Mark schemes

1 Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1–2 marks)
Considers either solid or gas and describes at least one aspect of the particles.

or

Considers both solids and gases and describes an aspect of each.

Level 2 (3–4 marks)
Considers both solids and gases and describes aspects of the particles.

or

Considers one state and describes aspects of the particles and explains at least one of the properties.

or

Considers both states and describes an aspect of the particles for both and explains a property for solids or gases.

Level 3 (5–6 marks)
Considers both states of matter and describes the spacing and movement / forces between the particles. Explains a property of both solids and gases.

examples of the points made in the response

extra information

Solids

- (particles) close together
- (so) no room for particles to move closer (so hard to compress)
- vibrate about fixed point
- strong forces of attraction (at a distance)
- the forces become repulsive if the particles get closer
- particles strongly held together / not free to move around (shape is fixed)

any explanation of a property must match with the given aspect(s) of the particles.

Gases

- (particles) far apart
- space between particles (so easy to compress)
- move randomly
- negligible / no forces of attraction
- spread out in all directions (to fill the container)

[6]

2 (a) kilograms per metre cubed, kg / m^3

1

(b) (solid has) more particles

allow atoms for particles

1

in the same volume **or** in a given volume

allow description of a given area

1

(c) randomly

this order only

1

kinetic

1

(d) (pressure) rises

1

[6]

3 (a) random

accept in all directions

1

description must be of random motion

(b) heating increases the temperature of the gas

1

temperature is proportional to kinetic energy

1

if kinetic energy increases speed increases

1

(c) energy is needed to change the state of the water

1

to break the bonds

1

(d) $1000 = m / 2.5 \times 10^{-5}$

1

$m = 2.5 \times 10^{-5} \times 1000$

1

m = 0.025 (kg)

1

E = 0.025 × 2 260 000

1

E = 56 500 (J)

1

*allow 56 500 (J) without working shown for **5** marks*

***0** marks awarded for E = m × L*

(e) any **four** from:

- because the water is preheated) the change in temperature of the water is less
- so less energy is used to heat the water (E=mcΔθ)
- therefore they (condensing boilers) are more efficient
- so less energy is wasted
- less gas is burned to heat the same amount of water
- less waste gas (CO_2) is produced by the boiler **or** (because less gas is used) they are cheaper to run / save money

4

[15]

4 (a) they move in random directions

1

they move with a range of different speeds

1

(b) the (mean) speed of the particles would increase

allow kinetic energy increases

1

(c) (if the temperature increases) the pressure increases

allow an explanation in terms of large pressure difference

1

so it could explode

1

(d) p = 0.1 (MPa)

1

(e) $p = 2.25 \times \left(\frac{25}{100}\right)$

allow any correct method of determining 25% of 2.25
allow use of 2.2−2.3

1

p = 0.56

allow 0.55−0.575

1

t = 27 (minutes)

allow 26−28 minutes
allow correct value of t using their calculated value of p

1

*an answer of 27 scores **3** marks*

(f) (the volume of the air) increases

1

[10]