

GCSE Combined Science: Trilogy

Worksheet: State symbols

TIME 30 min	TOTAL 26 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
-----------------------	--------------------------	------------------------------	-----------------------------------

Topics: State symbols

NAME _____	CLASS _____	DATE _____
-------------------	--------------------	-------------------

- 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

State symbols are written in brackets after each formula in a chemical equation.

0 1 . 1

Which state symbol means 'gas'?

Tick (✓) **one** box.

(s)

☐

(l)

☐

(g)

☐

(aq)

☐

[1 mark]

0 1 . 2

Which state symbol means 'dissolved in water'?

Tick (✓) **one** box.

(s)

☐

(l)

☐

(g)

☐

(aq)

☐

[1 mark]

0 2

State symbols show the states of the substances in a chemical equation.

0 2 . 1

What does the state symbol (aq) mean?

.....

.....

[1 mark]

0 2 . 2

Give the state symbol for water at room temperature.

.....

.....

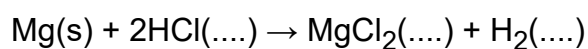
.....

.....

[1 mark]

0 2 . 3

Complete the state symbols in the equation for the reaction of magnesium with hydrochloric acid.



.....

.....

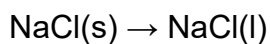
.....

.....

[2 marks]

0 3

A student wrote this equation for dissolving solid sodium chloride in water:



0 3 . 1

Evaluate whether the student's equation correctly represents dissolving.

[2 marks]

0 4

Chemical equations should include state symbols.

0 4 . 1

Calcium carbonate decomposes when heated to form calcium oxide and carbon dioxide.

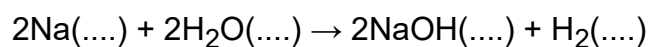
Add state symbols to the equation.



[1 mark]

0 4 . 2

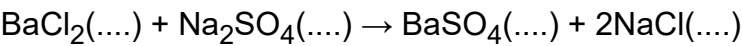
Add state symbols to the equation for the reaction of sodium with water.



[2 marks]

0 4 . 3

When solutions of barium chloride and sodium sulfate are mixed, a white precipitate of barium sulfate forms.
Add state symbols to the equation.



.....

.....

.....

.....

[2 marks]

0 4 . 4

In the electrolysis of molten sodium chloride, the sodium chloride is shown as NaCl(l), not NaCl(aq).
Explain why.

.....

.....

[1 mark]

0 5

The state symbol of a substance in an equation depends on the conditions of the reaction.

0 5 . 1

Describe how the melting point and boiling point of a substance are used to decide which state symbol to use for it in a reaction at a given temperature.
Explain when (aq) is used instead.

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

0 6

Zinc reacts with dilute sulfuric acid to form zinc sulfate solution and hydrogen gas.

0 6 . 1

Write a balanced symbol equation for this reaction, including state symbols.

.....

.....

.....

.....

[2 marks]

0 6 . 2

Give **one** observation that shows a gas is produced.

.....

.....

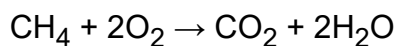
[1 mark]

0 7

The state of a substance in a reaction depends on the temperature of the reaction.

0 7 . 1

Methane burns in a gas cooker flame.



In the flame, the water is produced as a gas. Add state symbols to the equation.

.....

.....

[1 mark]

0 7 . 2

At 200 °C, hydrogen reacts with bromine to form hydrogen bromide, HBr.
Bromine boils at 59 °C and hydrogen bromide boils at -67 °C.
Write a balanced symbol equation, including state symbols, for this reaction at 200 °C.

.....

.....

.....

.....

[2 marks]

0 7 . 3

Bromine melts at -7 °C.
Give the state symbol for bromine at 25 °C.

.....

.....

.....

.....

[1 mark]

0 7 . 4

A solution of iodine in hexane is **not** written as I₂(aq).
Suggest why.

.....

.....

[1 mark]

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: State symbols · 26 marks

Question 1 (2 marks)

01.1 [1 mark]

Correct: (g)

01.2 [1 mark]

Correct: (aq)

Question 2 (4 marks)

02.1 [1 mark]

Answer: aqueous: dissolved in water

- aqueous / dissolved in water (1)

Notes: Allow 'in solution in water'.

02.2 [1 mark]

Answer: (l)

- (l) (1)
-

02.3 [2 marks]

Answer: HCl(aq), MgCl₂(aq), H₂(g)

- HCl(aq) and MgCl₂(aq) (1)
 - H₂(g) (1)
-

Question 3 (2 marks)

03.1 [2 marks]

Answer: It is wrong: the product should be NaCl(aq), because the sodium chloride is dissolved in water. (l) would mean molten sodium chloride, a pure liquid with no water.

- the equation is incorrect: it should be NaCl(s) → NaCl(aq), because the sodium chloride is dissolved in water (1)
 - (l) means liquid / molten sodium chloride (a pure liquid with no water), which is not a solution (1)
-

Question 4 (6 marks)

04.1 [1 mark]

Answer: $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$

- (s), (s), (g) (1)
-

04.2 [2 marks]

Answer: $2\text{Na}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{NaOH}(\text{aq}) + \text{H}_2(\text{g})$

- Na(s) and H₂O(l) (1)
 - NaOH(aq) and H₂(g) (1)
-

04.3 [2 marks]

Answer: $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$

- BaCl₂(aq) and Na₂SO₄(aq) (1)
 - BaSO₄(s) and NaCl(aq) (1)
-

04.4 [1 mark]

Answer: Molten means melted (a pure liquid); it is not dissolved in water.

- molten means melted / liquid, not dissolved in water (1)
-

Question 5 (4 marks)

05.1 [4 marks]

Answer: Compare the reaction temperature with the melting and boiling points: below the melting point use (s); between them use (l); above the boiling point use (g). Use (aq) when the substance is dissolved in water.

- if the reaction temperature is below the melting point, the substance is a solid, (s) (1)
 - if the reaction temperature is between the melting point and boiling point, the substance is a liquid, (l) (1)
 - if the reaction temperature is above the boiling point, the substance is a gas, (g) (1)
 - (aq) is used when the substance is dissolved in water (an aqueous solution) (1)
-

Question 6 (3 marks)

06.1 [2 marks]

Answer: $\text{Zn(s)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{ZnSO}_4\text{(aq)} + \text{H}_2\text{(g)}$

- $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$ (correct formulae) (1)
 - state symbols: (s), (aq), (aq), (g) (1)
-

06.2 [1 mark]

Answer: fizzing / bubbles

- fizzing / bubbles (of gas) (1)
-

Question 7 (5 marks)

07.1 [1 mark]

Answer: $\text{CH}_4\text{(g)} + 2\text{O}_2\text{(g)} \rightarrow \text{CO}_2\text{(g)} + 2\text{H}_2\text{O(g)}$

- all four state symbols (g) (1)
-

07.2 [2 marks]

Answer: $\text{H}_2\text{(g)} + \text{Br}_2\text{(g)} \rightarrow 2\text{HBr(g)}$

- $\text{H}_2 + \text{Br}_2 \rightarrow 2\text{HBr}$ (1)
 - all state symbols (g) (1)
-

07.3 [1 mark]

Answer: (l)

- (l) (1)
-

07.4 [1 mark]

Answer: The solvent is hexane, not water.

- the solvent is hexane / not water (1)
-