Physics Separate Science Curriculum Long Term Plan

		Half Term 1	Half Term 2	Half Term 3	Half Term 4	Half Term 5	Half Term 6
Year 10	Big Idea	**Energy:** How are energy transfers calculated? **Particle Model:** How do substances change state?	**Electricity:** What are the properties of electricity?	**Electricity continued**	**Atomic Structure:** What is nuclear radiation and what are its properties?	**Forces:** What can affect the motion of an object?	**Forces continued**
	Key knowledge and skills	**Energy** • Naming and describing the different stores of energy and how energy can be transferred between these stores • Understanding the concept of efficiency in relation to useful and wasted energy transfers • Understanding the concept of 'Work Done' and how to calculate it • Understanding how energy transfers relate to 'Power' and how this can be calculated	**Electricity:** • Understanding how to construct circuit diagrams • Understanding the concept of voltage, current and resistance and how they are linked together via Ohm's law. • Understanding the difference between series and parallel circuits and the effect these circuits have on current, voltage and resistance. • Investigating the resistance of different components		**Atomic Structure & Radioactivity:** • Understanding basic atomic structure and linking this to knowledge of what an isotope is. • Understanding the process that scientists went through, over hundreds of years, to determine the structure of the atom. • Understanding the 3 different types of nuclear decay and their properties • Understanding the concept of half-life in terms of radioactive decay.	**Forces:** • Explaining the difference between scalar and vector quantities • Describing and explaining the difference between contact and non-contact forces • Explaining how different forces can be combined into a single, resultant force • Explaining how gravity and weight are related • Explaining how forces relate to energy through the concept of Work Done • Understanding the concept of elasticity	

		• Calculating changes in gravitational potential energy, kinetic energy and elastic potential energy • Understanding how unwanted energy transfers can be reduced with the use lubrication and insulation • Understanding the concept of Specific Heat Capacity and how it can be calculated. • Evaluating the advantages and disadvantages of renewable and non-renewable methods of generating electricity **Particle Model of Matter:** • Understanding how the different states of matter can be represented using particle diagrams • Describing and explaining the arrangement, movement and forces between	• Understanding how specific electrical components, such as LDRs and thermistors, can be used in everyday life. • Understanding the concept of electrical power and how this links to electrical appliances. • Understanding how electricity is distributed across the UK via the national gird. • Describing the production of static electricity and the formation of an electric field		• Describing and explaining the differences between nuclear contamination and nuclear irradiation. • Describing how nuclear fission can be used as an energy source • Understanding the process of nuclear fusion	and how it relates to forces, particularly when stretching or compressing a spring • Describing and explaining the concept of motion, including how to calculate speed and acceleration and how to interpret motion using distance time graphs and velocity time graphs • Explaining how Newtons 3 laws can be used to predict and explain the motion of an object • Explaining the forces involved in braking and the different factors that can affect the stopping distance of a car • Understanding the concept of momentum and how to calculate it. • Describing how changes in momentum affect objects • Understanding how pressure is caused and changes in a fluid	

		particles in different states of matter. • To understand how substances can change state and how this links to thermal and kinetic energy • Understanding the term density and how it can be calculated for different objects • Understanding the concept of Internal Energy in relation to different substances • Understanding the meaning of specific heat capacity and specific latent heat, as well as how to calculate these quantities.				• Understanding how to calculate moments around a point.	
	End Point	Pupils will explain the particle model, including state changes, density and internal energy, and calculate specific heat capacity and latent heat for different substances. They will represent chemical reactions, analyse energy transfers and efficiency, and	Pupils will construct and analyse electrical circuits using key principles such as Ohm's law and power.		Pupils will explain atomic structure and isotopes, describe types of nuclear radiation and half-life, and distinguish between nuclear contamination and irradiation, and nuclear fusion, fission.	Pupils will be able to distinguish between scalar and vector quantities, explain contact and non-contact forces, and calculate resultant forces. They will understand the relationship between gravity and weight, and explain how forces transfer energy through	

		calculate work, power and energy changes, evaluating sustainable energy generation and reducing energy losses				work done. Pupils will describe elasticity and apply Hooke's Law to springs. They will calculate and interpret speed and acceleration using distance–time and velocity–time graphs. They will use Newton's three laws to explain and predict motion, analyse the forces and factors affecting vehicle stopping distances, and, how to calculate and explain momentum.	
Year 11	Big Idea	**Forces:** What can affect the motion of an object?	**Waves:** How does energy travel from one place to another?	**Magnets and Electromagnetism:** What are magnets? **Space:** What makes up the universe and how is it changes?			
	Key Knowledge and skills	• Explaining the difference between scalar and vector quantities • Describing and explaining the difference between contact and non-contact forces • Explaining how different forces can be combined into a single, resultant force	**Waves:** • Understanding the difference between transverse and longitudinal waves • Understanding the key properties and characteristics of all waves, including the use of the wave equation • Describing and explaining the different features and uses of the electromagnetic spectrum	**Magnets:** • Stating which materials are magnetic and understanding the concept of attraction and repulsion • Understanding the concept of permanent and induced magnets and how this links to magnetic fields • Understanding the key features of magnetic fields,			

		• Explaining how gravity and weight are related • Explaining how forces relate to energy through the concept of Work Done • Understanding the concept of elasticity and how it relates to forces, particularly when stretching or compressing a spring • Describing and explaining the concept of motion, including how to calculate speed and acceleration and how to interpret motion using distance time graphs and velocity time graphs • Explaining how Newtons 3 laws can be used to predict and explain the motion of an object • Explaining the forces involved in braking and the different factors that can affect the	• Investigating the properties of waves in water and waves on a string, with a particular focus on their wavelength, wave speed and frequency • Constructing ray diagrams to demonstrate the reflection and refraction of waves • Understanding the structure of the ear and linking to sound waves • Understanding how waves are used for detection and exploration • Constructing and drawing lens diagrams • Explaining why we see different colours of light	including how to plot and how to interpret them to determine where the magnetic force is strongest • Understanding the concept of electromagnetism, including how to build an electromagnet and how to vary the strength of them. • Understanding how permanent and induced magnets can interact to produce the motor effect • Describing and explaining how to use Flemings Left Hand Rule to determine the direction of force produced by the motor effect. • Understanding how the motor affect can be used to produce electric motors. • Explaining Faraday's law of induction			

		stopping distance of a car • Understanding the concept of momentum and how to calculate it. • Understanding the concept of momentum and how to calculate it. • Describing how changes in momentum affect objects • Understanding how pressure is caused and changes in a fluid • Understanding how to calculate moments around a point.		• Explaining how loudspeakers generate sound • Understanding how AC and DC generators work • Understanding how to interpret diagrams of electromagnetic devices in order to explain how they work. **Space:** • Understanding how starts are formed from a cloud of dust and gas • Understanding the life cycle of a star and how they change over time • Understanding the orbital motion of natural and artificial satellites • Explaining the difference in light given off by distant galaxies			

	End Point	Pupils will be able to distinguish between scalar and vector quantities, explain contact and non-contact forces, and calculate resultant forces. They will understand the relationship between gravity and weight, and explain how forces transfer energy through work done. Pupils will describe elasticity and apply Hooke's Law to springs. They will calculate and interpret speed and acceleration using distance–time and velocity–time graphs. They will use Newton's three laws to explain and predict motion, analyse the forces and factors affecting vehicle stopping distances, and, how to calculate and explain momentum.	Pupils will understand the properties and behaviour of waves, including how they transfer energy, interact with different materials, and are used across the electromagnetic spectrum for communication, imaging, and other real-world applications.	Pupils will explain magnetic materials, fields and electromagnetism, including the motor effect, and apply this to practical uses. Pupils will understand the structure and life cycle of the universe, including the solar system, stars, galaxies, and cosmology, and be able to explain how scientific observations provide evidence for theories about the origin and evolution of the universe.			