YEAR 11 2023-2024 SPR 1

'An ambitious curriculum that meets the needs of all'

Medium Term Planning - Topic: Electromagnetism

Curriculum Intent	**In addition to working further on objectives from Years 7-9, pupils will be taught, following National Curriculum guidelines, the following this topic:** • Exploring the magnetic fields of permanent and induced magnets, and the Earth's magnetic field, using a compass. • Magnetic effects of currents, how solenoids enhance the effect. • How transformers are used in the national grid and the reasons for their use.
Skills/Assessment Objective Links	
Spiritual, moral, social, and cultural development	**SMSC:** Since the industrial revolution engineers have been utilizing the energy stored in fossil fuels to create mechanical motion. This has enabled the rapid expansion of manufacture and transportation industries together with the ability to generate electricity on a mass scale leading to huge advances in society. However, they have come with an unanticipated cost – climate change. Students learn about electromagnetism and its ability generate electricity and motion in what can be a more ethical, moral and environmental friendly way. **PSHE/British Values:** EM is the foundation for electric cars, emission free factories and renewable electricity generation. These technologies will drive economic growth and employment in the early part of 21st century. Learning about the Physics and engineering behind these technologies position our students to rapidly become successful members of this new emerging society. **Skills Builder:** Analysis and evaluation 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:** Electric field, magnetic field, transformer, conductor, alternator, attraction, dynamo, electromagnetic, generator, motor, magnetic pole, repulsion. **Vocabulary Tier 3:** Induction, solenoid, Tesla. **Reading:** Students are given the 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:** Medical treatment and diagnosis, medical research, electricity generation, national grid engineering and maintenance, automotive design, consumer product design, environmental sustainability consultation, naturalist.
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 **Learning Outcomes (Knowledge)**	To be able to: • P.7.1.1.a - I can describe the attraction and repulsion between unlike and like poles of permanent magnets and explain the difference between permanent and induced magnets. • P.7.1.1.b - I know that magnetic attraction and repulsion are examples of non-contact forces and that magnetic forces are strongest at the poles of a magnet. • P.7.1.2.a - I can draw the magnetic field pattern of a bar magnet, showing how field strength and direction are indicated, and change from one point to another. • P.7.1.2.b - I can explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic. • P.7.1.2.c - I can describe how to plot the magnetic field pattern of a magnet using a compass. • P.7.1.2.d - I know that Iron, Nickel and cobalt are magnetic metals. • P.7.2.1.a - I can state examples of how the magnetic effect of a current can be demonstrated, and explain how a solenoid arrangement can increase the magnetic effect of the current. • P.7.2.1.b - I can draw the magnetic field pattern for a straight wire carrying a current and for a solenoid (showing the direction of the field). • P.7.2.1.c - (Physics only) I can interpret diagrams of electromagnetic devices in order to explain how they work. • P.7.2.2.a (HT) - I can state and use Fleming's left-hand rule and explain that the size of the induced force depends on the magnetic flux density, current in, and length of, the conductor in the magnetic field. • P.7.2.2.b (HT) - I can calculate the force on a conductor carrying a current at right angles to a magnetic field by applying, but not recalling, the equation: F = B I L • P.7.2.3.a (HT) - I can explain how rotation is caused in an electric moto. • P.7.2.4.a (HT Physics only) - I can explain how a moving-coil loudspeaker and headphones work. • P.7.3.1.a - I can describe the principles of the generator effect, including the direction of induced current, effects of Lenz' Law, and factors that increase induced p.d., and apply them in a given context. • P.7.3.2.a - I can explain how the generator effect is used in an alternator to generate a.c. and in a dynamo to generate d.c. • P.7.3.2.b - I can draw/interpret graphs of potential difference generated in the coil against time. • P.7.3.3.a - I can explain how a moving-coil microphone works. • P.7.3.4.a - I can explain how the effect of an alternating current in one coil inducing a current in another is used in transformers. • P.7.3.4.b - I can explain how the ratio of the potential differences across the two coils depends on the ratio of the number of turns on each, and so distinguish a step-up from a step-down transformer. • P.7.3.4.c - I can apply the equation linking the p.d.s and number of turns in the two coils of a transformer to the currents and the power transfer involved, and relate these to the advantages of power transmission at high voltages.

	• P.7.3.4.d - I can calculate the number of turns on each coil of transformers, and the voltage or current through them, by understanding that ideal transformers' input and output powers are the same, and by applying but not recalling the equations: Vs × Is = Vp x Ip
Current learning to be developed in the future within:	• Topic 8 – Space.
Assessment	Refer to assessment maps for formative and summative assessment opportunities.
Impact	Attainment and Progress – Refer to assessment results / data review documentation.