SP14: **Particle Model** (Paper 2)
SP15: **Forces and Matter** (Paper 2)

Lesson	Objectives Tracker Sheet	Date covered	I know this well	I need to do more work on this
SP14a Particles and density	P14.1 Use a simple kinetic theory model to explain the different states of matter (solids, liquids and gases) in terms of the movement and arrangement of particles.			
	P14.2 Recall and use the equation: density (kilograms per cubic metre, kg/m3) = mass (kilograms, kg) / volume (cubic metres, m3). $\rho = m/V$			
	P14.4 Explain the differences in density between the different states of matter in terms of the arrangements of the atoms or molecules.			
	P14.5 Describe that when substances melt, freeze, evaporate, boil, condense or sublimate mass is conserved and that these physical changes differ from some chemical changes because the material recovers its original properties if the change is reversed			
SP14a Investigating densities – Core Practical	P14.3 Investigate the densities of solids and liquids.			
SP14b Energy and changes of state	P14.6 Explain how heating a system will change the energy stored within the system and raise its temperature or produce changes of state.			
	P14.7 Define the terms specific heat capacity and specific latent heat and explain the differences between them.			
	P14.10 Explain ways of reducing unwanted energy transfer through thermal insulation.			
SP14c Energy calculations	P14.8 Use the equation: change in thermal energy (joule, J) = mass (kilogram, kg) × specific heat capacity (joule per kilogram degree Celsius, J/kg °C) × change in temperature (degree Celsius, °C) $\Delta Q = m \times c \times \Delta\theta$			
	P14.9 Use the equation: thermal energy for a change of state (joule, J) = mass (kilogram, kg) × specific latent heat (joule per kilogram, J/kg) $Q = m \times L$			
SP14c Investigating water – Core Practical	P14.11 Core Practical: Investigate the properties of water by determining the specific heat capacity of water and obtaining a temperature-time graph for melting ice.			
	P14.12 Explain the pressure of a gas in terms of the motion of its particles.			

SP14d Gas temperature and pressure	P14.13 Explain the effect of changing the temperature of a gas on the speed of its particles and hence on the pressure produced by a fixed mass of gas at constant volume (qualitative only).			
	P14.14 Describe the term absolute zero, −273°C, in terms of the lack of movement of particles.			
	P14.15 Convert between the Kelvin and Celsius scales.			
SP14e Gas pressure and volume	P14.16P Explain that gases can be compressed or expanded by pressure changes.			
	P14.17P Explain that the pressure of a gas produces a net force at right angles to any surface.			
	P14.18P Explain the effect of changing the volume of a gas on the rate at which its particles collide with the walls of its container and hence on the pressure produced by a fixed mass of gas at constant temperature.			
	P14.19P Use the equation: P1 × V1 = P2 × V2 to calculate pressure or volume for gases of fixed mass at constant temperature.			
	P14.20P **H** Explain why doing work on a gas can increase its temperature, including a bicycle pump.			
SP15a Bending and stretching	P15.1 Explain, using springs and other elastic objects, that stretching, bending or compressing an object requires more than one force.			
	P15.2 Describe the difference between elastic and inelastic distortion.			
	P15.5 Describe the difference between linear and non-linear relationships between force and extension.			
SP15b Extension and energy transfers	P15.3 Recall and use the equation for linear elastic distortion including calculating the spring constant: force exerted on a spring (newton, N) = spring constant (newton per metre, N/m) × extension (metres, m) F = k × x			
	P15.4 Use the equation to calculate the work done in stretching a spring: energy transferred in stretching (joule, J) = 0.5 × spring constant (newton per metre, N/m) × (extension (metres, m))2 E = ½ × k × x2			
SP15b Investigating springs – Core Practical	P15.6 Investigate the extension and work done when applying forces to a spring			
SP15c Pressure in fluids	P15.7P Explain why atmospheric pressure varies with height above the Earth's surface with reference to a simple model of the Earth's atmosphere.			

	P15.8P Describe the pressure in a fluid as being due to the fluid and atmospheric pressure			
	P15.9P Recall that the pressure in fluids causes a force normal to any surface			
	P15.10P Explain how pressure is related to force and area, using appropriate examples			
	P15.11P Recall and use the equation: pressure (pascal, Pa) = force normal to surface (newton, N)/area of surface square metre, m2), P =			
	P15.12P Describe how pressure in fluids increases with depth and density			
SP15d Pressure in upthrust	P15.13P **H** Explain why the pressure in liquids varies with density and depth.			
	P15.14P **H** Use the equation to calculate the magnitude of the pressure in liquids and calculate the differences in pressure at different depths in a liquid: pressure due to a column of liquid (pascal, Pa) = height of column (metre, m) ´ density of liquid (kilogram per cubic metre, kg/m3) ´ gravitational field strength (newton per kilogram, N/kg). P = h ´ ρ ´ g			
	P15.15P **H** Explain why an object in a fluid is subject to an upwards force (upthrust) and relate this to examples including objects that are fully immersed in a fluid (liquid or gas) or partially immersed in a liquid.			
	P15.16P **H** Recall that the upthrust is equal to the weight of fluid displaced.			
	P15.17P **H** Explain how the factors (upthrust, weight, density of fluid) influence whether an object will float or sink.			