

4.1 – States of Matter	
Particle Model	Atoms or molecules represented by small, solid, spherical particles . Particles identical in each state – only arrangement and energy change.
Solids	Particles are regularly arranged, close together and vibrating in fixed positions. Strong forces.
Liquids	Particles are randomly arranged, close together and moving around each other. Weak forces.
Gases	Particles are randomly arranged, far apart and moving randomly in all directions at a range of speeds . No forces.
4.2 – Gas Pressure	
How do gases exert pressure?	Particles collide with the walls of the container and exert a force . Pressure is the force per unit area .
Temperature of a gas	Related to the average kinetic energy of the particles .
Temperature and pressure	Temperature of gas increases -> particles have more K.E. -> move faster -> more frequent collisions with walls -> and larger force exerted -> pressure increases .
High pressure	May cause container to break, burst or explode .
4.3 – Changes of State	
3 key facts	1. Physical changes. 2. Mass is always conserved . 3. Easily reversible .
Melting	Solid to liquid . Energy supplied . Forces weaken . Occurs at melting point when heating .
Boiling	Liquid to gas . Energy supplied . Forces break . Occurs at boiling point when heating .
Condensing	Gas to liquid . Energy given out . Forces reform . Occurs at boiling point when cooling .
Freezing	Liquid to solid . Energy given out . Forces strengthen . Occurs at melting point when cooling .

4.4 – Density		
Definition	Mass per unit volume. Measured in kg/m^3 .	
Equation	density = mass / volume	
Density of regular solid (e.g. cuboid)	<ol style="list-style-type: none"> 1. Measure length, width and height with a ruler. 2. Calculate volume: length x width x height. 3. Measure mass with a mass balance. 4. Use density equation. 	
Density of irregular solid (e.g. a stone)	<ol style="list-style-type: none"> 1. Fill eureka can with water and insert object. 2. Collect displaced water in a measuring cylinder to measure volume. 3. Measure mass with a mass balance. 4. Use density equation. 	
Density of liquid	<ol style="list-style-type: none"> 1. Measure volume with a measuring cylinder. 2. Measure mass with a mass balance. 3. Use density equation. 	
4.5 – Internal Energy and Energy Transfers		
Internal energy	Total kinetic energy and potential energy of all the particles in a system .	
Change in internal energy	Causes either a change in temperature or a change in state .	
Heating & cooling curves	Diagonal line	Temperature is increasing or decreasing .
	Horizontal line	A change of state is occurring (temperature remains constant).
Specific heat capacity	Definition	Amount of energy required to increase the temperature of 1 kg of a substance by 1 °C . Measured in $\text{J/kg } ^\circ\text{C}$.
	Equation	Energy change = mass x SHC x temp change
Specific latent heat	Definition	Amount of energy required to change the state of 1 kg of a substance without changing its temperature . Measured in J/kg .
	Equation	Energy change = mass x specific latent heat

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Physics P3 – Particle Model of Matter