

1.1 Solids, liquids and gases

Name: _____ Class: _____ Date: _____

Total: 11 marks**KEY WORDS** pressure 压强 • particles 粒子 • solid 固体 • liquid 液体 • volume 体积

Objective

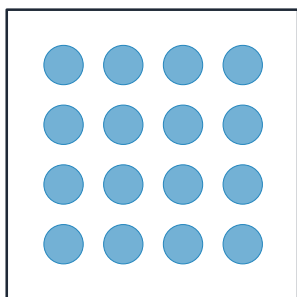
Build the skills to answer exam questions on **solids, liquids and gases** 固液气 — their properties, the particle picture, **changes of state** 状态变化, and gas behaviour.

You must be able to:

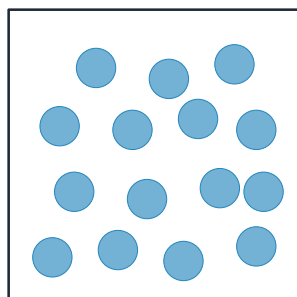
- describe the arrangement, separation and motion of particles in each state
- name the changes of state and explain them with the particle theory
- explain why temperature is constant during melting/boiling, and gas behaviour

1 Worked examples

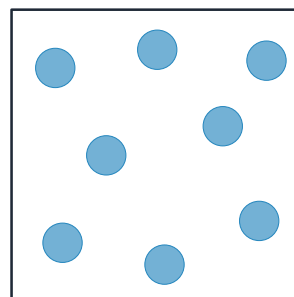
■ Particles and changes of state



solid
regular, touching
vibrate in place

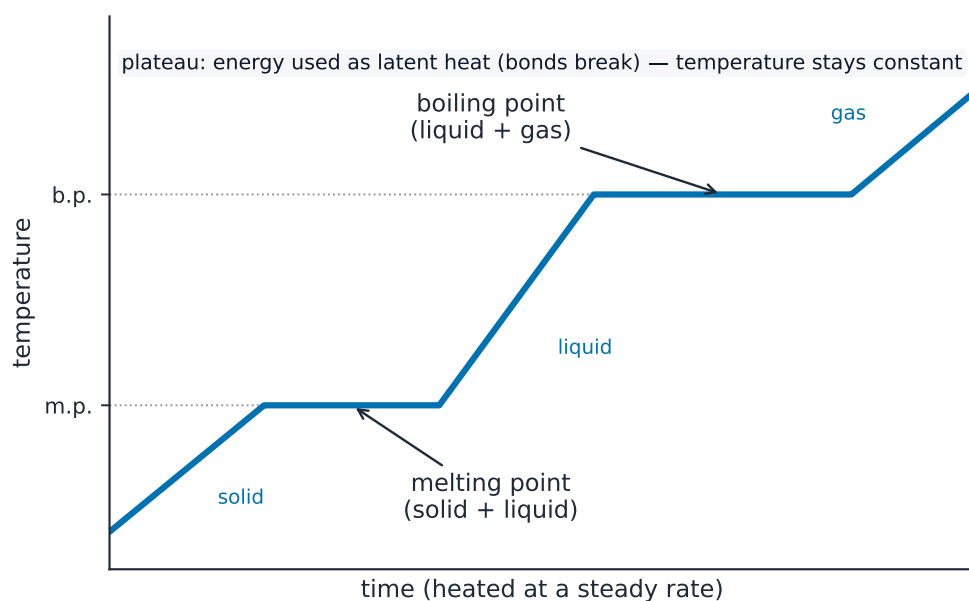


liquid
close, random
slide past each other



gas
far apart, random
move fast

Packed and regular in a solid, close and random in a liquid, far apart in a gas



Temperature stays constant while forces of attraction are broken (melting, boiling)

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

2 Practice

2.1 Name the change of state from gas to liquid.

[1]

2.2 Describe the arrangement and motion of particles in a liquid.

[2]

3 Exam-style questions

3.1 Which property is true for a gas but not a liquid? [1]

- **A** it flows
 - **B** it has a fixed volume
 - **C** it is easily compressed
 - **D** it has a fixed shape
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3.2 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. [2]

(b) Explain why a gas can be compressed but a liquid cannot. [2]

3.3 A fixed mass of gas in a sealed rigid container is heated. Explain why its pressure rises. [3]

Solutions

2.1 condensation.

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

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

3.2 (a) the energy goes into breaking the forces of attraction between particles, not into making them move faster; so the temperature does not rise while melting.

(b) a gas has particles far apart with space between them, so it can be squeezed; a liquid's particles are already close together with almost no space.

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