AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.3.2.3

Using moles to balance equations (HT only)

Past-paper questions

Tier	**Higher**
Question groups	**2**
Available paper years	**2021–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

5.3.2.3 Using moles to balance equations (HT only)

Question 01

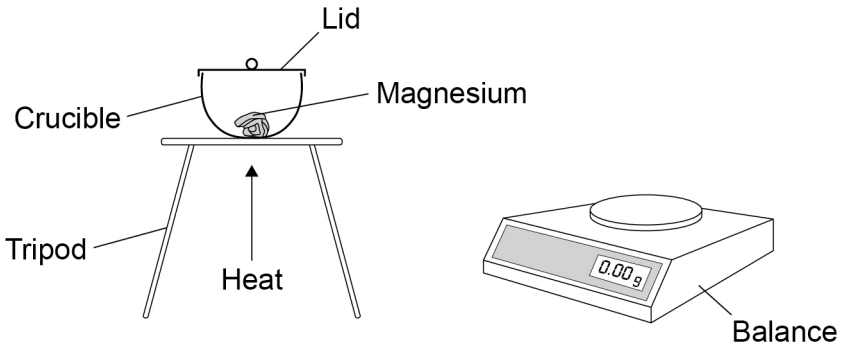
November 2021 | 8464/C/1H | Original Q6

0 6 Metal oxides are produced when metals are heated in air.

A student investigated the change in mass when 0.12 g of magnesium was heated in air.

Figure 5 shows the apparatus.

Figure 5



The student measured the mass of magnesium oxide produced.

0 6 . 1 0.12 g of magnesium reacted to produce 0.20 g of magnesium oxide.

Calculate the number of moles of oxygen gas (O_2) that reacted.

Relative atomic mass (A_r): O = 16

[3 marks]

Moles of oxygen gas = _____

5.3.2.3 Using moles to balance equations (HT only)

Question 01 · continued

0 6 . 2 The student repeated the experiment **without** a lid on the crucible.

Suggest why the mass of magnesium oxide produced would be different without a lid on the crucible.

[2 marks]

0 6 . 3 Copper reacts with oxygen to produce copper oxide.

63.5 g of copper produces 79.5 g of copper oxide.

Calculate the mass of copper oxide produced when 0.50 g of copper reacts with oxygen.

Give your answer to 3 significant figures.

[3 marks]

Mass (3 significant figures) = _____ g

Question 6 continues on the next page

5.3.2.3 Using moles to balance equations (HT only)

Question 01 · continued

0 6 . 4 Iron reacts with oxygen to produce an oxide of iron.

0.015 moles of iron reacts with 0.010 moles of oxygen gas (O_2).

Determine:

- the formula of the iron oxide produced
- the balanced symbol equation for the reaction.

[4 marks]

Formula of iron oxide = _____

Balanced symbol equation

_____

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5.3.2.3 Using moles to balance equations (HT only)

Question 02

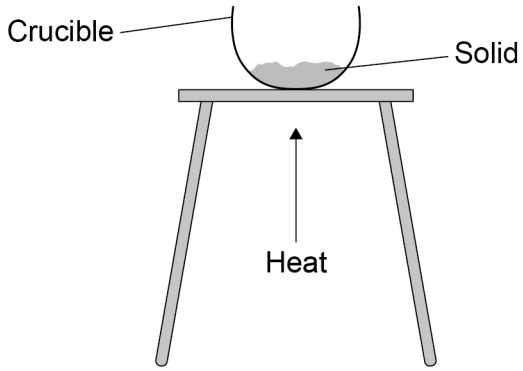
June 2025 | 8464/C/1H | Original Q6

0 6 Some reactions appear to involve a change in mass.

A student investigated the change in mass when solids were heated.

Figure 7 shows the apparatus.

Figure 7



The student determined the mass of the contents of the crucible at regular intervals.

0 6 . 1 The student used a Bunsen burner instead of a water bath to heat the crucible.

Suggest **one** reason why.

[1 mark]

Question 6 continues on the next page

The student planned to heat:

- 0.01 mol of magnesium
- 0.01 mol of magnesium carbonate.

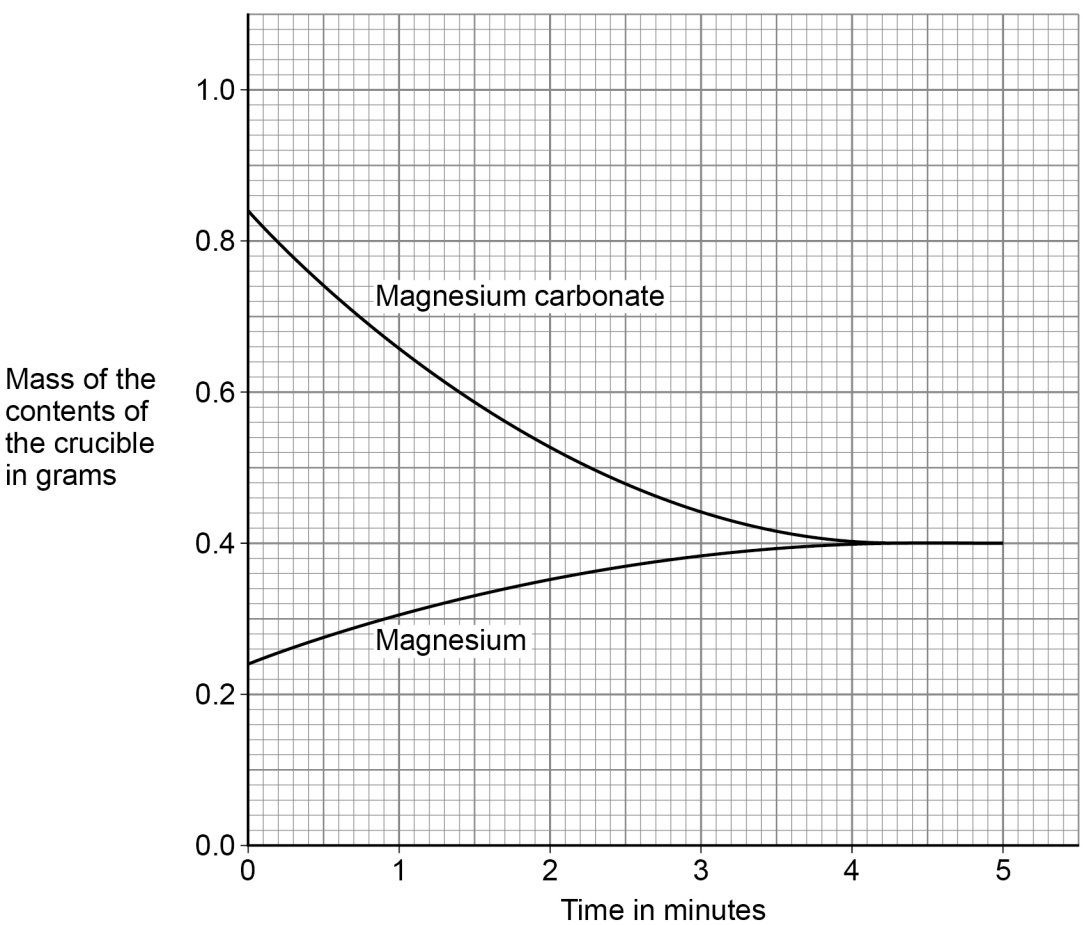
The equations for the reactions are:

$$Mg + \tfrac{1}{2}O_2 \rightarrow MgO$$

$$MgCO_3 \rightarrow MgO + CO_2$$

Figure 8 shows the student's **predicted** results.

Figure 8



5.3.2.3 Using moles to balance equations (HT only)

Question 02 · continued

0 6 . 2 Look at **Figure 8**.

Explain the **two** trends for the first 3 minutes.

[4 marks]

Magnesium _____

_____

_____

_____

Magnesium carbonate _____

_____

_____

_____

0 6 . 3 **Figure 8** shows that both reactions are complete after 5 minutes.

Why is the final mass of the contents of the crucible the same for both reactions?

[1 mark]

_____

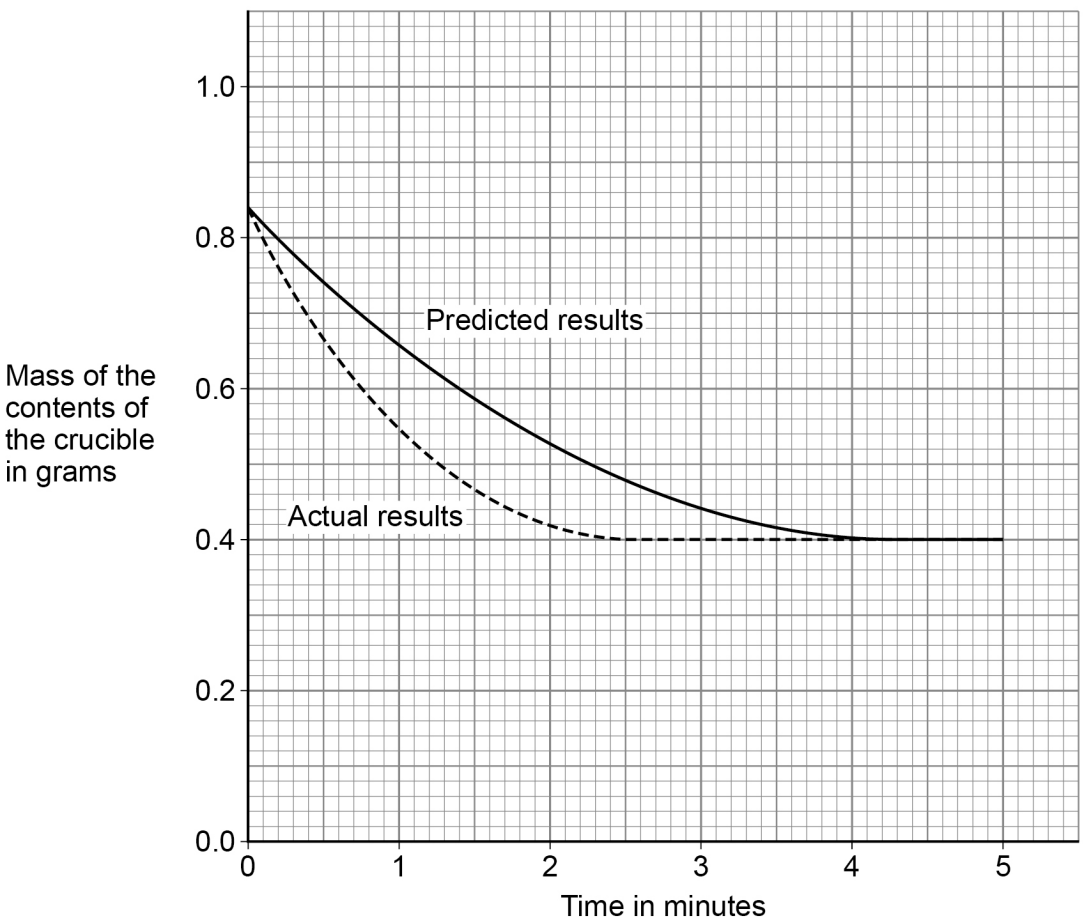
_____

Question 6 continues on the next page

0 6 . 4 The student heated magnesium carbonate.

Figure 9 shows the results.

Figure 9



The student concluded:

'The difference between the predicted results and the actual results is caused by solid escaping from the crucible.'

Give **one** reason why the results show the student is **not** correct.

[1 mark]

5.3.2.3 Using moles to balance equations (HT only)

Question 02 · continued

0 6 . 5 Iron reacts with steam (H_2O) to produce an oxide of iron and hydrogen gas.

0.120 moles of iron reacts with 0.160 moles of steam.

Determine the balanced equation for the reaction.

You should determine:

- the simplest whole number mole ratio of Fe : H_2O
- the formula of the iron oxide produced.

[4 marks]

Simplest mole ratio of Fe : H_2O = _____ : _____

Formula of the iron oxide = _____

Balanced equation for the reaction:

_____ + _____ → _____ + _____

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