

Week 1

IGCSE Chemistry

Homework bundle for this week

本周作业合集

exercises.lol

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IGCSE Chemistry

Name: _____ Score: _____

1. In a solid, the particles:

- ☐ are closely packed and only vibrate in place
- ☐ are far apart and move fast
- ☐ slide past each other
- ☐ do not exist

2. The change from solid to liquid is called:

- ☐ melting
- ☐ freezing
- ☐ condensing
- ☐ subliming

3. Gas pressure is caused by particles:

- ☐ colliding with the container walls
- ☐ melting
- ☐ staying still
- ☐ joining together

4. Diffusion is the movement of particles from a region of:

- ☐ high concentration to low concentration
- ☐ low concentration to high concentration
- ☐ high pressure to high temperature
- ☐ solid to liquid

5. A gas spreads to fill its container because its particles are:

- ☐ far apart and moving quickly in all directions
- ☐ fixed in place
- ☐ packed tightly
- ☐ not moving

6. A gas at pressure 200 and volume 4 is compressed to volume 2. What is the new pressure?

7. Ice, water and steam are made of the same particles.

☐ True ☐ False

8. During melting, the temperature stays constant until all the solid has melted.

☐ True ☐ False

9. At constant temperature, pressure $\times$ volume stays constant for a fixed mass of gas.

☐ True ☐ False

10. Diffusion is evidence that particles are in constant random motion.

☐ True ☐ False

IGCSE Chemistry

1. **are closely packed and only vibrate in place**

Solids have closely packed, vibrating particles.

2. **melting**

Solid $\rightarrow$ liquid is melting.

3. **colliding with the container walls**

Collisions with the walls create pressure.

4. **high concentration to low concentration**

Particles spread down the concentration gradient.

5. **far apart and moving quickly in all directions**

Fast, widely spaced particles fill the available space.

6. **400**

$200 \times 4 = p \times 2$, so $p = 800 \div 2 = 400$.

7. **True**

Only the arrangement and energy differ, not the substance.

8. **True**

The energy is used to separate particles, not raise temperature.

9. **True**

This is Boyle's law.

10. **True**

They mix without any outside force.

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

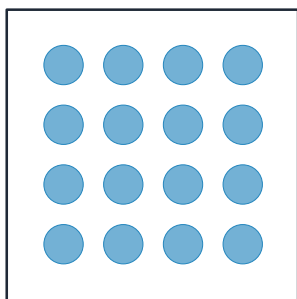
Build the skills to answer exam questions on **solids, liquids and gases** 固液气 — their properties, the particle picture, **changes of state** 状态变化, and gas behaviour.

You must be able to:

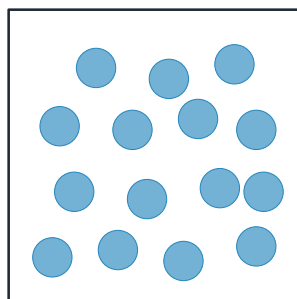
- describe the arrangement, separation and motion of particles in each state
- name the changes of state and explain them with the particle theory
- explain why temperature is constant during melting/boiling, and gas behaviour

1 Worked examples

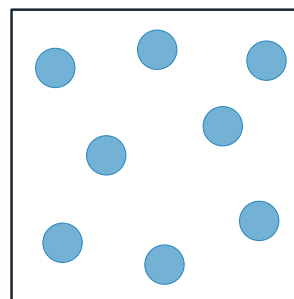
■ Particles and changes of state



solid
regular, touching
vibrate in place

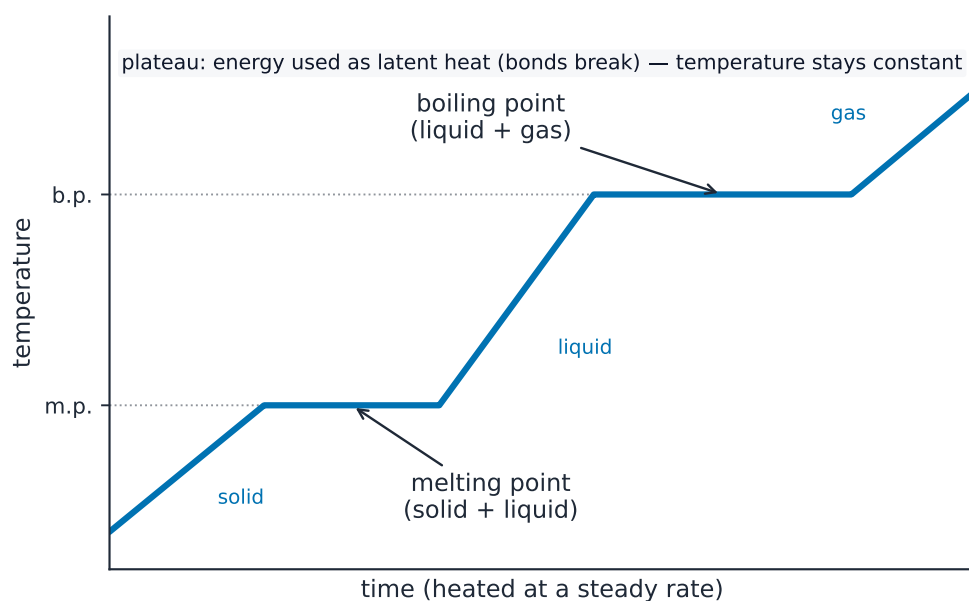


liquid
close, random
slide past each other



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
-

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.

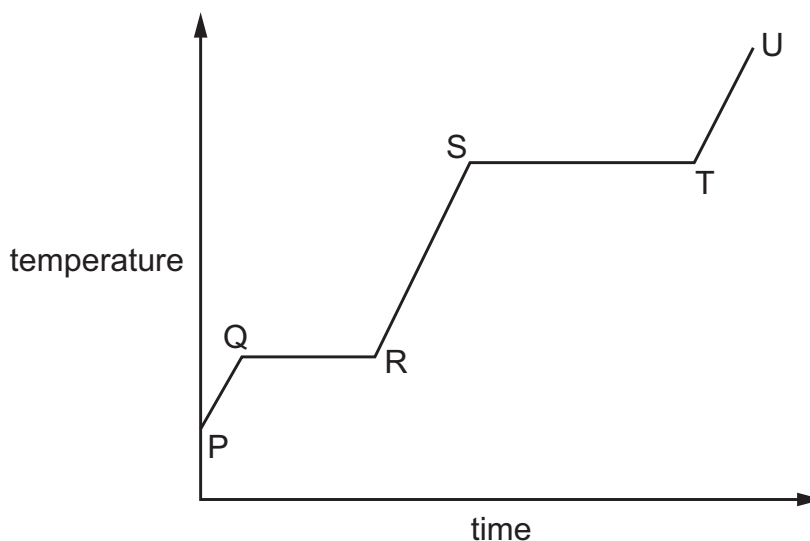
1 A sealed balloon contains air.

The temperature of the balloon is increased.

Which row describes how the pressure in the balloon and the kinetic energy of the particles in air change?

	pressure	kinetic energy of particles
A	decreases	decreases
B	increases	decreases
C	decreases	increases
D	increases	increases

2 The diagram shows the heating curve for a substance.



Between which two points do the particles of the substance change from being in fixed positions to being mobile?

- A** P and Q **B** Q and R **C** S and T **D** T and U

- 1** What happens to the volume of a fixed mass of gas when pressure and temperature are separately increased?

	volume of gas	
	pressure increased	temperature increased
A	increases	increases
B	no change	decreases
C	decreases	increases
D	no change	increases

1 The three states of matter are solid, liquid and gas.

(a) Complete Table 1.1 to describe the structures of solids, liquids and gases in terms of particle separation, particle arrangement and particle motion.

Table 1.1

state of matter	particle separation	particle arrangement	particle motion
solid	touching		
liquid			
gas		random	random

[3]

(b) Substances can physically change.

Name each physical change:

- solid to liquid
- gas to liquid
- solid to aqueous.

[3]

(c) Gases diffuse.

(i) Describe, in terms of particles, why gases diffuse.

..... [1]

(ii) State what determines the relative rate of diffusion of gases at constant temperature.

..... [1]

(d) Gaseous oxides of nitrogen are atmospheric pollutants. One adverse effect of oxides of nitrogen is the formation of acid rain.

State **two other** adverse effects of oxides of nitrogen.

1.....

2.....

[2]

(e) In a catalytic converter, oxides of nitrogen are removed by reaction with the toxic gaseous product of the incomplete combustion of hydrocarbon fuels. Two non-toxic gases are formed in this reaction.

(i) Name the toxic gaseous product of the incomplete combustion of hydrocarbon fuels.

..... [1]

(ii) Name the **two** non-toxic gases formed in the catalytic converter.

1

2 [2]

[Total: 13]

1 A gas is placed in a sealed container with a fixed volume.

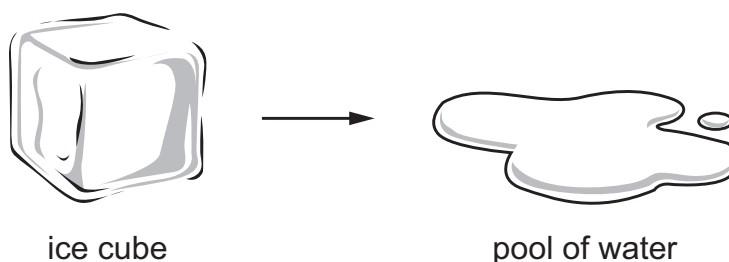
The gas is heated.

Which statements are correct?

- 1 The gas molecules move around faster.
- 2 The gas particles collide with the walls of the container more frequently.
- 3 The pressure in the container decreases.

A 1 and 2 **B** 1 only **C** 2 and 3 **D** 2 only

1 An ice cube melts.

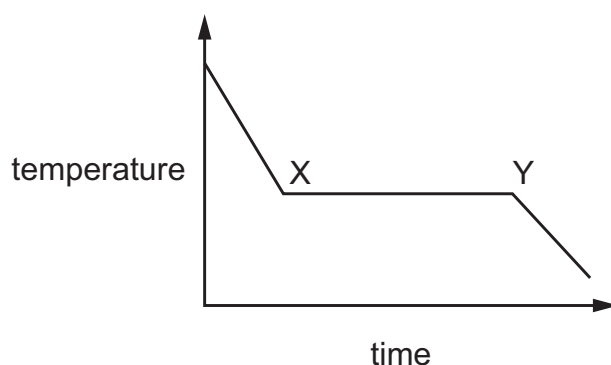


What happens to the molecules of water in the ice cube?

- A** They evaporate.
- B** They dissolve.
- C** They gain energy.
- D** They lose energy.

- 2 Solid G is heated until it melts. It is then left to cool to room temperature.

The graph shows the cooling curve for G.



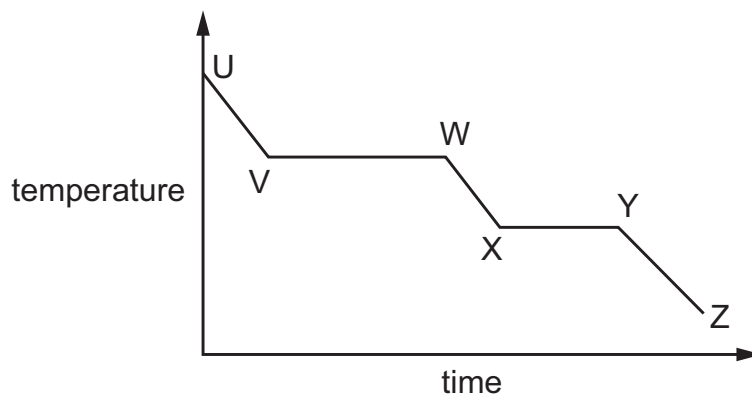
Four statements about the cooling curve between X and Y are listed.

- 1 The speed of the molecules of G decreases.
- 2 The molecules of G become less closely packed.
- 3 Thermal energy is released by the molecules of G to the surroundings.
- 4 G changes from solid to liquid.

Which statements are correct?

- A** 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

- 2 A cooling curve for a substance is shown.



Which statement is correct?

- A** Between U and V, the substance is condensing.
B Between V and W, heat is being absorbed from the surroundings.
C Between W and X, the particles are close together and randomly arranged.
D Between Y and Z, the substance is changing from a liquid to a solid.

1.2 Diffusion

Name: _____ Class: _____ Date: _____

Total: 8 marks

KEY WORDS diffusion 扩散 • relative molecular mass 相对分子质量 • particles 粒子 • rate 速率
• mass 质量

Objective

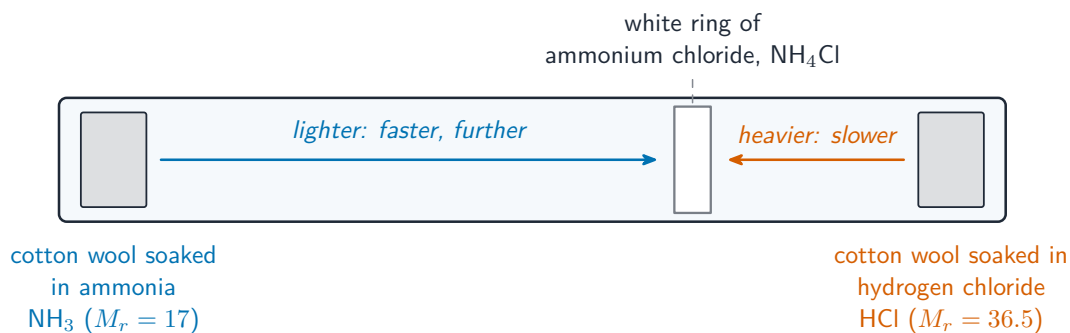
Build the skills to answer exam questions on **diffusion** 扩散 — what it is, why it happens, and how the **rate** depends on **relative molecular mass** 相对分子质量.

You must be able to:

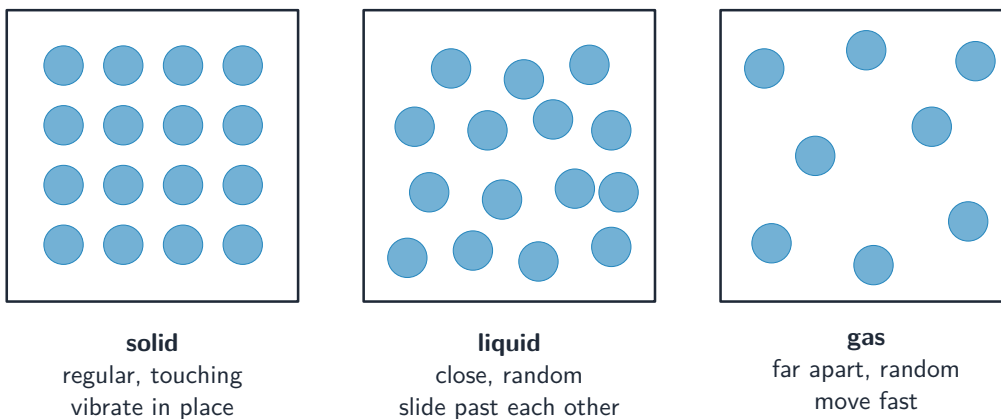
- describe diffusion as spreading from high to low concentration
- explain diffusion using the random motion of particles
- explain why lighter molecules diffuse faster (the NH_3/HCl experiment)

1 Worked examples

■ The NH_3/HCl experiment



Ammonia ($M_r = 17$) is lighter, so it diffuses faster and further; the ring forms nearer HCl



Diffusion is the random movement of particles

- **diffusion:** particles spread from high to low concentration because they move randomly.
- happens in gases and liquids, **not** solids (particles can't move from place to place).
- lighter molecules (smaller M_r) diffuse **faster**.

2 Practice

2.1 Define diffusion. [1]

2.2 State why diffusion does not occur in solids. [1]

3 Exam-style questions

3.1 Two gases diffuse along a tube. The one that travels faster has the: [1]

- **A** larger relative molecular mass
 - **B** smaller relative molecular mass
 - **C** higher density
 - **D** larger molecules
-

3.2 In the experiment, ammonia ($M_r = 17$) and hydrogen chloride ($M_r = 36.5$) diffuse from opposite ends of a tube and form a white ring.

(a) State, with a reason, at which end the white ring forms nearer. [2]

(b) Name the white solid formed. [1]

3.3 Explain, in terms of particles, why you can smell perfume from across a room. [2]

Solutions

2.1 the spreading of particles from a region of high concentration to a region of low concentration.

2.2 the particles in a solid cannot move from place to place (only vibrate).

3.1 B. The gas with the smaller relative molecular mass diffuses faster.

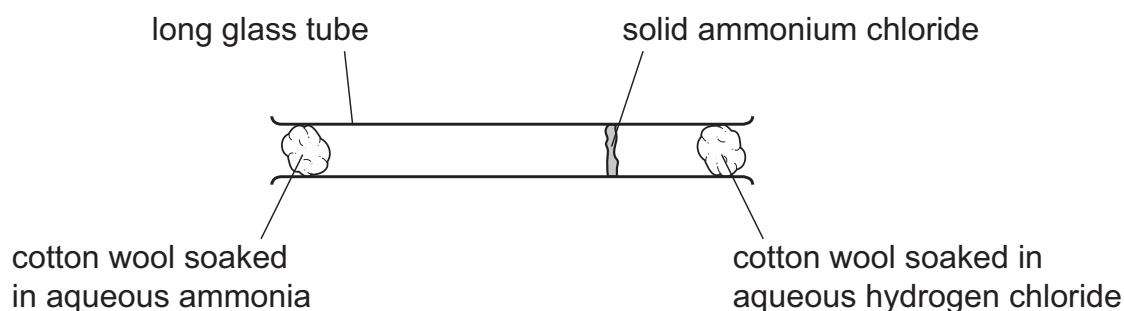
3.2 (a) nearer the hydrogen chloride end; because ammonia is lighter, so it diffuses faster and travels further.

(b) ammonium chloride (NH_4Cl).

3.3 the perfume particles move randomly in all directions; they diffuse and mix with the air until they reach your nose.

- 2 Ammonia gas is reacted with hydrogen chloride gas using the apparatus shown.

Solid ammonium chloride is produced.



Which statement explains why the solid ammonium chloride is formed nearer to the hydrogen chloride?

- A Aqueous ammonia is a base and aqueous hydrogen chloride is an acid.
- B Ammonia molecules diffuse more slowly than hydrogen chloride molecules.
- C Hydrogen chloride has a greater molecular mass than ammonia.
- D Only ammonia molecules diffuse in all directions at the same time.

- 3 A student investigates the diffusion of ammonia gas, NH_3 , and hydrogen chloride gas, HCl .

Two sets of apparatus are set up as shown at room temperature and pressure.



The damp red litmus paper in apparatus 1 changes colour after 30 seconds.

How long does it take for the damp blue litmus paper in apparatus 2 to change colour?

- A 21 seconds
- B 30 seconds
- C 64 seconds
- D The damp blue litmus paper does **not** change colour.

- 2 Which gas diffuses most quickly at room temperature and pressure?

- A CH_4
- B C_2H_6
- C CO
- D SO_2

3 Samples of four gases are released in a room at the same time.

The gases are carbon dioxide, CO_2 , hydrogen chloride, HCl , hydrogen sulfide, H_2S , and nitrogen dioxide, NO_2 .

Which gas diffuses fastest?

- A** carbon dioxide
- B** hydrogen chloride
- C** hydrogen sulfide
- D** nitrogen dioxide