

Particle Model Key Concepts:

States of Matter:

- **Solid:** Particles closely packed in fixed positions, vibrate, strong forces.
- **Liquid:** Particles closely packed but random, move past each other, weaker forces.
- **Gas:** Particles far apart, random and rapid movement, negligible forces.

Internal Energy: Total kinetic and potential energy of all particles in a system.

Specific Latent Heat (L): Energy to change state of 1 kg at constant temperature. $E = m \times L$

Density (ρ): Mass per unit volume. $\rho = \frac{m}{V}$ (Units: kg/m³ or g/cm³)

Pressure (P): Force per unit area. $P = \frac{F}{A}$ (Units: Pa or N/m²)

Gas Pressure: Caused by force of collisions of gas particles with container walls. Increasing temperature or decreasing volume increases collision frequency and force, thus increasing pressure.

Section A: Key Terms & Processes

1. Figure 1 shows the arrangement of particles in three different states of matter (A, B, C) and the processes involved in changing between them.

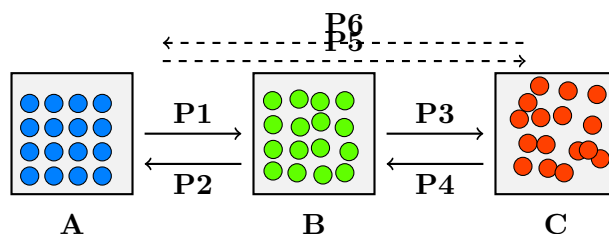


Figure 1: States of Matter and Phase Changes

Complete the table below by identifying the state of matter and the name of each process:

Label	State of Matter / Process Name
A	_____
B	_____
C	_____
P1	_____
P2	_____
P3	_____
P4	_____
P5	_____

2. Complete the sentences below using appropriate scientific terms:

- In a solid, particles are held in _____ positions by strong forces and can only _____.
- Liquid particles are closely packed but can _____ each other, allowing liquids to flow and take the shape of their container.
- Gas particles are far apart and move _____ and _____, with negligible forces between them.
- The total kinetic and potential energy of all the particles in a system is called its _____.

Section B: Core Concepts & Explanations

3. Answer the following questions related to the particle model of matter:

- Explain, in terms of particles, why solids have a fixed shape and a fixed volume.

- b) A block of ice at 0°C is heated until it completely melts into water at 0°C . Explain what happens to the internal energy of the substance during this melting process, referring to the kinetic and potential energy of the particles.

- c) Describe how the density of a gas changes when it is compressed into a smaller volume, assuming its mass remains constant.

- d) Explain why the pressure exerted by a gas inside a sealed container increases when its temperature is increased, assuming the volume of the container is kept constant. Refer to the movement and collisions of particles with the container walls.

Section C: Exam Application & Extended Writing

4. A student is investigating the properties of different materials.

- a) A block of material has a mass of 250 g and a volume of 50 cm^3 . Calculate its density in kilograms per cubic metre (kg/m^3). Show your working clearly, including any unit conversions.

- b) Explain the process of evaporation and how it differs from boiling. Include factors that affect the rate of evaporation. (6 marks)
