	What will I learn?	How will I learn it?	Why is it important that I learn this?	Why am I learning this now?
Y9 TERM 1				
***Topic** 1:* *Energy*	You will learn about energy stores and transfers in the laboratory and in the world around us. You will learn to calculate the amount of energy an elastic, moving or high up object has. You will learn about work and power, and be able to calculate them using and rearranging an equation. You will learn how thermal energy is transferred in different states of matter and how to reduce unwanted transfers. You will learn about efficiency and how to calculate and compare efficiencies of different machines.	Planning and completing investigations Teacher input and demonstration Independent learning and research Using scientific evidence to justify a choice	To be able to understand the differences between energy stores and appreciate how they relate to everyday life. To plan and carry out a range of investigations and to work safely. To be able to draw conclusions based on data and observations and to use evidence to justify ideas. To practice calculations and improve mathematical skills.	This builds on your work in KS3 when you looked at energy and the impact it has on our lives. This knowledge gained in this topic is essential going further into GCSE Physics as the equations used in this topic often appear in later topics. It is a fundamental requirement in A-level, that is expanded upon in more detail. It builds on skills learned in maths and helps to develop mathematical confidence, applying understanding to new concepts.
Y9 TERM 2				
***Topic** 3:* *Particle Model of Matter*	You will compare the three states of matter (solid, liquid, gas) in terms of particle arrangement, movement and the bonds between particles. You will calculate the density of regular and irregular solids, and of liquids.	Teacher input and demonstration. Investigations of heating and cooling. Required Practical: • Density	You will understand the difference between chemical changes and physical changes. You will begin to develop your scientific vocabulary with key terms used in practical investigations. You will gain a greater	Since Y1 you have been classifying materials by their properties, and by Y5 you were identifying reversible and irreversible changes (for example changes of state such as freezing are reversible – ice cubes melt! – but chemical changes are irreversible – which is just as well, as you don't want table salt suddenly changing into other chemicals in your mouth!)

	An object's internal energy is the sum of the kinetic energy and potential energy of all the particles in the object. Heating an object increases either the kinetic energy of its particles OR the potential energy of its particles. This manifests as an increase in temperature OR a change of state.		understanding of the conservation laws that govern our universe. You will develop your skills in the interpretation of graphs.	In KS3 you learnt about the difference in density between states of matter, and that mass is conserved in physical changes. You also learnt how the movement and arrangement of particles changes when they are heated. If you continue to A Level, you will study Thermal Physics in more detail, and learn how the behaviour of atoms and molecules is governed by the rules of probability.
Y9 TERM 3				
***Topic** 4:* *Atomic Structure*	You will learn about the history of the atom and the scientific models used to explain the results of experiments You will learn the basic structure of an atom including protons, electrons and neutrons. You will acquire knowledge of the properties of alpha particles, beta particles and gamma waves and apply it to decay equations Radioactive decay is random so it is not possible to predict which individual nucleus will decay next, but with a large enough number of nuclei it is possible to predict how many will	Through making models of atoms Through teacher input and demonstration – observing Alpha, Beta and Gamma particles Through experimental analysis and drawing and interpreting graphs – half life Through practical investigations by using dice to simulate the decay of a radioactive nuclide Apply mathematical concepts and calculate results	Apply mathematical concepts and calculate results Present observations and data using appropriate methods, including tables and graphs. Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions Use and derive simple equations and carry out appropriate calculations Build on problem solving skills by using practical equipment	This learning will build on previous learning topics from KS3 from the particle model of matter including; the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density. Understanding the structure and behaviour of atoms is fundamental to not just physics topics but all of the sciences. Realising the many uses of radiation will also give students ideas about future careers beyond school and A level.

	decay in a certain amount of time. You will learn some of the many uses nuclear radiation has ranging from medicine to smoke alarms.	Through using scientific evidence to justify a choice.		
Y10 TERM 1				
Topic 1 : *Energy*	You will learn the theory of and complete an investigation on specific heat capacity Required Practical: • Specific Heat Capacity			
Topic 1 T: *Energy*	You will complete an investigation on insulation Required Practical: • Insulation (T)			
***Topic** 3 T:* *Particle Model of Matter*	You will revisit the empirical gas laws governing the relationship between temperature, pressure and volume of an ideal gas, and use Boyle's law to make predictions about volume and pressure. You will examine the effects of work done on a gas, mechanically or by heating.			
***Topic** 4 T:* *Atomic Structure*	You will cover in more detail the uses and hazards of radiation. You will learn about the nuclear processes of fission and fusion, and compare them as means of generating electricity.			
***Topic** 2:* *Electricity*	You will learn about the concepts of voltage, electrical current and resistance and how to calculate these quantities. You will learn how light and temperature sensors operate You will understand aspects of mains electricity supply and distribution (T) You will know how static electricity is created and understand the properties of an electric field and the forces it creates between charged objects.	Through planning and completing investigations and performing calculations. Through teacher input and demonstration, using analogies to simply complex concepts. By collection of data from experimental observations to arrive at an understanding. Required Practicals: • Resistance • IV graphs	To be able to understand the mechanics of how an electrical circuit operates, using technical terms correctly in a fluent fashion. To plan and carry out a range of investigations and to work safely. To be able to draw conclusions based on data and observations and to use evidence to justify ideas. To practise calculations and	This builds on your work in KS3 when you looked at electricity in more detail, with a more mathematical approach. This knowledge gained in this topic is essential going further into GCSE Physics as the equations used in this topic often appear in later topics. It is a fundamental requirement in A-level, in which a greater depth of understanding is paramount. It builds on skills learned in maths and helps to develop mathematical confidence, applying understanding to new concepts.

			improve mathematical skills.	
Y10 TERM 2 & 3				
***Topic** 5:* *Forces*	You will study forces and their interactions. You will re-visit the difference between mass and gravity, and compare weight on different planets and moons. You will learn that gravity is one of three non-contact forces you need to know about. You will learn the difference between scalar and vector quantities, how to identify them and how to represent vectors. You will calculate the resultant of more than one force acting on a body using vector addition and scale drawing. Similarly, you will learn how to resolve vectors into orthogonal components. Using the formula for mechanical work, you will learn how forces affect the kinetic energy stores of objects. You will learn the difference between elastic and inelastic behaviour, and investigate Hooke's Law. You will consider	Teacher input and demonstration. Investigation Required Practicals: • Force vs extension • Acceleration Use frictionless air track and light gates to make accurate observations relating to Newton's Laws of Motion	You will gain an understanding of how objects interact with each other. You will be able to explain an object's constant or changing motion in terms of the resultant force acting on it. You will gain further practice drawing and interpreting graphs, and make links with the mathematics of gradient and area.	In Y3 and in Y7, you looked at magnets and how the magnetic force does not require objects to be touching to feel a force from each other. In Y5 and Y7, you learnt that gravity is another force that does not require objects to touch. Earlier in GCSE (T) you may have learnt about the third non-contact force, the electrostatic force. In Y7 you looked in more detail at resistive forces such as friction and air resistance, and how different surfaces and shapes affect the size of these forces. In maths, you have learnt the equation relating speed, distance and time, and practised drawing graphs and calculating gradients and areas. If you continue to A Level Physics, you will learn about some other fundamental forces, including the interactions that hold matter together or rip it apart. You will calculate radial forces and draw comparisons between gravitational and other forces.

	the mechanical work done in stretching or compression, and relate this to the elastic potential energy equation. (T) You will learn that more than one force acting on an object may cause a rotation. You will learn how machines such as levers and gears transmit the rotational effects of forces. (T) You will learn about pressure in fluids, and use this to explain the variation of pressure with depth in the oceans and with height in the atmosphere. You will learn the difference between distance and displacement and between speed and velocity. You will draw and interpret distance-time and velocity-time graphs, and learn how to calculate quantities from the gradient and area underneath graphs. You will use Newton's three laws of motion to describe and explain a variety of motions. You will learn why objects moving through fluids all have a terminal velocity.			

	You will use the knowledge acquired in this unit to explain the variation with speed of vehicles' stopping distances, and identify other factors that will affect thinking or braking distance. You will learn about momentum and its conservation, and (T) how changing momentum in collisions leads to impact forces.			
Y11 TERM 1				
***Topic** 6:* *Waves*	Students will learn the difference between longitudinal and transverse waves and describe evidence that it is the wave and not the material itself that travels Properties of electromagnetic waves including uses and associated risks such as sun burn from ultraviolet waves. Describe how EM waves interact with matter focusing on investigations for reflection and refraction investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface. (T) The physics behind echoes and how their	Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations including the use of ripple tanks and ray boxes Through student modelling of waves Through teacher input and demonstration Through experimental analysis and drawing and interpreting graphs Through practical investigations by using ray boxes to learn the law of reflection	To develop scientific explanations and understanding of familiar and unfamiliar facts. Plan methodical experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. Present observations and data using appropriate methods, including tables and graphs. Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions	This learning will build on previous learning from KS3 waves topic including areas such as; sound and light waves, how they travel and how they interact with matter. Students will be able to evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences Realising the many uses of electromagnetic waves will also give students ideas about future careers beyond school and A level. Students will be able to: explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; make decisions based on the evaluation of evidence and arguments

	applications can be used in ultrasound. (T) Using analysis of seismic waves to learn about the structure of the earth. (T) Apply the laws of refraction to explain how lenses work (T) How the colour of objects (including black bodies) is related to the differential absorption, transmission and reflection of different wavelengths of light	Apply mathematical concepts and calculate results Through using scientific evidence to justify a choice. Required Practicals: • Speed of Waves • Reflection & Refraction (T) • Infrared absorption and emission	Use and derive simple equations and carry out appropriate calculations Build on problem solving skills by using practical equipment	
Y11 TERM 2				
***Topic** 7:* *Magnetism & Electromagnetism*	You will learn about magnetism and the connection between electricity and magnetism (electromagnetism) You will appreciate that when a current carrying conductor is placed in a magnetic it will experience a force. (T) You will understand how a transformer operates and know it's uses. (T) You will know how the National Grid system works and how transformers are important in the operation of this to minimise energy loss, to improve efficiency.	Through student observation during practical and teacher demonstration Through teacher input and demonstration, to explain complex concepts and carrying out calculations. By collection of data from experimental observations to arrive at an understanding. By applying an equation to aid understanding of this.	To be able to deal with abstract ideas to gain an understanding of this phenomenon which will enable you to understand further work in this topic To be able to draw conclusions based on data and observations and to use evidence to justify ideas. To practice calculations and improve mathematical skills.	This builds on your work in KS3 when you looked at the basics of magnetism and electromagnetism in to look at the underlying mechanisms in more depth. This knowledge gained in this topic is essential foundation for topics at A-level, in which field theory is required. It builds on skills learned in product design, being able to think in three dimensions, enhancing spatial awareness.
***Topic** 8 T:* *Space physics*	You will learn about the composition of our Solar System.	Teacher input and demonstration.	You will appreciate the relative sizes of objects in the Universe.	In Y6 you studied Earth and Space. You learned that the Sun, Earth and Moon are approximately

	You will distinguish between planets, moons and artificial satellites. You will learn that the force of gravity keeps moons in orbit around planets, planets in orbit around stars, and stars in orbit around each other in binary systems You will learn how stars are born. You will compare the life cycles of stars and understand how a star's mass affects its ultimate fate. You will compare the Doppler effect (sound) with Redshift (light). You will study the evidence that led astronomers to the Big Bang theory of creation.	Investigation of circular motion: how an increase in tangential velocity affects the radius of stable orbits Videos of the relative size of objects in the Universe, Redshift and Big Bang simulation. You will simulate the expansion of time and space using a balloon!	You will understand how the scientific term "theory" differs from how the word is used in general life, and how this has led to public misconceptions about theories such as Darwinian evolution. You will finally understand how the orbital motion of the Moon led Newton to his theory of gravity – and recognise that the story of an apple falling on his head is just a myth. You will understand how balanced and imbalanced forces dictate the life stages of stars.	spherical objects, and that the Moon follows a roughly circular orbit around the Earth, and the Earth follows a roughly circular orbit around the Sun. In Y7 you learnt about some of the objects in the Solar System and how the distance of a planet from the Sun affects its climate and the length of its year. If you continue to A Level, you will study Newton's Theory of Gravity in more detail, and learn how to derive Kepler's empirical law from theoretical principles.