

Key Stage 3 Overview – Physics

	Unit 1 - Measurement	Unit 2 - Forces	Unit 3 – Electrostatics	Unit 4 - Sound		
Year 8	<p>With emphasis on <u>managing information, thinking, problem-solving, decision making, maths, communication</u> and <u>ICT</u>.</p> <p>Pupils will: understand the measurement of length; explore techniques for making small measurements; know how to measure area and volume ($A = \text{length} \times \text{breadth}$) and ($V = \text{length} \times \text{breadth} \times \text{height}$); learn how to measure small volumes; learn how to measure time and understand periodic time; learn the terms dependent, independent and control variables; understand temperature, the units of temperature and measurement of temperature using a thermometer; plan and design an experiment to measure temperature of ice heated over a fixed period of time; know that mass is the amount of matter in something measured in Kilograms (kg).</p>	<p>With attention to <u>communication, working with others, presentation, problem solving, development of practical skills</u> and <u>decision making</u>.</p> <p>Pupils will: be given an introduction to forces; be able to describe the effects of force on an object; learn that force is measured in Newtons (N) and measured with a Newton meter or Spring Balance; solve problems and conduct experiments to show that the weight of an object is a force and is different to an object’s mass; conduct an experiment to investigate the extension of a coiled spring by adding various weights (emphasis is on experimental design and planning, ICT based presentation of results); examine contact and non-contact (or action at a distance) forces; recognize electrostatic forces, magnetic forces, gravitational force.</p>	<p>Focusing on <u>communication, self-management, information management, working with others, thinking, problem-solving, decision making</u> and <u>being creative</u>.</p> <p>Pupils will: understand electrostatics, know that matter is made up of positive and negative charges called electrons; understand charge balance and that electrostatics is the transfer of charge between objects; learn about the Van de Graff generator, thunderstorms etc; understand current electricity, circuit symbols, and be able to construct circuits; recognize that a circuit must be complete to flow, and learn the terms normal brightness, less than normal brightness, brighter than normal; conduct experiments involving conductors and insulators, 2-way switches and measure current using ammeters; execute a research project investigating an aspect of electricity and present results.</p>	<p>Using <u>good communication, information management, thinking, problem-solving, decision making</u>, and <u>being creative</u>.</p> <p>Pupils will: learn about sound production, loudness and frequency; recognize the terms pitch and frequency and appreciate the relationship between them; understand that sound needs a medium (a material) in which to travel (Bell Jar Experiment); understand hearing, the human ear and noise pollution; be aware that noise is measured on a decibel range.</p>		
Year 9	Unit 1 – Application of Forces	Unit 2 - Sound	Unit 3 – Introduction to Light	Unit 4 – Earth in Space	Unit 5 – Current Electricity	Unit 6 - Energy
	<p>Using <u>communication, writing skills, maths, ICT, thinking, problem-solving</u> and <u>decision making</u>.</p> <p>Pupils will: learn about speed and acceleration (equation: $s = d/t$); understand the terms accelerating/decelerating (equation $Acc = \text{change in speed}/\text{time}$); distinguish between balanced and unbalanced forces; understand friction, factors which influence friction and the harmful effects of friction; observe demonstrations where friction applies; learn about floating and sinking through practical demonstration and class discussion.</p>	<p>With emphasis on <u>information management, working with others, communication, writing skills, maths</u> and <u>ICT</u>.</p> <p>Pupils will: examine the speed of sound by planning and conducting experiments to measure the speed of sound in air; recognise that the speed of sound varies in different mediums i.e. air, water, gas and steel; learn about ultrasound and its applications in our society; understand that ultrasound waves are sound waves with a frequency above 20,000Hz.</p>	<p>Focusing on <u>communication, writing skills, maths, ICT, thinking, problem-solving</u> and <u>decision making</u>.</p> <p>Pupils will: learn that light is a form of energy; learn that light sources are either luminous or non-luminous; understand that light travels in straight lines hence the existence of light beams and shadows; understand the reflection of light, that light can reflect from different surfaces, that reflected light from surfaces forms images of objects; perform experiments to establish the laws of reflection; learn about the refraction of light (bending of light as it crosses the boundary of 2 transparent media; conduct experiments to measure the angle of incidence/refraction; learn about refraction in a glass prism and dispersion of light and the order of colours in the light spectrum.</p>	<p>With attention to <u>information management, problem-solving, decision making skills</u> and <u>cooperating with others</u>.</p> <p>Pupils will: be introduced to space and the following terms: universe, stars, galaxies, constellations, planets, asteroids and comets; explore the above ideas as a project to be presented as a poster or Powerpoint presentation; be introduced to the unit for measuring distances in space i.e. light year; know our nearest galaxy and star; examine experiments to measure the distance from earth to moon; learn that the solar system consists of a star, planets, moons and asteroids; understand planets move in anticlockwise, elliptical paths around the sun; explore asteroids; appreciate the factors influencing day and night on earth and also seasons of the year; examine the origins of the Universe including steady state theory and big bang theory; be aware of red shift.</p>	<p>With emphasis on <u>working with others, being creative, good communication, thinking, problem-solving</u> and <u>decision making</u>.</p> <p>Pupils will: construct circuits and understand current in parallel circuits; know what a series circuit is; understand the association between number of cells in circuit, size of current and bulb brightness; understand current splits evenly in parallel branches; learn that resistance is measured in ohms (Ω); observe the effect of a variable resistor on current; appreciate the use of resistors and variable resistors in circuits; understand short circuits and their dangers; learn about fuses and the electrical plug.</p>	<p>With attention to <u>communication, mathematics, ICT, sharing opinions, self-management, problem-solving, demonstrating practical skills</u> and <u>critical thinking</u>.</p> <p>Pupils will: define what energy is and identify energy types; understand that energy is measured in Joules (J); recognize types of energy – chemical, gravitational, potential energy, elastic potential energy (or strain energy), nuclear energy, kinetic energy, thermal (or heat energy), sound, light, electrical energy; participate in lab experiments to help them understand the ‘conservation of energy’; study energy resources including renewable and non-renewable energy sources; produce an A3 poster summarising the causes of global warming, the use of renewable energy for electricity, and the nuclear power debate.</p>
Year 10	Unit 1 – Further application of forces	Unit 2 – Magnetism and Electromagnetism	Unit 3 – Waves and the electromagnetic (EM) spectrum	Unit 4 – Temperature and heat transfer	Unit 5 – Work and energy	
	<p>With emphasis on <u>moral character, health & safety, communication, maths</u> and <u>ICT</u>.</p> <p>Pupils will: conduct experiments to find the densities of a liquid and a gas; define density (kg/m^3 or g/cm^3), density = mass/volume; understand the principles of floating and sinking in terms of density; appreciate that force is linked with area (equation: Pressure = Force/Area) measured in N/m^2 or Pascal; understand that a force making something turn is a turning force or moment; know the term pivot and that moment is the product of force and its perpendicular distance from the pivot (equation: $N = f \times d$) with units as Nm or Ncm; recognise that devices which turn about a pivot are called levers; learn the principle of moments including the law of levers; understand centre of gravity and stability.</p>	<p>Using <u>problem-solving</u> and <u>decision making skills, creativity</u> and <u>self-management</u>.</p> <p>Pupils will: appreciate magnets strongly attract ferromagnetic materials; that permanent magnets have a magnetic field; be able to plot a magnetic field around a bar magnet; recognise that a magnetic force is strongest at magnet ends or poles; understand that magnetic force lines have a direction of North to South, be aware that the Earth’s magnetic field lines run from South to North; perform the paper clips challenge; learn that when an electric current passes through a wire it generates a magnetic field around the wire called electromagnetism; be able to plot magnetic field lines around a long straight wire and also a current carrying coil; using their practical skills discover that an electromagnet can be turned on or off, direction of field lines is changed by altering the direction of current flow; learn methods of increasing electromagnetic strength.</p>	<p>Focusing on <u>information management, maths, ICT, being creative</u> and <u>problem solving</u>.</p> <p>Pupils will: learn about mechanical waves, electromagnetic waves, progressive waves, standing waves, transverse and longitudinal waves; be given the opportunity to observe different waves and realise that waves are the transfer of energy from a disturbance through material; be able to distinguish between transverse and longitudinal waves; understand terms used to describe waves with the aid of displacement-time graph; learn definitions of frequency (f), wavelength (λ), amplitude (a), and speed (v) and their respective units of measurement; know equation $v = f \times \lambda$; appreciate that EM spectrum is a family of transverse waves, which travel at the same speed in a vacuum; know the position of waves in the spectrum, radio has longest wavelength and gamma the shortest; be aware that the shorter the wavelength the more dangerous it is.</p>	<p>With attention to <u>information management, practical skills, cooperating with others, thinking, problem-solving, decision making</u>.</p> <p>Pupils will: understand the difference between Heat (energy measures in Joules) and temperature (Celsius $^{\circ}\text{C}$); realise through practical demonstrations that heat travels by conduction, convection and radiation; recognise differences between conductors and insulators and that conduction occurs in metals due to the presence of free electrons; know that convection occurs in liquid and gases and involves the physical transfer of molecules; explore how a hot water system works; examine convection in nature i.e. land/sea breezes, ocean currents, ventilation in coalmines; understand that radiation is transfer of heat by electromagnetic waves (specifically infra-red); observe experiments to show radiation heat is emitted through dull black surfaces better than a light shiny surface; discover using temperature sensors what are the best insulators for reducing heat loss; discover applications of conduction, convection and radiation in real life e.g. insulation in buildings.</p>	<p>Focusing on <u>practical skills, being creative, thinking, problem-solving, decision making, maths</u> and <u>ICT</u>.</p> <p>Pupils will: understand the close correlation between energy and work done; recall that energy is a quantity a machine or system possesses to enable it to do useful work; identify specific situations where energy changes take place when work is done and construct ‘energy transfer equations’ e.g. a car journey to school; know the equation for work done $W = F \times d$; understand that power is defined as the rate at which work is done <u>or</u> the rate at which energy is changed; be able to use the equation $P = W/t$ or $P = E/t$; understand that power is measured in watts (w) and that one watt is one joule per second $w = \text{j}/\text{s}$; plan and conduct experiments to measure the power of a person running up a flight of stairs and the power of a light bulb; learn electrical companies charge customers for units of electricity known as kilowatt-hour (kWhr).</p>	

