change to its velocity. Multiple forces can be represented on free body force diagrams. Levers can be used to provide greater turning force (moment/torque) around a pivot. Moment = Force x distance.	Speed is a scalar, and velocity is a vector quantity. Speed = distance/time Velocity = displacement/time Displacement/distance-time graphs can be used to track an objects movement. Acceleration = change in velocity/time taken. Speed/velocity-time graphs can be used to track an objects movement.

	Symbols can be used to represent components in circuits. Potential difference (V), current (A) and Resistance (Ω) are related by the following equation: Potential difference = current x resistance. There is various components that act as resistors and some of these are affected by outside factors.	All electrical appliances are sold with an efficiency rating. Efficiency = output power/input power x 100%. Power = current x potential difference.	the specific latent heat of fusion. Energy needed to change the state of 1kg of matter from solid to liquid is called the specific latent heat of vaporisation. Gas exerts a pressure on a surface. Temperature of a gas can affects its pressure. Random movement of gas particles is called Brownian motion. How gas pressure can affect its volume and vice versa. Pressure x volume of a gas is always constant (Boyle's law). Work done increasing the pressure on a gas can increase temperature. The unit of pressure is Pascals.	sample to decrease its mass/count rate by half. Radiation emitted from unstable nuclei is used in nuclear medicine. Ionising radiation from substances in the environment is called background radiation. Background radiation poses very little health risk to humans. Nuclear fission is used to generate electricity. Nuclear fusion happens in stars. Using Ionising radiation and radiation in the environment can be dangerous.	Levers and gears are known as force multipliers. The centre of mass of an object is the point at which its mass can be thought of being concentrated. Vector diagrams can be used to resolve two forces into one resultant force. A single force can be resolved into two component forces at right angles to each other using vector diagrams.	
	Students will know how to					
	Explain how two insulators become charged. Explain the interaction of charged particles.	Construct series and parallel circuits to investigate potential difference and current.	Measure the density of a solid. Measure the density of a liquid.	Compare historical models of the atom. Compare the scale of atomic structure. Label the parts of an atom and their	Classify quantities as vector or scalar. Represent vector quantities on a scale diagram.	Carry out an experiment to calculate average speed. Compare average everyday speeds.

	Explain the flow of current in a circuit. Apply and rearrange equations to calculate current, charge or time. Construct and interpret circuit diagrams. Construct basic electrical circuits. Apply and rearrange equations to calculate potential difference, current and resistance. Construct circuits in order to collect data that allows the relationship between current and potential difference to be plotted. Construct circuits in order to collect data that allows the relationship between resistance and wire length to be plotted. Plot graphs showing the resistance characteristics for a range of electrical components.	Calculate the total resistance in series and parallel circuits. Answer exam questions on electricity required practicals. Explain the difference between alternating and direct current. Describe the stages of the national grid. Label the parts and wires of a plug and physically wire it. Apply and rearrange equations to calculate current, time, potential difference and resistance. Apply and rearrange equations to calculate Energy current, time and potential difference. Compare energy efficiency ratings.	Calculate the volume of a regular shaped object. Convert units where necessary. Use standard form where necessary. Conduct the required practical to measure the density of an irregular shaped object. Compare and contrast the kinetic theory of different states of matter. Use and interpret a temperature time graph to find the melting/boiling point of a substance. Explain changes of state referencing forces of attraction and kinetic theory. Explain gas pressure using kinetic theory. Calculate specific latent heat of fusion/vaporisation. Conduct experiments to measure the specific latent heat of fusion/vaporisation.	respective masses and charges. Use mass and charge numbers to identify numbers of subatomic particles. Compare alpha, beta, neutron and gamma radiation and the effect they have on the emitting nucleus. Balance nuclear equations. Use graphs to calculate half-life. Calculate activity using half-life. Compare different methods used in nuclear medicine. Explain the difference between contamination and irradiation. Minimise risk from ionising radiation. Explain the process of nuclear fission and how it is used in nuclear reactions. Explain the process of nuclear fusion. Compare nuclear fission and fusion.	Apply Newton's third law to a variety of situations. Apply Newton's first law to a variety of situations. How to construct free body force diagrams. Calculate moments and apply them to equilibrium situations. Explain how levers and gears increase the rotational effect of forces. How to find the centre of mass for symmetrical objects. Use vector diagrams of forces.	Plot and analyse displacement/distance-time graphs. Calculate acceleration of an object. Plot and analyse speed/velocity-time graphs.

			See random movement of gas molecules. Apply Boyle's law.			
	Vocabulary and the concepts they link to					
	Proton Neutron Electron Charge Insulator Repel Attract Interaction Field Current Resistor Ammeter Voltmeter Cell Battery Diode Thermistor Series Parallel	Live wire Neutral wire Earth wire National grid Alternating current Direct current Fuse Power Efficiency Appliance	Density Mass Volume Meniscus Kinetic theory Melt Freeze Condense Vaporise Sublimate Pressure Fusion Exert Pascals	Nucleus Plum pudding Proton Electron Neutron Subatomic Unstable Ionising Radioactive Activity Decay Half-life Contamination Irradiation Fission Fusion	Vector Scalar Resultant Resolve Newton Moment Equilibrium Torque Gears	Acceleration Velocity displacement
	Assessment					
	End of unit test: Electricity Key piece six-mark exam question	End of unit test: Electricity Key piece six-mark exam question	End of unit test: Molecules and matter Key piece six-mark exam question	End of unit test: Radioactivity Key piece six-mark exam question	End of unit test: Forces and motion Key piece six-mark exam question	End of unit test: Forces and motion Key piece six-mark exam question

	Diversity & development of cultural capital					
	Electrician and electrical engineering links (college and apprenticeship). Lighting in homes and Christmas lights.	Choosing and purchasing electrical appliances. Readings on energy bills. Purchasing a home (energy surveys).	Story of the word Eureka and Archimedes. Why things float and sink! Air pressure (balloons, tyres, airplane cabins). Diesel engines. Why bike pumps heat up.	Development of the Universe after the Big Bang. Cancer development. Cancer scans. Cancer treatment. Non-renewable energy. Radon gas survey when buying a house. Blue John mines and their radon gas detectors.	Gearboxes in cars and bicycle gears. Levers in everyday life. See-saw in the park. Approach vectors and navigation of aircraft and boats.	Tachograph in vehicles. Average speeds of athletes. Students own running speeds.
	Cross-curricular opportunities and enrichment					
	Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures, interpreting and drawing graphs). Electronics (circuit diagrams and components).	IDP household bills.	Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures, standard form and volumes of regular shapes). Chemistry (Solids, liquids and gases, bonding and Brownian motion)	Maths (graph skills). Chemistry (atomic structure), Biology (cancer development, cancer treatment and scans) Geography (Non-renewable energy resources, environmental disasters and pollution). History (Second world war and the cold war)	Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures, standard form and symmetry)	Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures, interpreting and drawing graphs).

Year 11 GCSE Physics Themes	Autumn term 1	Autumn term 2	Spring term 1	Spring term 2	Summer term 1	Summer term 2
Forces and motion **Wave properties** **Electromagnetic waves** **Light** **Electromagnetism** **Space**	**Students will know that**					
	Vector quantities have direction and magnitude, but scalar only have magnitude. Forces are interactions between objects. Forces can be contact or non-contact. Newton's third law applies to all force interactions between objects. Multiple forces can be replaced with one single resultant force. Newton's first law states if the resultant force on an object is zero then there is no change to its velocity. Multiple forces can be represented on free body force diagrams.	Speed is a scalar, and velocity is a vector quantity. Speed = distance/time Velocity = displacement/time Displacement/distance-time graphs can be used to track an objects movement. Acceleration = change in velocity/time taken. Speed/velocity-time graphs can be used to track an objects movement. Newton's second law states that force = mass x acceleration. Inertial mass = Force/acceleration. Mass of an object refers to the amount of matter it contains. Weight of an object is the force acting on a mass due to gravity. Terminal velocity is the velocity a falling object reaches when there is no	Pressure = force/area. Pressure in a column of liquid depends on depth. The atmosphere exerts pressure on surfaces which is dependent on altitude. Objects in a fluid will be subject to a force called upthrust. The density of the object and the upthrust it is subject to in a fluid are the deciding factors of whether it floats or sinks. Waves are a transfer of energy, not matter. Waves are longitudinal or transverse. All waves have specific parts and properties. Period = 1/frequency.	Electromagnetic waves are transverse waves that all travel at the speed of light in a vacuum. Electromagnetic waves have different properties, uses and dangers dependent on their frequency and wavelength. Different electromagnetic waves are produced in a variety of ways. Some electromagnetic radiation is ionising. Visible light can be reflected at surfaces following the law of reflection. Refraction causes light to disperse through a prism shaped object. Different colours of light combine with different effects. The colour of objects depends on the light they absorb/reflect.	The Solar system consists of planets and other bodies that were formed from a supernova. Gravity acts as centripetal force to keep bodies in orbit. Earths satellites orbits are different depending on their designated purpose. Red-shift is when light from distant galaxies has had its wavelength stretched. Red-shift provides evidence for the expansion of the Universe and therefore the Big Bang theory. Red-shift allows to calculate age and distance of distant galaxies. Cosmic microwave background radiation can be explained by the Big Bang.	GCSE PREPERATION AND EXAMS

	Levers can be used to provide greater turning force (moment/torque) around a pivot. Moment = Force x distance. Levers and gears are known as force multipliers. The centre of mass of an object is the point at which its mass can be thought of being concentrated. Vector diagrams can be used to resolve two forces into one resultant force. A single force can be resolved into two component forces at right angles to each other using vector diagrams.	resultant force acting upon it. Braking distance + thinking distance = stopping distance. Typical human reaction time is 0.2-0.9s. Large decelerations can be dangerous. Momentum = mass x velocity. Momentum is conserved in collisions (closed system). The rate of change of momentum during collisions is equal to the force on the objects. Safety features that increase the time momentum changes over reduce impact forces. Elastic materials return to their original shape after the forces are removed. Force applied = spring constant x extension	Wave speed = frequency x wavelength. Refraction occurs as waves enter new mediums. Reflection occurs as waves meet the boundary of a new medium. Human hearing range is 20-20K Hz. Infrasound is below 20Hz and ultrasound is above 20kHz. Ultrasound is used in medical scanning and echo sounding. We can track seismic waves through the Earth to identify its internal structure.	Lenses use refraction to focus an image. Lenses can be used to correct eye defects. Magnets can attract or repel each other. Magnets can attract magnetic materials. Magnets are surround by a magnetic field. Magnetic fields can be induced in magnetic materials. Electric currents produce magnetic fields. A solenoid is a coil of wire with a current passing through it. A current carrying wire in a magnetic field is subject to a force. A moving magnetic field inside a wire or a wire moving inside a magnetic field induces a current. Transformers can be used to change the size of an alternating potential difference. $V_p \times I_p = V_s \times I_s$	The Big Bang theory has more credible evidence than other theories.	

	Students will know how to					
	Classify quantities as vector or scalar. Represent vector quantities on a scale diagram. Apply Newton's third law to a variety of situations. Apply Newton's first law to a variety of situations. How to construct free body force diagrams. Calculate moments and apply them to equilibrium situations. Explain how levers and gears increase the rotational effect of forces. How to find the centre of mass for symmetrical objects. Use vector diagrams of forces.	Carry out an experiment to calculate average speed. Compare average everyday speeds. Plot and analyse displacement/distance-time graphs. Calculate acceleration of an object. Plot and analyse speed/velocity-time graphs. Apply Newton's second law to different situations. Investigate the effect the mass of an object has on its acceleration. Explain the difference between mass and weight. Calculate stopping, thinking and braking distance. Explain the factors that affect braking and thinking distance. Estimate the braking force of a vehicle. Measure human reaction time. Complete calculations using the principle of	Calculate pressure in a variety of situations. Explain sharp objects using pressure. Use the equation pressure = height of liquid x density x gravity to find unknowns. Explain why atmospheric pressure changes with altitude. Explain why objects in fluid experience upthrust due to pressure difference. Calculate if objects will float or sink in a fluid. Compare transverse and longitudinal waves. Measure the speed of sound in air. Measure the speed of water waves. Measure the speed of sound in a solid. Calculate properties of waves in a variety of situations.	Group electromagnetic waves according to their frequency/wavelength. Investigate the amount of infrared absorbed/transmitted by a surface. Construct ray diagrams to show the law of reflection. Explain the difference between diffuse and specular reflection. Explain the difference between a real and virtual image. Explain the refraction of light rays. Construct ray diagrams to show refraction at a straight or curved surface. Compare converging and diverging lenses and the images produced. Plot a magnetic field. Explain the strength of magnetic fields in various situations. Explain the motor effect.	Describe the life cycle of a star. Explain how a bodies orbit will depend on its speed. Explain how an orbiting body's velocity is constantly changing. Compare light from a stationary source and distant galaxies. Use evidence to evaluate theories of the Universe.	

		conservation of momentum, Apply the rate of change of momentum to collisions. Decrease forces in collisions. Investigate how the extension of a spring changes with force. Explain what happens at the limit of proportionality. Plot and analyse Force-extension graphs.	Explain the refraction and reflection of waves. Construct ray diagrams to show waves at material interfaces. Explain how humans hear. Explain how ultrasound is used in scanning and sounding. Explain the journey of seismic waves though the Earth.	Explain the generator effect. Explain how an AC and a DC generator work. Explain how a microphone and loudspeaker work. Explain how transformers work and their role in the National grid. Carry out transformer efficiency calculations.		
	Vocabulary and the concepts they link to					
	Vector Scalar Resultant Resolve Newton Moment Equilibrium Torque Gears	Acceleration Velocity Displacement Momentum Rate Impact Collision	Pressure Pascal Sharp Column Atmosphere Upthrust Density Transverse Longitudinal Frequency Amplitude Frequency Period Ultrasound Infrasound Echo Seismic	Electromagnetic Radio wave Microwave Infrared Ultraviolet X-ray Gamma Ionising Diffuse Specular Real Virtual Convex Concave Medium Converging Diverging	Supernova Black hole Neutron star Protostar Nebula Orbit Centripetal Asteroid Comet Red-shift Spectral	

				North South Pole Flux Induce Transformer		
	Assessment					
	Key piece six-mark exam question	End of unit test: Forces and motion Key piece six-mark exam question	Paper 1 mock End of unit test: Forces and pressure Key piece six-mark exam question	End of unit test: Forces and pressure Key piece six-mark exam question	Paper 2 mock Key piece six-mark exam question	
	Diversity & development of cultural capital					
	Gearboxes in cars and bicycle gears. Levers in everyday life. See-saw in the park. Approach vectors and navigation of aircraft and boats.	Tachograph in vehicles. Average speeds of athletes. Students own running speeds. Highway code. Driving theory test. Speed limits. Driving laws (drinking and phones). Bicycle helmets, boxing gloves, crash mats and everyday protective equipment.	Bed of nails. Why football boots hurt if you step on someone's foot. Airplane journeys. How knives work. Floating and sinking objects. Fireworks and thunder and lightning time delay. How we hear. Foetal scanning. Car reverse sensors. Animal echo location.	How food cooks in microwaves. How heat signature cameras work. UV protection in sun creams. Skin cancer. Medical physics techniques in hospitals. Why rainbows form. Eye defects and correction. Magilev trains. School door release system. Electric motors in cars.	Space in the news. Astronomy and the night sky. Theories of the Universe. Future of the Universe.	

	Cross-curricular opportunities and enrichment					
	Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures, standard form and symmetry)	Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures, interpreting and drawing graphs).	Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures)	Maths (Rearrangement of equations, units and prefixes, decimal places and significant figures)		