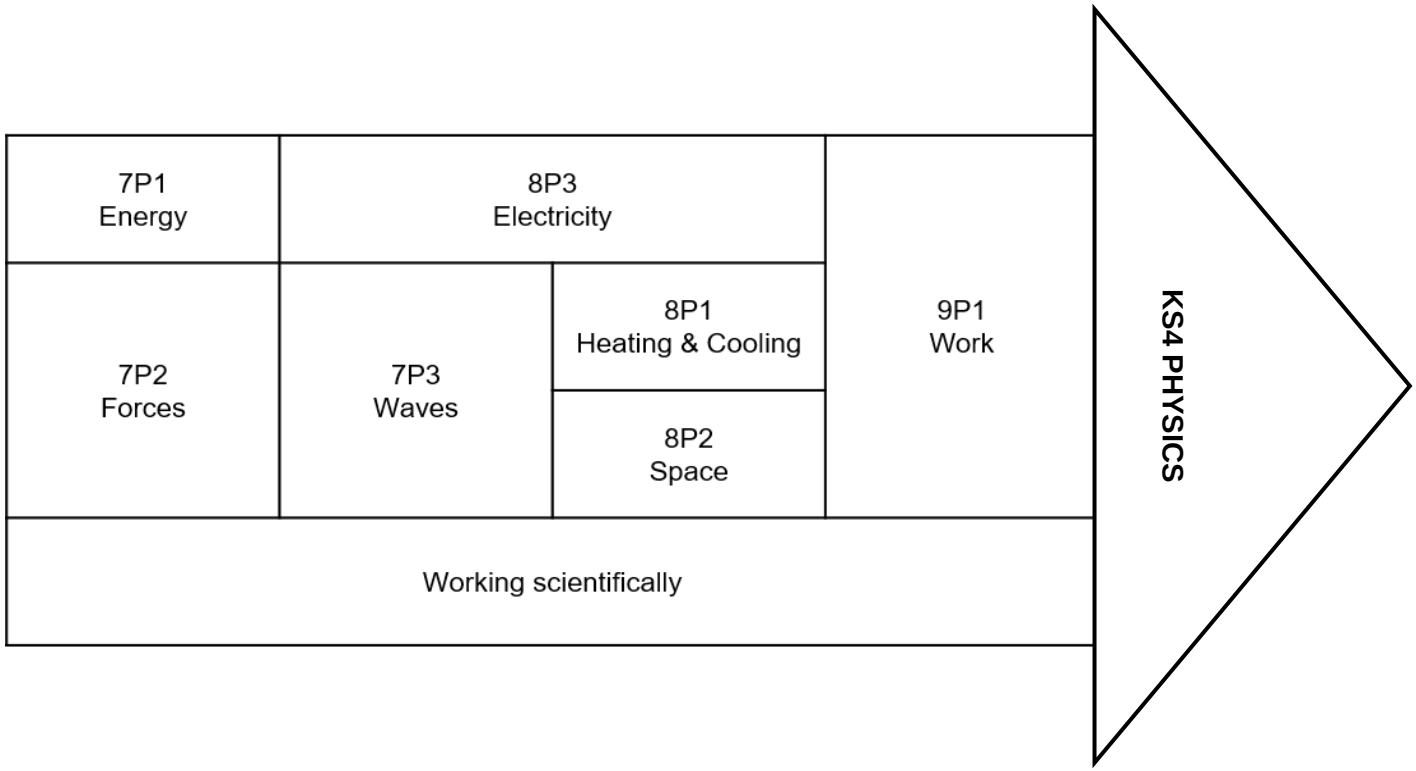
KS3 Physics – Curriculum overview



The above arrow shows the progression of physics topics across Key Stage 3. It shows how substantive knowledge is built upon in a sequential nature to prepare learners for KS4 physics. Running alongside and integrated throughout is the thread of working scientifically whereby students develop their knowledge of scientific methods, apparatus and data analysis.

KS3 Curriculum Intent - Physics

Intent **By the end of KS3 students are able to…**		**What new knowledge/content do we introduce?**			**How does this curriculum go beyond the National Curriculum? How does going beyond the NC ensure challenge?**
		Year 7	**Year 8**	**Year 9**	
Have a thorough substantive knowledge of three fundamentals of physics: energy, forces and waves. Energy: be able to understand energy stores and transfers in a variety of different contexts and applications, from heating and cooling to electricity. Forces: understand that anything mechanical can be analysed through forces. To calculate the effects of forces and explain their uses in everyday life. Waves: have a secure knowledge of the properties of waves and understand how their role in scientific exploration of space. Have the disciplinary knowledge to understand the evidence for the science they learn (e.g. conduction, moments).	**Autumn**	**Energy** • Conservation of energy. • Energy is transferred between stores via pathways. • Energy as a fuel – including food and fossil fuels • Generating electricity and renewable energy sources.	**Heating & cooling** • Thermal energy vs. heat • Types of heat transfer: conduction, convection, radiation. • Scientific investigation of insulation.	**Work** • Understanding and calculating pressure. • Describe and interpret investigations of springs • Calculate moments for pivots and levers • Calculate work done • Making electromagnets	Energy: Energy in foods, including student-led investigations Forces: Explain the everyday application of certain forces (friction in shoe design, understanding of streamlining in vehicle design). Waves: Introduction to the electromagnetic spectrum. Heating and cooling: investigating conduction and expansion through practical work. Space: Drawing ray diagrams to show both reflection and refraction, including calculating angles. Electricity: Making series and parallel circuits to investigate changes in p.d. and current. Work: Calculating moments using mathematical formulae. Energy: rearranging equations.
	Spring	**Forces** • Measuring forces and understanding free body diagrams • Contrasting mass and weight • Friction and air resistance in terms of motion and real world application • Speed calculations and distance-time graphs • Floating in terms of buoyancy and density.	**Space** • Earth's place in the solar system and beyond. • Orbital behaviour in relation to day/night, years and seasons. • Gravity and the types/uses of satellites. • The behaviour of light and its role in telescopes	**Energy** • Energy stores and transfers • Calculating efficiency and work done. • Kinetic Energy, Elastic energy and Gravitational Potential energy. • Specific heat capacity • Energy resources and investigating solar cells.	
	Summer	**Waves** • Properties of light and ray diagrams. • Understanding sound as vibrations. • Comparing sound and light in terms of transverse vs. longitudinal waves. • Perception of colour. • Seeing and hearing in terms of the structure of the eye and ear.	**Electricity** • Static electricity in terms of electrons • Potential difference and circuit models • Current, conductors and insulators. • Series and parallel circuits • Resistance in a circuit .	**Particle model of matter** • Using particle model to understand density • Internal energy and changes of state • Investigating and calculating density. • Internal energy and specific latent heat • Particle motion in gases and gas laws.	

		• Introduction to the electromagnetic spectrum.			Particle model of matter: particle motion and gas laws, investigating density.
	Rationale for this sequence	Year 7 aims to introduce the three fundamentals of physics that underpin the subsequent topics of KS3. This begins with the concept of energy stores and the law of conservation of energy. Students study different types of energy transfer and apply this to the energy demands of society, including a comparison between renewable and non-renewable energy resources. With an understanding of energy established, students are now able to explore another fundamental: forces. They study how forces can cause energy to be transferred between objects and build upon this by looking at different types of forces and utilising mathematical knowledge to calculate effects on motion. The final term then aims to introduce a third fundamental of physics. The waves topic introduces the electromagnetic spectrum and investigates how humans perceive visible light as colour. There is a focus consolidating knowledge through a comparison of light and sound.	In Year 8, students now consolidate and further their understanding of the fundamentals of physics by applying knowledge to new contexts. In heating and cooling, students use knowledge of energy transfers and relate this to thermal energy and temperature to explain heat transfer including conduction, convection and radiation. They compare and explain how each work in different mediums, including different states of matter and vacuums. The Space topic aims to widen thinking from particles to galaxies. It looks at the role of physics in understanding the Earth we inhabit and our place in the wider solar system and galaxy. Specifically, it investigates how this knowledge is built through analysing waves and exploring lenses, refraction and reflection in the importance of telescope design. The final term investigates another form of energy transfer: electrical transfer. It begins by looking at common experiences such as static electricity and moves into more abstract concepts such as current, potential difference and resistance. Here, students develop their understanding of circuitry through investigation and build to designing their own functioning circuit in the form of a quiz board.	The beginning of Year 9 begins by uniting much of the knowledge established in Year 7 and Year 8. The first topic of work looks at energy transferred by the application of a force. It employs some basic mathematics to calculate this in a quantitative way and couples knowledge of both circuitry and forces to enable students to build and operate electromagnets. The following topic of energy then furthers this knowledge by introducing the concepts of kinetic, elastic and gravitational potential energy. It builds upon the mathematical skills earlier by introducing more complicated formulae and the skills of rearranging equations. Particle model of matter systematically reviews the knowledge of particle theory and heating and cooling and builds upon this knowledge through exploring the concepts of internal energy and changes of state. Through employing formulae to calculate temperature changes within a system, students are able to go beyond explanations of energy transfer and instead interrogate them scientifically.	

	How does the KS3 Curriculum build on previous learning at KS2?	**Earth and space** KS2 students can: • Describe movement of Earth and the moon and our place in the solar system KS3 students can: • Explain day, night, years, leap years and seasons as well as phases of the moon. • Understand how data is gathered with reference to telescopes and lenses. **Forces** KS2 students can: • Explain unsupported objects fall towards Earth because of gravity. • Identify effects of air resistance, water resistance and friction • Recognise some mechanisms allow a smaller force to have a greater effect KS3 students can: • Calculate resultant forces and effect on motion of objects • Calculate moments for pivots and levers. • Interpret distance-time graphs **Light** KS2 students can: • Recognise that light travels in a straight line and can reflect into eyes. • Explain why shadows have the same shape as the objects that cast them. KS3 students can: • Describe visible light as a part of the electromagnetic spectrum • Understand the structure of the eye and ear and its role in allowing vision/hearing. • Understand how colour works through use of filters. **Electricity** KS2 students can: • Understand voltage can change brightness or volume of an object • Use circuit symbols in a simple circuit diagram. KS3 students can: • Assembly a variety of circuits from diagrams • Investigate conductors, insulators and resistance in a circuit	