AQA Physics GCSE Student Progress

Unit 4.3 - Particle Model of Matter

4.3.1. Changes of State and the Particle Model

4.3.1.1. Density of Materials

a	I can recall and apply the following equation: density = mass / volume $\rho = m / V$ density, ρ, in kilograms per metre cubed, kg/m^3 mass, m, in kilograms, kg volume, V, in metres cubed, m^3			
b	I know that the particle model can be used to explain: • the different states of matter; • differences in density.			
c	I can recognise / draw simple diagrams to model the difference between solids, liquids and gases.			
d	I can explain the differences in density between the different states of matter in terms of the arrangement of atoms or molecules.			

4.3.1.2. Changes of State

a	I can describe how, when substances change state (melt, freeze, boil, evaporate, condense or sublimate), mass is conserved.			
b	I know that changes of state are physical changes which differ from chemical changes because the material recovers its original properties if the change is reversed.			

4.3.2. Internal Energy and Energy Transfers

4.3.2.1. Internal Energy

a	I know that energy is stored inside a system by the particles (atoms and molecules) that make up the system. This is called internal energy.			
b	I know that internal energy is the total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system.			
c	I know that heating changes the energy stored within the system by increasing the energy of the particles that make up the system. This either raises the temperature of the system or produces a change of state.			

4.3.2.2. Temperature Changes in a System and Specific Heat Capacity

a	I know that, if the temperature of the system increases, the increase in temperature depends on the mass of the substance heated, the type of material and the energy input to the system.			
b	I can apply the following equation (it will be provided on the physics equation sheet): change in thermal energy = mass × specific heat capacity × temperature change $\Delta E = m c \Delta \theta$ change in thermal energy, ΔE, in joules, J mass, m, in kilograms, kg specific heat capacity, c, in joules per kilogram per degree Celsius, J/kg °C temperature change, $\Delta \theta$, in degrees Celsius, °C.			
c	I know that, the specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius.			

4.3.2.3. Changes of Heat and Specific Latent Heat

a	I know that the energy needed for a substance to change state is called latent heat.			
b	I know that the specific latent heat of a substance is the amount of energy required to change the state of one kilogram of the substance with no change in temperature.			
c	I know that, when a change of state occurs, the energy supplied changes the energy stored (internal energy) but not the temperature.			
d	I can apply the following equation (it will be provided on the physics equation sheet): energy for a change of state = mass × specific latent heat $E = m L$ energy, E, in joules, J mass, m, in kilograms, kg specific latent heat, L, in joules per kilogram, J/kg			
e	I know that the specific latent heat of fusion is the change of state from solid to liquid.			
f	I know that the specific latent heat of vaporisation is the change of state from liquid to vapour.			
g	I can interpret heating and cooling graphs that include changes of state.			
h	I can distinguish between specific heat capacity and specific latent heat.			

4.3.3. Particle Model and Pressure

4.3.3.1. Particle Motion in Gases

a	I know that the molecules of a gas are in constant random motion.			
b	I know that the temperature of the gas is related to the average kinetic energy of the molecules.			
c	I know that changing the temperature of a gas, held at constant volume, changes the pressure exerted by the gas.			
d	I can explain how the motion of the molecules in a gas is related to both its temperature and its pressure.			
e	I can explain qualitatively, the relationship between the temperature of a gas and its pressure at constant volume.			

4.3.3.2. Pressure in Gases (Physics Only)

a	I know that a gas can be compressed or expanded by pressure changes.			
b	I know that the pressure produces a net force at right angles to the wall of the gas container (or any surface).			
c	I can use the particle model to explain how increasing the volume in which a gas is contained, at constant temperature, can lead to a decrease in pressure.			
d	I can apply the equation for a fixed mass of gas held at a constant temperature (it will be provided on the physics equation sheet): pressure × volume = constant p V = constant pressure, p, in pascals, (Pa), volume, V, in metres cubed, (m^3)			

4.3.3.3. Increasing the Pressure of a Gas (Physics Only) (HT Only)

a	I know that work is the transfer of energy by a force.			
b	I know that doing work on a gas increases the internal energy of the gas and can cause an increase in the temperature of the gas.			
c	I can explain how, in a given situation e.g. a bicycle pump, doing work on an enclosed gas leads to an increase in the temperature of the gas.			