YEAR 10 2023-2024 AUT 2

'An ambitious curriculum that meets the needs of all'

Medium Term Planning - Topic: Electricity

Curriculum Intent	**In addition to working further on objectives from Year 7 and 9, pupils will be taught, following National Curriculum guidelines, the following this topic:**
Skills/Assessment Objective Links	• Measuring resistance using p.d. and current measurements. • Exploring current, resistance and voltage relationships for different circuit. • Elements; including their graphical representations. • Quantity of charge flowing as the product of current and time. • Drawing circuit diagrams; exploring equivalent resistance for resistors in series. • The domestic a.c. supply; live, neutral and earth mains wires, safety measures. • Power transfer related to p.d. and current, or current and resistance.
Spiritual, moral, social, and cultural development	**SMSC:** Electrical power fills the modern world with artificial light and sound, information and entertainment, remote sensing and control. The fundamentals of electromagnetism were worked out by scientists of the 19th century. However, power stations, like all machines, have a limited lifetime. If we all continue to demand more electricity this means building new power stations in every generation – but what mix of power stations can promise a sustainable future? **PSHE/British Values:** Electricity is all around us, we use it daily to transfer energy from global resources into the devices we use to improve out lives. Understanding how it works and being able to repair products when it goes wrong are important skills. This is overlaid with the spiritual and moral considerations of how electrical devices are changing our lives and society for better and worse. **Skills Builder:** Building circuits, replacing components, wiring a plug and electrical safety. Working in groups, interpreting instructions and developing practical skills.
Numeracy	**Arithmetic and numerical computation:** Recognise and use expressions in decimal form. Recognise and use expressions in standard form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations **Handling data:** Use an appropriate number of significant figures. Find arithmetic means. Construct and interpret frequency tables and diagrams, bar charts and histograms. Understand the terms mean, mode and median. Use a scatter diagram to identify a correlation between two variables. Make order of magnitude calculations. **Algebra:** Understand and use the symbols: =, <, <<, >>, >, ∝ , ~ . Change the subject of an equation. Substitute numerical values into algebraic equations using appropriate units for physical quantities. Solve simple algebraic equations. **Graphs:** Translate information between graphical and numeric form. Understand that y = mx + c represents a linear relationship. Plot two variables from experimental or other data. Determine the slope and intercept of a linear graph. Draw and use the slope of a tangent to a curve as a measure of rate of change. Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropriate. **Geometry and trigonometry:** Use angular measures in degrees. Visualise and represent 2D and 3D forms including two dimensional representations of 3D Objects. Calculate areas of triangles and rectangles, surface areas and volumes of cubes

Literacy	**Vocabulary Tier 2:** Direct, alternating, diode, insulation**,** parallel, series. **Vocabulary Tier 3:** Amps, Columbus, potential difference, current, charge, resistance, field, ohmic, static. **Reading:** Students are given opportunity to develop their skills in specified tasks that develop disciplinary literacy. Throughout the GCSE Physics and Combined Science course they develop their understanding of the requirements of exam questions and the key terminology in questions. In addition, they read practical methodology and translate this to actions in laboratory tasks. **Writing:** Students construct answers independently and through class teaching. Their answers range from single word answers to the planning and writing of 6-mark "extended writing" tasks that require linking of multiple concepts from a topic. These often develop students ability to construct written evaluations of contrasting situations, where the use of comparative connectives are required. **Oracy:** Students are regularly given the opportunity to practice their scientific vocabulary in class discussion, through choral response and in giving instruction to others during practical activities.
Becoming future ready	**Careers/Employability:** National grid and water management. Power plant operations and engineering. Electrician and maintenance. Electrical engineering. Consumer product design. Communications. Automotive design.
Adaptation **QFT/SEND Provision**	Throughout this topic, quality first teaching will provide differentiation: **By product:** Assessments have opportunities for students to achieve all grades, with structured questions and opportunities for development of extended writing for all abilities. **By resource:** PowerPoints, worksheets and booklets are differentiated as appropriate and produced in conjunction with class teachers for students who would benefit from additional scaffolding of resources in order to achieve their potential. **By Intervention**: by providing different levels of supervision and support, including the specific deployment of teaching assistants within lessons. Structured intervention is planed and delivered based on summative assessment results. **By Progressive Questioning:** exploring pupils' understanding through interactive dialogue. **By Grouping:** according to prior attainment, gender, social preference. **By Task:** Pupils should be involved in the identification of targets which are meaningful to them and in the selection of an appropriate task from the given range. **By Offering Optional Activities:** In class or as homework, to extend learning. This QFT/SEND provision will be explicit within the lesson-by-lesson schemes of work.
Implementation Curriculum Delivery	To be able to: 2.1 Current, potential difference and resistance • P.2.1.1.a - I can draw and interpret circuit diagrams, including the circuit symbols for: switch, cell, battery, diode, resistor, variable resistor, LED, lamp, fuse, voltmeter, ammeter, thermistor, LDR. • P.2.1.2.a - I can define electric current as the rate of flow of electrical charge around a closed circuit. • P.2.1.2.b - I can calculate charge and current by recalling and applying the formula: Q = It • P.2.1.2.c - I can explain that current is caused by a source of potential difference and it has the same value at any point in a single closed loop of a circuit. • P.2.1.3.a - I can describe and apply the idea that the greater the resistance of a component, the smaller the current for a given potential difference (p.d.) across the component. • P.2.1.3.b - I can calculate current, potential difference or resistance by recalling and applying the equation: V = IR • Required Practical 3: I can investigate, using circuit diagrams to set up a circuit, the factor(s) that affect the resistance of an electrical component. • P.2.1.4.a - I can define an ohmic conductor as one for which current through it is directly proportional to the potential difference across it (at a constant temperature) and sketch/interpret the current-voltage graph of an ohmic conductor. • P.2.1.4.b - I can explain that the resistance of components such as lamps, diodes, thermistors and LDRs is not constant, and sketch/interpret IV graphs of their characteristic electrical behaviour.

Learning Outcomes (Knowledge)	• P.2.1.4.c - I can explain how to measure the resistance of a component by measuring the current through, and potential difference across, the component, drawing an appropriate circuit diagram using correct circuit symbols. • Required practical 4: I can investigate, using circuit diagrams to construct circuits, the V-I characteristics of a filament lamp, a diode and a resistor at constant temperature. 2.2 Series and parallel circuits • P.2.2.1.a - I can show by calculation and explanation that components in series have the same current passing through them, and the total potential difference shared between them. • P.2.2.1.b - I can show by calculation and explanation that components connected in parallel have the same the potential difference across each of them, and the total current through the circuit shared between them. • P.2.2.1.c - I can calculate the total resistance of two components in series as the sum of the resistance of each component using the equation: Rtotal = R1 + R2 • P.2.2.1.d - I can explain qualitatively why adding resistors in series increases the total resistance whilst adding resistors in parallel decreases the total resistance. • P.2.2.1.e - I can solve problems for circuits which include resistors in series using the concept of equivalent resistance. 2.5 Static electricity (Physics only) • P.2.5.1.a - I can describe how insulating materials may become electrically charged when rubbed against each other due to electrons being moved from one material to the other. I can explain why one material becomes positively charged and the other becomes negatively charged. • P.2.5.1.b - I can describe evidence that charged objects exert forces of attraction or repulsion on one another when not in contact and determine whether charged objects will attract or repel based on their charges. • P.2.5.1.c - I can explain how the transfer of electrons between objects can explain the phenomenon of static electricity, including how sparks are created. • P.2.5.2.a - I can draw the electric field pattern for an isolated charged sphere. • P.2.5.2.b - I can explain the concept of an electric field, and the decrease in its strength as the distance from it increases and sketch the electric field pattern for an isolated charged sphere. • P.2.5.2.c - I can explain how the concept of an electric field helps to explain the non-contact force between charged objects as well as other electrostatic phenomena such as sparking. 2.3 Domestic uses and safety • P.2.3.1.a - I can explain the difference between direct and alternating voltage and current, stating that UK mains is an a.c. supply of 50 Hz and 230 V. • P.2.3.2.a - I can identify and describe the function of each wire in a three-core cable. • P.2.3.2.b - I can state that the potential difference between the live wire and earth (0 V) is about 230 V, and that both neutral wires and our bodies are at, or close to, earth potential (0 V). • P.2.3.2.c - I can explain that a live wire may be dangerous even when a switch in the mains circuit is open by explaining the danger of providing any connection between the live wire and earth. 2.4 Energy transfers • P.2.4.1.a - I can calculate power by recalling and applying the equations: P = VI and P=I2R • P.2.4.2.a - I can describe how appliances transfer energy to the kinetic energy of motors or the thermal energy of heating devices because work is done when charge flows in a circuit. • P.2.4.2.b - I can calculate and explain the amount of energy transferred by electrical work by recalling and applying the equations: E = Pt and E = QV • P.2.4.3.a - I can identify the National Grid as a system of cables and transformers linking power stations to consumers. • P.2.4.3.b - I can explain why the National Grid system is an efficient way to transfer energy, with reference to change in potential difference reducing current and therefore heat loss, for a given electrical power.
Current learning to be developed in the future within:	• Topic 7 – Electromagnetism.
Assessment	Refer to assessment maps for formative and summative assessment opportunities.
Impact	Attainment and Progress – Refer to assessment results / data review documentation.