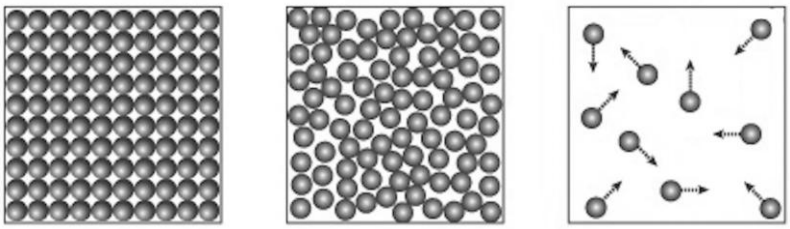
P2 Thermal Physics

P2.1 Kinetic particle model of matter

P2.1.2 Particle model

Simple Particle diagrams

Solid Liquid Gas



How Forces, Distances, and Motion Affect Properties

Solids: Strong forces + small distances → fixed shape and volume. Particles only vibrate → cannot flow or be compressed.

Liquids: Weaker forces → particles can slide → take shape of container but keep fixed volume.
Still close together → not easily compressed.

Gases: Very weak forces + large distances → particles move freely → no fixed shape or volume, easily compressed.

Relationship Between Particle Motion and Temperature

Temperature measures the **average kinetic energy** of the particles.

When temperature increases → particles move faster → gain kinetic energy.

When temperature decreases → particles move slower → lose kinetic energy.

Heating can cause **changes of state** because increased motion can overcome the attractive forces between particles.

Gas Pressure

Gas particles move quickly and randomly in all directions. When they **collide with the walls** of their container, they exert a **force on the walls**. The **total force per unit area** is called **pressure**.

- Increasing temperature → faster particle motion → more frequent and harder collisions → **higher pressure**.
- Decreasing volume (while keeping the same number of particles) → collisions happen more often → **pressure increases**.