Key Stage 4 PHYSICS: Year 9

Overall Curriculum Goals – to develop an understanding of the development of atomic theory, and how subatomic particles interact					
Half Term 1	**Half Term 2**	**Half Term 3**	**Half Term 4**	**Half Term 5**	**Half Term 6**
				P7: Atomic Structure • Explore the current model for the structure of the atom, interpreting data to predict number and location of subatomic particles • Looking at the changes to the atomic model over time, from Dalton to the Bohr model. Evaluating the evidence that brought these changes about. • Radioactivity as a mechanism to increase nuclear stability. Looking at the effect of emitting alpha, beta, gamma and nuclear radiation on the nucleus. Properties of alpha, beta and gamma radiation, including applications, and decay equations. Interpreting information on half life and problem-solving. The effects of irradiation and contamination. • *Identifying levels of background radiation, and the need to take it into account when measuring radiation. Estimating doses of background radiation and the environmental factors which could alter a person's exposure. (TRIPLE ONLY)* • *Describing the process of nuclear fission, qualitatively and quantitatively. Looking at controlled and uncontrolled chain reactions and the consequences of each. Benefits, risks and consequences of nuclear fission as a power source. (TRIPLE ONLY)* • *Describing the process of nuclear fusion, qualitatively and quantitatively. Explaining the conditions required for fusion reactions to take place. (TRIPLE ONLY)* Required practical: None	
Key Vocabulary/Concepts/Ideas		**Key Vocabulary/Concepts/Ideas**		**Key Vocabulary/Concepts/Ideas**	
				• Protons, neutrons, electrons • Models of the atom • Radioactivity • *Nuclear fission and fusion*	
CIAG		**CIAG**		**CIAG**	
				Role of the scientist in changing/adapting accepted models	

Key Stage 4 PHYSICS: Year 10

Overall Curriculum Goals – To use the concept of conservation of energy, and energy dissipation, to quantify, predict and explain physical phenomena					
Half Term 1	**Half Term 2**	**Half Term 3**	**Half Term 4**	**Half Term 5**	**Half Term 6**
P6: Particle Model of Matter • Defining, calculating and experimentally determining density • Revisiting particle model from KS3, and using it to describe the internal energy of substances	**P1 Energy & Dissipation** • Building on work at KS3 to identify energy stores and recognise examples of objects with each store. • Recognise the mechanisms which allow work to be done in	**P2 Energy transfer by heating & P3 Energy resources** • Describe the process of conduction and recognise the thermal conductivity of	**P4 Electrical Circuits** • Draw and interpret circuit diagrams using conventional circuit symbols. Construct circuits from circuit diagrams. • Define, calculate and experimentally determine	**P5 Electricity in the Home** • Exploring the difference between a.c. and d.c. supply • Determining the characteristics of a.c. supplies • Structure and wiring of a three-pin plug	***P16 Space (TRIPLE ONLY)*** • *Identifying, describing and classifying common objects found in our universe, including planets, stars, satellites, dwarf planets, galaxies, the universe as a whole.*

• Interpreting heating and cooling curves for a range of substances, including identifying changes of state • Particle motion and pressure in gases, including the effect of temperature (qualitative only) • *Doing work on gases (TRIPLE ONLY)* • *The connection between pressure, temperature and volume for a gas, both qualitatively and quantitatively (TRIPLE ONLY)* Required practical: determining the density of regular and irregular solids, and liquids	transferring energy from one store to another • Use models to represent the conservation on energy, and recognise examples of energy being dissipated to the surroundings • Define and calculate power as the rate of doing work. • Solve problems involving calculations of kinetic, gravitational potential and elastic potential energy Required practical: none	materials as a measure of the ease of energy flow. • *Describe the process of convection and the uses of this in home heating systems (TRIPLE ONLY)* • Define, calculate and experimentally determine the specific heat capacity of materials • Strategies to reduce unwanted energy transfer, including lubrication and insulation • Efficiency calculations • Recognise a range of renewable and non-renewable energy resources, and evaluate the advantages and disadvantages of each. • Describe and explain the long-term trends in uses of energy resources in the UK, the developed world and globally. Required practical: determining the specific heat capacity of a material Required practical: *comparing the thermal conductivity of materials (TRIPLE ONLY)*	current, charge, potential difference and resistance. • Recognise the differences between series and parallel and circuits, and understand the rules that determine current and potential difference in series and parallel circuits. • Investigate how length affects the resistance of a wire • Investigate how adding resistors in series and in parallel affects the total resistance of a circuit • Experimentally determine the I-V characteristics of a fixed resistor, filament bulb and diode. • Describe the function of an LDR and thermistor, and describe how they can be used in sensing circuits. Required practical: the effect of length of wire on the resistance of a wire Required practical: the effect of adding resistors in series and in parallel on the total resistance of the circuit Required practical: determining the I-V characteristics of components	• The role of fuses and earth wires in electrical safety in the home • The components and functions of the national grid which enable safe electricity distribution • Calculating the power and efficiency of electrical appliances, and the importance of choosing the most efficient appliance. • *Describing the causes of a build-up of static charge (TRIPLE ONLY)* • *Uses and dangers of static electricity (TRIPLE ONLY)* • *Exploring electric fields and the behaviour of charged particles (TRIPLE ONLY)* Required practical: none	• *Describing the mechanics of orbital motion, and predicting the effect of changing the motion of an object in stable orbit* • *Describe the life cycle of a star including general timescales for the evolution of a star. Explain the factors and mechanisms that cause the star to move from one stage to the next* • *Describe Big Bang theory to explain the origins of the Universe. Explain why this is the most widely accepted scientific theory of the origins of the universe.* • *Describe the doppler effect, and show how this leads to the most significant evidence of an expanding universe.* Required practical: none N.b. as the combined groups have fewer lessons, they will be finishing P5 in this half term.
Key Vocabulary/Concepts/Ideas		**Key Vocabulary/Concepts/Ideas**		**Key Vocabulary/Concepts/Ideas**	
• Determining density • States of matter and changes of state • Latent heat • Gas pressure, temperature *and volume*	• Energy stores and transfers • Conservation and dissipation • Efficiency • Work and power	• Conduction *and IR radiation* • Thermal conductivity • Lubrication and insulation • Specific heat capacity • Renewable and non-renewable energy resources	• Current, charge, pd, resistance • Series and parallel circuits • Component characteristics •	• a.c. and d.c. • Electrical safety • Power and efficiency • *Static electricity* • *Electric fields*	• *Structure of the solar system* • *Orbits of planets and satellites* • *Life cycle of a star* • *Expanding universe*
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Materials scientist	Rollercoaster design	Workers in the energy sector	Electrical engineers	Electricians	Astronomy

Key Stage 4 PHYSICS: Year 11

Overall Curriculum Goals – To explain the motion of objects in terms of the forces acting upon them, and to use the wave-model of light to explain physical phenomena					
Half Term 1	**Half Term 2**	**Half Term 3**	**Half Term 4**	**Half Term 5**	**Half Term 6**
P8 Forces in balance & P9 Motion • Recognise that forces are vector quantities, represent them with free body diagrams and find the resultant of forces acting in parallel and perpendicularly. • Classify forces as contact and non-contact, and describe a field as the area that a non-contact force may be experienced. Define and calculate weight as the effect of a gravitational field on a mass. • *Calculate the turning effect of a force and use the principle of moments to predict when objects are in equilibrium (TRIPLE ONLY)* • Calculate the speed and acceleration of a moving object • Interpret graphs of motion (distance-time and velocity time) to describe journeys • Investigate the effect of forces of springs, including calculating the spring constant, and instances of elastic and plastic deformation Required practical: investigating the effect of force on the extension of a spring	**P10 Forces & Motion *& P11 Pressure (TRIPLE ONLY)*** • Recall and apply Newton's first and second laws of motion to predict the effect of forces on the motion of an object, *and link this to the inertial mass of an object (TRIPLE ONLY)* • Investigate the effect of force on the acceleration of a trolley • Recall and apply Newton's third law of motion • Describe how a vehicle comes to a stop in an emergency and identify the factors which affect the stopping distance of a vehicle, including those that effect thinking distance and those that effect braking distance. • Link the braking distance with the work done by the brakes in removing energy from the kinetic store of the vehicle and dissipating it to the surroundings as thermal energy • Calculate the momentum of a moving object and solve problems using the law of conservation of momentum • *Identify factors which affect the pressure on an object submerged in fluid, and complete calculations to find the magnitude of the pressure and the resulting force acting (TRIPLE ONLY)* Required practical: investigating the effect of force on the acceleration of a trolley	**P12 Waves & P13 Electromagnetic Waves** • Describe a wave as transferring energy or information without transferring matter • Identify the features of a longitudinal and transverse wave, and recall examples of each • Use the wave equation to solve problems about waves • Experimentally determine the speed of water waves and waves on a string • *Apply the law of reflection and recognise/describe specular and diffuse reflection (TRIPLE ONLY)* • Show that light is refracted when meeting a boundary and explain the reasons for this • Recall the electromagnetic spectrum and describe uses and dangers of each • Investigate how surface colour affects the amount of IR radiation emitted from a surface • *Explain the wavelength distribution of radiation emitted by a perfect black body at various temperatures, and how the absorption, reflection and emission of radiation by the Earth has an impact on climate (TRIPLE ONLY)* • *Describe the structure of the human ear and explain how each part enables us to hear (TRIPLE ONLY)* • *Recall typical frequencies of ultrasound waves and describe some uses of ultrasound in imaging and SONAR (TRIPLE ONLY)* • *Explain how waves can be used to explore internal structures,*	**P14 Light & P15 Electromagnetism** • *Construct accurate ray diagrams to show how images are formed using lenses. Describe some applications of each type of lens (TRIPLE only).* • *Draw ray diagrams to show what happens when light meets materials which are transparent, translucent, opaque, black and white (TRIPLE ONLY)* • *Explain that colour is a visible manifestation of wavelength, and recall the typical wavelengths of red and violet light (TRIPLE ONLY)* • *Recall that the primary colours of light are red, green and blue, and all other colours are made by mixing these colours (TRIPLE ONLY)* • *Explain how filters work, and predict the outcome of using various filters. Draw ray diagrams to show partial transmission and absorption through colour filters (TRIPLE ONLY)* • Describe the properties and magnetic fields of permanent and induced magnets • Predict the size and shape of the magnetic field around a current-carrying wire and a solenoid • Predict the magnitude and direction of the force on a current-carrying wire in a magnetic field • *Describe applications of the motor effect including motors and loudspeakers (TRIPLE ONLY)* • *Describe the induction of a potential difference when a wire*	**Revision, consolidation, terminal assessment**	

		including the structure of the Earth (TRIPLE ONLY) Required practical: Measuring the speed of waves in water and on string Required practical: investigating the effect of colour on the emission of IR radiation	*moves in a magnetic field (TRIPLE ONLY)* • *Describe applications of the generator effect including alternators, dynamos and microphones (TRIPLE ONLY)* • *Describe the structure of transformers and explain how they work (TRIPLE ONLY)* • *Use the transformer equation to predict the output of step-up and step-down transformers (TRIPLE ONLY)* Required practical: none	
Key Vocabulary/Concepts/Ideas		**Key Vocabulary/Concepts/Ideas**		**Key Vocabulary/Concepts/Ideas**
• Vectors and scalars • Resultant forces • Forces and fields • *Moments, levers and gears* • Speed, velocity and acceleration • Graphs of motion • Deformation	• Force, mass and acceleration • Stopping distance and *road safety* • Momentum (*conservation)* • *Pressure at surfaces & in fluids*	• Transverse and longitudinal • Reflection, refraction, transmission and absorption • *Sound and ultrasound* • Electromagnetic spectrum • *Structure of the Earth*	• *Light and colour* • *Lenses* • Electromagnetism • The motor effect • *Generators & transformers*	
CIAG		**CIAG**		**CIAG**
Engineering	Engineering, *fluid dynamics*	Health care applications	*Opticians*	