

GCSE Combined Science: Trilogy

Worksheet: The three states of matter

TIME 30 min	TOTAL 30 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: The three states of matter

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Substances can exist as solids, liquids or gases.

0 1 . 1 Name the change of state when a liquid turns into a gas.

.....

.....

.....

.....

[1 mark]

0 1 . 2 At which temperature does a liquid freeze?

Tick (✓) **one** box.

At its melting point

☐

At 0 °C for all substances

☐

At 100 °C for all substances

☐

At room temperature

☐

[1 mark]

0 1 . 3

Which statement describes the particles in a solid?

Tick (✓) **one** box.

Far apart and moving randomly at high speed

☐

Close together and moving around each other

☐

Close together in a regular arrangement, vibrating about fixed positions

☐

Far apart in a regular arrangement

☐

[1 mark]

0 1 . 4

Name the change of state when a gas turns into a liquid.

.....

.....

.....

.....

[1 mark]

0 2

Substances change state when energy is transferred to or from them.

0 2 . 1

Which change of state transfers energy from the substance to the surroundings?

Tick (✓) **one** box.

Melting

☐

Boiling

☐

Freezing

☐

Evaporating

☐

[1 mark]

0 2 . 2

Complete the sentence.

Melting and freezing take place at the same temperature, called the

.....

.....

.....

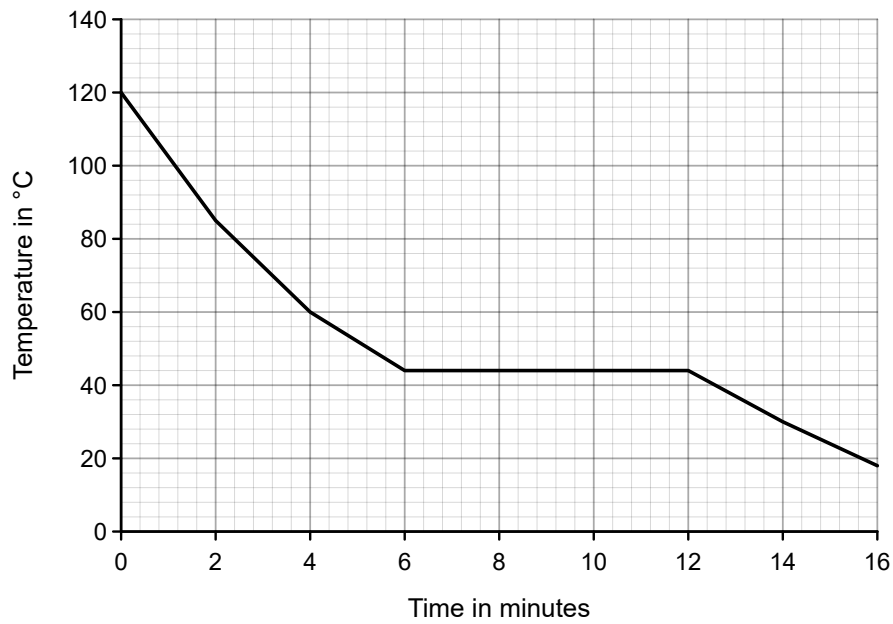
.....

[1 mark]

0 3

A student cooled a liquid and recorded its temperature every two minutes. Figure 1 shows the results.

Figure 1



0 3 . 1

Use Figure 1 to find the freezing point of the substance.

.....

.....

.....

Freezing point = °C

[1 mark]

0 3 . 2

Give the state of the substance at 2 minutes and at 15 minutes.

.....

.....

.....

.....

[2 marks]

0 3 . 3

Explain why the temperature stays constant between 6 and 12 minutes, even though the substance is still transferring energy to the surroundings.

.....

.....

.....

.....

[2 marks]

0 4

Particle theory can be used to explain changes of state.

0 4 . 1

Describe the arrangement and movement of the particles in a liquid.

.....

.....

.....

.....

[2 marks]

0 4 . 2

Describe what happens to the particles when a solid melts.

.....

.....

.....

.....

.....

.....

[3 marks]

0 4 . 3

Sodium chloride melts at 801 °C. Ice melts at 0 °C.
Explain this difference in terms of the forces between particles.

.....

.....

.....

.....

[2 marks]

.....

0 5

Table 1 lists four changes of state.

Table 1

Change of state	Energy transferred to or from the substance?
Melting	
Boiling	
Condensing	
Freezing	

0 5 . 1

Complete Table 1 by writing 'to' or 'from' for each change of state.

.....

.....

.....

.....

[2 marks]

0 5 . 2

Explain, in terms of the forces between particles, why boiling a substance needs much more energy than melting the same mass of the substance.

.....

.....

.....

.....

[2 marks]

.....

0 6

Table 2 shows the melting points and boiling points of four substances, **A**, **B**, **C** and **D**.

Table 2

Substance	Melting point in °C	Boiling point in °C
A	-114	78
B	801	1413
C	-218	-183
D	44	280

0 6 . 1

Which substance is a gas at 25 °C?

.....

.....

.....

.....
[1 mark]

0 6 . 2

Which substance is a liquid at 25 °C?

.....

.....

.....

.....
[1 mark]

0 6 . 3

What is the state of substance **D** at 50 °C?
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 6 . 4

Which substance has the strongest forces between its particles?
Give a reason for your answer.

[2 marks]

0 7

Solids are usually much denser than gases.

0 7 . 1

Explain, in terms of the arrangement of particles, why a solid is usually much denser than the same substance as a gas.

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: The three states of matter · 30 marks

Question 1 (4 marks)

01.1 [1 mark]

Answer: boiling / evaporating

- boiling / evaporating (1)
-

01.2 [1 mark]

Correct: At its melting point

01.3 [1 mark]

Correct: Close together in a regular arrangement, vibrating about fixed positions

01.4 [1 mark]

Answer: condensing

- condensing / condensation (1)
-

Question 2 (2 marks)

02.1 [1 mark]

Correct: Freezing

02.2 [1 mark]

Answer: melting point

- melting point (1)

Notes: Allow freezing point.

Question 3 (5 marks)

03.1 [1 mark]

Answer: 44 °C

- 44 (°C) (1)

Notes: Allow 43–45.

03.2 [2 marks]

Answer: 2 minutes: liquid; 15 minutes: solid

- 2 minutes: liquid (1)
 - 15 minutes: solid (1)
-

03.3 [2 marks]

Answer: The substance is freezing: energy is released as forces form between the particles, and this balances the energy transferred to the surroundings.

- the substance is freezing / changing from liquid to solid (1)
- energy is released as (stronger) forces form between the particles, which balances the energy lost to the surroundings (1)

Notes: Do not accept 'energy is used to form bonds'.

Question 4 (7 marks)

04.1 [2 marks]

Answer: Close together in a random arrangement; they move around each other.

- close together / touching in a random arrangement (1)
- (particles) move around / slide past each other (1)

04.2 [3 marks]

Answer: The particles gain energy and vibrate more; some of the forces between them are overcome; they can then move around each other.

- particles gain (kinetic) energy / vibrate more (1)
- (some of the) forces between the particles are overcome (1)
- the particles can move around / past each other (1)

04.3 [2 marks]

Answer: The forces between the ions in sodium chloride are much stronger than the forces between water molecules in ice, so much more energy is needed to overcome them.

- the forces between ions in sodium chloride are much stronger than the forces between water molecules (1)
- so much more energy is needed to overcome them (1)

Question 5 (4 marks)

05.1 [2 marks]

Answer: melting: to; boiling: to; condensing: from; freezing: from

- melting and boiling: to (the substance) (1)
- condensing and freezing: from (the substance) (1)

05.2 [2 marks]

Answer: When a substance melts, only some of the forces are overcome and the particles stay close together; when it boils, the forces must be overcome completely so that the particles can move far apart.

- on melting, only some of the forces between particles are overcome (the particles stay close together) (1)
 - on boiling, the forces are overcome (almost) completely, so the particles can move far apart (1)
-

Question 6 (6 marks)

06.1 [1 mark]

Answer: C

- C (1)

06.2 [1 mark]

Answer: A

- A (1)

06.3 [2 marks]

Answer: Liquid, because 50 °C is above its melting point (44 °C) but below its boiling point (280 °C).

- liquid (1)
- 50 °C is between its melting point (44 °C) and its boiling point (280 °C) (1)

06.4 [2 marks]

Answer: B, because it has the highest melting and boiling points.

- B (1)
- it has the highest melting point / boiling point (so the most energy is needed to overcome the forces) (1)

Question 7 (2 marks)

07.1 [2 marks]

Answer: In a solid the particles are touching, but in a gas they are far apart, so the same volume of gas contains far fewer particles and has much less mass.

- in a solid the particles are close together / touching; in a gas the particles are far apart (1)
 - so the same volume of gas contains far fewer particles / has much less mass (1)
-