Yardleys Curriculum Aims

- To achieve academic excellence
- To educate the 'whole child' so they are ready for life
- To work collaboratively and ethically to provide education of the highest standard

PHYSICS – KEY STAGE 4

Curriculum Overview

INTENT: Science helps students gain an understanding of the world around them, from the micro-level of particles and atoms to the macro-level of our expanding universe. It encourages students to question and enquire in order to learn more. We want our students to acquire the scientific knowledge and skills to meet their academic, practical and "real life" challenges of the future.

Year 9

Year 9 Physics is foundational and covers many areas that will frequently be revisited in the future. It starts with the ideas of forces and energy, which together explain how the objects that students are able to see and interact with everyday move and change. Following this the students will delve deeper into waves, a way in which energy is able to move, and then in particular at how light waves in the electromagnetic spectrum behave and how they can be used. Finishing Year 9, a student the content should equip a student with many things that may have experienced in their day to day lives – such as refraction in a glass of water, or why larger objects are harder to slow down.

	Forces and Motion	Forces	Energy	Waves	EM Spectrum
SUBSTANTIVE KNOWLEDGE	• Vectors and scalars • Speed and acceleration • Distance – time graphs and velocity time graphs	• Newton's laws of motion • Momentum • Stopping distances and crash hazards	• Energy stores and transfers • Heat transfer and insulation • Efficiency • Energy resources	• Describing waves • Calculating wave speeds and finding them experimentally • Refraction • The ears • Infrasound and ultrasound	• Light interacting with boundaries • Colour • Lenses • Electromagnetic waves • Uses and dangers of the EM spectrum • Radiation and temperature

DISCIPLINARY KNOWLEDGE	• Calculating using equations • Interpreting graphs • Improving experimental accuracy • Identifying the correct units • Using prefixes in units	• Calculating using equations • Explaining phenomena using equations • Identifying the correct units • Using prefixes in units	• Calculating using equations • Interpreting graphs • Evaluating the suitability of energy resources • Drawing energy transfer diagrams	• Drawing ray diagrams. • Calculating using multiple equations at once • Identifying the correct units • Improving experimental accuracy	• Drawing ray diagrams • Evaluating the use of different waves of the EM spectrum

Year 10

Year 10 the students will apply their knowledge of forces, energy and waves to the science of very small objects in radioactivity, then very large objects in astronomy. By spring we will have started the paper 2 content and will revisit our understanding of energy with the concepts of work and power, and study more niche examples of forces – such as rotating forces. The concept of 'force fields' - an important concept for explaining how objects will interact at a distance will be introduced, before finally our students in Year 10 will learn the science of another energy transfer in electricity, going from the fundamentals of current, voltage, charge and resistance and building it up to the way in which different components work and how electricity is related to other energies.

	Radioactivity	**Astronomy**	**Energy (Forces doing work) & Forces and their effects**	**Electricity and circuits**
SUBSTANTIVE KNOWLEDGE	• Atomic models and their history • Types of radiation and properties • Half-life • Uses and dangers of radiation • Nuclear power	• The Solar System • Gravity and orbits • Life-cycle of stars • Red-shift and the origins of the universe	• Work and power • Objects putting forces on each other • Vector diagrams • Rotational forces	• Electric circuits • Current, voltage, power, resistance • Electricity transferring energy • Electrical safety
DISCIPLINARY KNOWLEDGE	• Measuring radiation with a Geiger counter • Control variables and accounting for background radiation • Interpreting half-life graphs	• How evidence changes our understanding of the universe • Standard form and new units such as light years	• Drawing vector diagrams. • Use of different scales in drawings • Drawing and interpreting gravitational field diagrams	• Calculating using equations. • Interpreting graphs • Improving experimental accuracy • Developing models and evaluating their strengths and weaknesses

Year 11

The beginning of Year 11 is spent further studying the world of electricity, magnetism and how the two are related by electromagnetic effects. We begin with static electricity before studying magnets, and then how electricity and magnets can be combined to produce either more powerful magnets or electric motors. The students will learn about how the electricity that we have been studying is generated using wires and magnets in a process called electromagnetic induction. The work on force fields in year 10 will be expanded upon with the inclusion of both electric fields and magnetic fields. After finishing up electricity and magnetism the students will further develop their knowledge of the final energy transfer, heat, explaining its effect on particles and calculating its transfer. To finish GCSE physics the students will study some final examples of forces and their effects – in this case the way in which objects and fluids can apply pressure on each other, the force of upthrust, and finally the way in which multiple forces can change the shape of an object.

	Static Electricity	**Magnetism and Motor Effect**	**Electromagnetic Induction**	**Particle Model**	**Forces and Matter**	

SUBSTANTIVE KNOWLEDGE	• Electrical charge • Static electricity • Dangers and uses of static electricity • Electric fields	• Magnets and magnetic fields • Electromagnets • Magnetic forces and motors • Fleming's hand rules	• How a current can be induced in a circuit • The National Grid • Transformers	• Particles and density • Energy and changes of state • Energy calculations • Gas pressure related to temperature and volume	• Bending and stretching • Extension and energy transfers • Pressure in fluids	
DISCIPLINARY KNOWLEDGE	• Drawing and interpreting electric fields	• Calculating using equations • Using Fleming's hand rules • Find a magnetic field with a compass • Drawing and interpreting magnetic fields	• Equations with four terms comparing a before and after state • Evaluating advantages of using AC for the National Grid	• Equations with four terms comparing a before and after state • Identifying where anomalies may arise from	• Calculating using equations • Interpreting graphs	