Ravens Wood School
KS4 Curriculum Plan

Subject: Year 9 P.3 The Particle Model of Matter

Overarching Topic: P.3 The Particle Model of Matter			
Why is this topic being studied at this time? How does it fit into the wider subject curriculum?	The particle model is widely used to predict the behaviour of solids, liquids and gases and this has many applications in everyday life. It helps us to explain a wide range of observations and engineers use these principles when designing vessels to withstand high pressures and temperatures, such as submarines and spacecraft. It also explains why it is difficult to make a good cup of tea high up a mountain! Having looked at states of matter in KS3 the next step is to think about all the interactions and how it effects pressures and temperatures. This is an in depth look into particle interactions		
	Essential	**Core**	**Ambitious**
The Big Questions (What questions will students be able to answer upon mastery of the topic?)	How can the density of regular and irregular shapes can be found by experiment? Can you draw, describe and explain the different particle arrangements in solids, liquids and gases due to the bonds between the atoms? Why do substances change state? What effect does increasing the temperature of an object have on the atoms that make up the object? Why does a half-full kettle heat up faster than a full kettle of water? Why are gas cylinders likely to explode in a fire?	Can you calculate the density, mass or volume of an object given any two other values? Can you describe the motion of particles in solids, liquids and gases? Why do the different states of matter have different densities in terms of mass and volume of the material? Why does the temperature of a substance remain constant when the substance is changing state? How does the strength of the bonds between the particles affect how much energy is needed to change the state of the substance? Can you calculate the change in thermal energy, mass, specific heat capacity or the temperature change of a substance that is heated or cooled? Why is more energy required to vaporise 1 kg of water than to melt 1 kg of ice? How does changing the volume of a gas affects the pressure?	Why do objects float? What are the limitations of the particle model of matter? How well do these models cope with water which is less dense than ice (solid water)? How, when a substance changes state, does the mass of the substance remain unchanged? Why is water used in central heating systems? Can you evaluate the use of different coolants used in fridges in terms of the specific latent heat of the coolant and the boiling point of the coolant? Why do gases exert a force on a container?
	TRIPLE ONLY QUESTIONS Why is it easy to compress a gas, but not solids or liquids? Using the equation $[p\,V = constant]$ how does increasing the volume of a container affect the pressure?	**TRIPLE ONLY QUESTIONS** How does the temperature of a gas affect the movement of the particles within it? How can doing work on an enclosed gas in a given situation, eg a bicycle pump, lead to an increase in temperature of the gas?	**TRIPLE ONLY QUESTIONS** What does a barometer measure and how does it work? Why do scuba divers suffer from decompression sickness if they surface too quickly? Why do gas cylinders freeze if they are opened and the gas inside is allowed to escape too quickly?

The Key Skills/ Techniques

The sophistication and application of skills will become more advanced as students' progress through the critical, core and pinnacle knowledge.

Skill/Technique	How will this skill be developed?
1. Graphing & Drawing	Draw graphs with suitable scales, axes and units. Correct line of best fit. Appreciation of anomalies and processed data. Scientific drawing of cells, concepts and scientific equipment.
2. Variables	Identify independent, dependent and control variables and devise experiments to include these to ensure valid results. Appreciation of uncertainty.
3. Data Analysis	Describe, explain and predict trends. Graph and table data interpretation. Identify links and patters within and between topics. Statistical analysis of data to include mode/median/mean/range determination. Drawing justified conclusions from presented data.
4. Application	Apply known and taught theory in unfamiliar contexts. Making links to taught theory and extracting key ideas. Communicating using correct scientific terminology.

	5. Working Scientifically	Identify hazards and planning to limit risk. Describe how to improve accuracy/precision/repeatability/reproducibility/validity. Evaluate reliability of methods and investigations, taking in to account data analysis.