YEAR 10 2023-2024 SPR 1

'An ambitious curriculum that meets the needs of all'

Medium Term Planning - Topic: Particle Model of Matter

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:**
Skills/Assessment Objective Links	• Relating models of arrangements and motions of the molecules in solid, liquid and gas phases to their densities. • Melting, evaporation, and sublimation as reversible changes. • Calculating energy changes involved on heating, using specific heat capacity; and those involved in changes of state, using specific latent heat. • Links between pressure and temperature of a gas at constant volume, related to the motion of its particles (qualitative).
Spiritual, moral, social, and cultural development	**SMSC:** The particle model is widely used to predict the behaviour of solids, liquids and gases and this has many applications in everyday life such as inflating balloons, boiling pasta and making ice cubes. It further extends to environmental challenges facing society including how particles in the atmosphere absorb energy, the principles of changing density in the oceans and melting of the ice caps linking to raising sea levels. **PSHE/British Values:** Links to insulating, heating and cooling homes. Cooking, heating and cooling food. Climate change. Spiritually students understand the smallest building block of the universe – the atom – and how atoms interact with energy. **Skills Builder:** Understanding how scientific ideas develop over time (the scientific model). Use and interpretation of models.
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:** Melting, boiling, evaporating, condensing, solidifying, freezing, state, pressure. **Vocabulary Tier 3:** Atom, electron, proton, neutron**,** specific heat capacity, latent heat, vaporization. **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:** Materials science, sports science, sustainability consultation, food, science, raw material extraction and processing, plumbing and heating, maintenance, thermal engineering, meteorology.
Adaptation	Throughout this topic, quality first teaching will provide differentiation:
QFT/SEND Provision	**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: • Required Practical - I can investigate, using appropriate apparatus, the densities of regular and irregular solid objects and liquids, making and recording appropriate measurements. • P.3.1.1.a - I can calculate the density of a material by recalling and applying the equation: $\rho = m/V$ • P.3.1.1.b - I can recognise/draw simple diagrams to model the difference between solids, liquids and gases.

Learning Outcomes (Knowledge)	• P.3.1.1.c - I can use the particle model to explain the properties of different states of matter, and differences in the density of materials. • P.3.1.2.a - I can recall and describe the names of the processes by which substances change state. • P.3.1.2.b - I can use the particle model to explain why a change of state is reversible and affects the properties of a substance, but not its mass. • P.3.2.1.a - I can state that the internal energy of a system is stored in the atoms and molecules that make up the system. • P.3.2.1.b - I can explain that internal energy is the total kinetic and potential energy of all the particles in a system, and that heating increases the energy of these particles, either raising the temperature of the substance, or changing its state. • P.3.3.1.a - I can explain that the molecules of a gas are in constant random motion, and that the higher the temperature of a gas, the greater the particles' average kinetic energy. • P.3.3.1.b - I can explain, with reference to the particle model, the effect of changing the temperature of a gas held at constant volume on its pressure. • P.3.3.2.a - (Physics only) I can explain, with reference to the particle model, how increasing the volume in which a gas is contained can lead to a decrease in pressure when the temperature is constant. • P.3.3.2.b - (Physics only) I can calculate the pressure for a fixed mass of gas held at a constant temperature by applying, but not recalling, the equation: p V = constant • P.3.3.3.a - (HT Physics only) I can explain how work done on an enclosed gas can lead to an increase in the temperature of the gas, as in a bicycle pump. • P.1.2.1.a. - I can describe the relationship between thermal conductivity and the rate of energy transfer by conduction across the material. • P.1.2.1.b. - I can describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls. • Black Body Radiation (Physics Only) • Required practical: I know how to investigate the effectiveness of different materials as thermal insulators and the factors that may affect the thermal insulation properties of a material • P.6.3.1.a. - I know that all objects emit infrared radiation and can describe the relationship between the temperature of a body and the amount of infrared radiation it emits in a given time. • P.6.3.1.b. - I can describe a perfect black body as an object that absorbs all of the radiation incident on it and a perfect black body would be the best possible emitter of infrared radiation. • P.6.3.2.a. - I can that the intensity and wavelength distribution of any emission depends on the temperature of an object. • P.6.3.2.b. - I can explain how the temperature of a body is related to the balance between incoming radiation absorbed and radiation emitted and apply this concept to everyday situations as well as the factors that determine the temperature of the Earth. • P.3.2.2. - I can describe how the temperature change of a system depends on the mass of the substance heated, the type of material and the energy input to the system. • P.3.2.2.b. - I can define the term specific heat capacity and I can apply the equation: $E=mC\Delta\theta$ • P.3.2.3.a. - I can define the term specific latent heat and apply the equation $E=mL$. • P.3.2.3.b. - I can explain that the energy supplied during a change of state changes the internal energy, but not the temperature and I can interpret heating and cooling graphs that include changes of state.
Current learning to be developed in the future within:	• Topic 4 – Forces • Topic 6 – Waves • 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.