

Exercise walk-through

Solids, liquids and gases ■ 1.1

eXercise

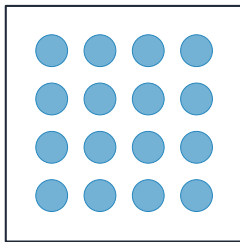
You must be able to

- describe the arrangement, separation and motion of particles in each state
- name the changes of state and explain them with the particle theory
- explain why temperature is constant during melting/boiling, and gas behaviour

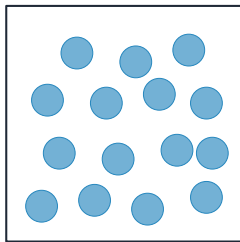
Method — Particles and changes of state

- **changes:** melting, freezing, evaporation, boiling, condensation (and sublimation).
- heating a gas at fixed volume raises the pressure (faster, harder, more frequent collisions).

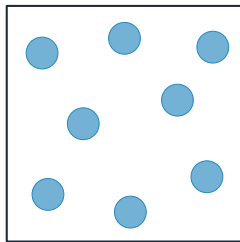
Method — Particles and changes of state



solid
regular, touching
vibrate in place



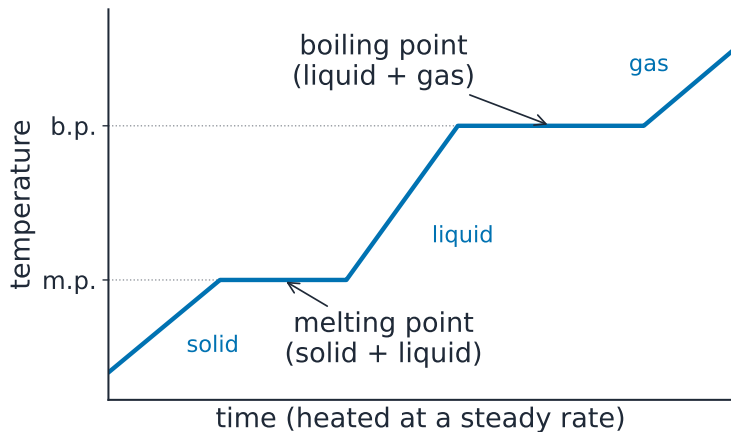
liquid
close, random
slide past
each other



gas
far apart,
random
move fast

Particle diagrams: regular-packed solid, close-random liquid, sparse gas

Method — Particles and changes of state



A heating curve: flat at the melting point, flat at the boiling point

Practice 2.1 ■ 1 mark

Name the change of state from gas to liquid.

Solution 2.1

Worked steps

condensation **B1**.

Practice 2.2 ■ 2 marks

Describe the arrangement and motion of particles in a liquid.

Solution 2.2

Method: Particles and changes of state

Worked steps

particles are close together, in a random arrangement **B1**; they move and slide past each other **B1**.

Exam-style 3.1 ■ 1 mark

Which property is true for a gas but not a liquid?

- A** it flows
- B** it has a fixed volume
- C** it is easily compressed
- D** it has a fixed shape

Solution 3.1

- A it flows
- B it has a fixed volume
- C it is easily compressed
- D it has a fixed shape



Worked steps

C. A gas is easily compressed; a liquid is not.

Exam-style 3.2 ■ 2 marks

A solid is heated until it melts and then boils.

- (a) Explain, using the particle theory, why the temperature stays constant while the solid melts.
- (b) Explain why a gas can be compressed but a liquid cannot.

Solution 3.2

Method: Particles and changes of state

Worked steps

- (a) the energy goes into breaking the forces of attraction between particles, not into making them move faster **M1**; so the temperature does not rise while melting **A1**.
- (b) a gas has particles far apart with space between them, so it can be squeezed **M1**; a liquid's particles are already close together with almost no space **A1**.

Exam-style 3.3 ■ 3 marks

A fixed mass of gas in a sealed rigid container is heated. Explain why its pressure rises.

Solution 3.3

Method: Particles and changes of state

Worked steps

heating gives the particles more kinetic energy, so they move faster (M1); they hit the walls harder and more often (M1); in a fixed volume this means the pressure rises (A1).