Meridian Trust

GCSE Physics: Curriculum Overview

Unit	Rationale for Sequence	Disciplinary knowledge map	Lessons in sequence
P1a	Energy underpins all aspects of physics and is a fundamental concept. Builds on and develops knowledge of energy stores and transfers from KS3. Methods of energy generation builds on knowledge of energy stores to contextualise and apply. Aspects of energy in all future units.	**RP- Insulation** Understanding patterns and ensuring validity with clear variables//development of method/procedures/Conclusions to determine best and worst insulators + alt methods for thickness of insulator.	L. 1 Energy Stores and transfers L. 2 Energy transfers and energy conservation L 3 Thermal transfers: conduction, convection and radiation L. 4 Investigating unwanted energy transfers (req practical) L. 5 Investigating unwanted energy transfers (req practical) analysis and application L.6 Renewable electricity generation: Wind and solar L.7 Renewable electricity generation: Biomass and Geothermal L.8 Non-renewable energy (includes how power stations work) L.9 Consolidation of learning through data task
P3	Builds on knowledge of energy in P1a, links to C2 and KS3 Particle Model Builds up from KS3 Science on particles and how they relate to the properties of the whole object, with a focus on the density of objects. It incorporates concepts covered in C1. Finally, the topic takes the ideas of energy and energy stores from P1a and uses it to explain the changes in particle behaviour for the changes of state and explaining pressure and pressure changes in a system.	**Required Practical: Density** Taking measurements with different apparatus, identifying and reducing errors, identifying resolution of apparatus and uncertainty in results, comparing results to known values and explain discrepancies. **Required Practical: Specific Heat Capacity** Identifying errors and ways to reduce errors, comparing results to known values and explain discrepancies. **Other disciplinary knowledge**: Modelling particles in the states of matter Modelling changes to particle behaviour with changes in energy Modelling particle behaviour in gases and how pressure is affected by changes Explaining temperature graphs for a substance as a substance changes states of matter linking to energy and the particle model Application of mathematical techniques.	L1: Density and the States of Matter L2: Density Required Practical (regular) L3: Density Required Practical (irregular) L4: Changes of State L5: Internal Energy L6: Specific Latent Heat L7 Specific Heat Capacity (Theory) L8: Specific Heat Capacity Required Practical L9: Specific Heat Capacity Required Practical (data analysis) L10: Pressure and Temperature in Gases (Separate Science) L11: Pressure and Volume in Gases (Separate Science)
P4	Builds on KS3 and C1. Looking at the structure of the atom and then focusing more on the nucleus. It shares common content with C1 for the development of models for the atom, but with more focus on the discovery of the nucleus. From here it will diverge and focus on radiation, its uses, and dangers. This links forward to P8 and the fusion in star as well as P1a for nuclear power. Links to Biology B3 cancer topic.	No RP **Other disciplinary knowledge**: Models of the atom Modelling the gold leaf experiment Understanding changes to scientific theory is through evidence Classification Pattern-seeking Risk analysis – of contamination/irradiation, using radioactive sources safely Half-life graphs – using to identify half-life and explaining the pattern seen Conclusions based on experimental results	L1:Atoms and Isotopes L2:The Development of the Atomic Model L3:Radioactive Decay and Nuclear Equations L4:Nuclear Radiation L5:Half-Lives L6:Radiation Risks L7:Uses of Nuclear Radiation L8:Nuclear Fission and Fusion (Separate Science)
P1b	The Energy Calculations topic builds on earlier ideas of energy stores and transfers to practice the more challenging energy calculations. Students will have more strongly developed Maths skills (linked to mathematics curriculum sequencing) at this point in the course to be able to confidently manipulate algebraic formulae.	No RP **Other disciplinary knowledge**: Apparatus/procedures (e.g. can students identify the best way to measure the variables stated in the equations?)	L1: Energy part 1 recap L2: Work done and Power L3: Gravitational Potential Energy L4: Elastic Potential Energy L5: Kinetic Energy L6: Conservation of Energy calcs

P2	Builds on circuits from KS3 through a more complete understanding of resistance, the factors that affect it and how we can design circuits to take advantage of resistance. It also builds on C1 where properties of metals are described and explained. The concept of potential difference is a difficult one to grasp and students need to have experience of producing models in more simple topics (e.g. particle model) before engaging with potential difference. Mains electricity generation links to P1a. P2 needs to be covered in advance of P7 to ensure understanding of transformer function.	**R of components/IV characteristic graphs** Explaining how and why we use certain equipment/resolution/explaining graphical trends by applying knowledge/safety/tables **Other disciplinary knowledge**: Modelling Application of mathematical techniques	L1: Drawing Circuits L2: Current, charge and circuits L3: Current in series and parallel L4: Potential difference and resistance L5: Resistance and Ohm's Law L6: Resistance of a wire L7: Ohmic Conductors L8: Non-Ohmic conductors L9: Sensing Circuits (LDR and Thermistor) L10: Series and Parallel Circuits L11: Mains Electricity L12: Energy Transfers in Appliances L13: Electrical Energy and Power Equations L14: The National Grid L15: Static Electricity (Separate Science)
P5	Forces is a large, complex topic. It requires a variety of skills (both qualitative and quantitative). Students need to have reached a level of competency to access this difficult topic. They need to be able to manipulate algebraic equations and interpret a variety of mathematical relationships graphically. It builds on energy through W = Fs, forces and braking, Hooke's Law and pressure from P3. Links to maths curriculum with scales, trigonometry, tangents, areas, gradients, unit conversions and algebraic rearranging.	**F = ma** Identifying variables and validity/Justifying the use of equipment/Resolution and Precision/identifying and proving graphical relationships/forming conclusions **Hooke's Law** Explaining particular steps in the method/identifying and proving graphical relationships/gradients and areas/unit conversion/discussing limitations/tables **Other disciplinary knowledge**: Scale drawing Application of mathematical techniques	L1 Introduction to Forces L2 Mass, Weight, gravity L3 Resultant Forces L4 work done and energy L5 Hooke's Law L6 Hooke's Law Practical L7 Distance, displacement and speed L8 Acceleration and velocity-time graphs L9 Acceleration part 2 L10 Newtons Laws L11 F=ma required practical L12 Terminal velocity L13 Momentum 1 L14 Momentum 2 L15 Stopping distances L16 Moments 1 (Separate Science) L17 Levers, gears and centre of mass(Separate Science) L18 Pressure- solids and fluids (Separate Science) L19Pressure- atmospheric (Separate Science) L20 Pressure- Upthust and Flotation (Separate Science)

P6	Waves deals with some more conceptually difficult ideas. It brings in ideas of energy transfers (P1), frequency (first met in P2), speed (P5) and the electromagnetic spectrum (first met in P4). The mathematical demands of the topic tend to be harder with small and large prefixes regularly used. Required practical 8 is more procedurally demanding that many of the earlier required practicals.	**RP 8 (20 Trilogy) Wave speed):** apparatus, measurement and reducing error, calculation of wave speed. **Uses of the electromagnetic spectrum** evidence, validity, peer review. **RP 10 (21 Trilogy) Absorption and Emission or Infrared:** fair test, pattern-seeking, conclusion. **RP 9 (Physics only)** Investigation of Reflection and Refraction: apparatus (e.g. protractor), measurement, pattern seeking, tables, conclusions.	L1: Types of Waves L2: The Wave Speed Equation L3: Wave Speed Required Practical 8 (20) L4: The Electromagnetic Spectrum L5: Uses of the Electromagnetic Spectrum L6: Infrared Required Practical 10 (21) L7: Reflection (Separate Science) L8: Refraction (Separate Science) L9: Reflection & Refraction Required Practical 9 L10: Lenses (Separate Science) L11: Visible light and Colour (Separate Science) L12: Black Body Radiation (Separate Science) L13: Sound and Hearing (Separate Science) L14: Waves for Detection and Exploration (Separate Science)
P7	Conceptually more demanding and requires knowledge of Energy and Forces from earlier modules. GCSE ideas from Energy and Forces are built on, as well as threshold magnetism concepts from KS3. Links to Electricity generation from P1a and P2 with household electricity.	No RP, however there is disciplinary knowledge built into the unit. Pattern-seeking e.g. effect of current/number of turns on strength of field Experimental procedures to build and test electromagnets/electric motors	L1: Introduction to Magnetism + Compasses L2: Electromagnets L3: Use of Electromagnets L4: Force on a current carrying wire L5: DC Motors L6:Electromagentic Induction (Separate Science) L7:Uses of Electromagnetic Induction (Separate Science) L8: Transformers (1)
P8	(Separate Science topic) Whilst looking like a stand-alone topic, there are a number of synoptic elements requiring prior knowledge from earlier topics, including frequency/wavelength (P6), black body radiation (P6), forces (for orbits) (P5) and Fusion in stars (P4).	No RP **Other disciplinary knowledge**: How theories are developed and replaced using evidence	L1- Our Solar System L2- Life Cycle of a Star L3- Red shift and evidence for the Big Bang L4- The Future of the Universe and orbits