

GCSE Combined Science: Trilogy

Worksheet: Mass changes when a reactant or product is a gas

TIME 30 min	TOTAL 28 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Mass changes when a reactant or product is a gas

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

0 1 . 1

Some iron wool is heated strongly in an open dish on a balance. The iron reacts with oxygen from the air to form iron oxide.

What happens to the reading on the balance?

Tick (✓) **one** box.

It increases, because oxygen from the air combines with the iron.

☐

It decreases, because the iron is used up.

☐

It stays the same, because iron oxide is a solid.

☐

It stays the same, because no atoms are made or destroyed.

☐

[1 mark]

0 1 . 2

Complete the sentence.

A system that no substances can enter or leave is called a system.

.....

.....

.....

[1 mark]

0 1 . 3

A reaction that produces a gas is carried out in a sealed flask on a balance.
Predict what happens to the reading on the balance during the reaction.
Explain your answer.

.....

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.....

.....

[2 marks]

0 2

A student heated a piece of magnesium ribbon in a crucible with a lid. The student lifted the lid a little from time to time.
Table 1 shows the student's results.

Table 1

Measurement	Mass in g
Empty crucible and lid	24.36
Crucible, lid and magnesium before heating	24.84
Crucible, lid and product after heating	25.16

0 2 . 1

Calculate the mass of magnesium used.

.....

.....

.....

Mass of magnesium = g

[1 mark]

0 2 . 2

Calculate the mass of oxygen that reacted with the magnesium.

.....

.....

.....

Mass of oxygen = g

[1 mark]

0 2 . 3

Explain why the mass of the crucible and its contents increased.

.....

.....

.....

.....

[2 marks]

0 2 . 4

Suggest why the student lifted the lid from time to time.

.....

.....

[1 mark]

0 3

Two students each investigated the reaction between marble chips and excess dilute hydrochloric acid by measuring the loss in mass of an open flask over time.

Student A started timing and began weighing the flask as soon as the acid and marble chips were mixed.

Student B mixed the acid and marble chips, waited two minutes, and then started weighing the flask.

0 3 . 1

Explain why student B's results would show a smaller total loss in mass than student A's, even though the same masses of marble chips and acid were used.

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.....

[2 marks]

0 3 . 2

Suggest **one** improvement to the method that would let a student find the total mass of gas produced more accurately.

.....

.....

[1 mark]

0 3 . 3

Suggest why the flask should not be sealed if the aim is to measure the loss in mass.

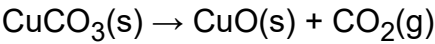
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[1 mark]

0 4

Copper carbonate is a green powder. When it is heated it decomposes to produce black copper oxide and carbon dioxide:



A student heated 12.35 g of copper carbonate in an open test tube until there was no further change. The mass of solid left was 7.95 g.

0 4 . 1

Calculate the mass of carbon dioxide produced.

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.....

.....

Mass of carbon dioxide = g

[1 mark]

0 4 . 2

Explain why the mass of solid decreased.
Use the equation in your answer.

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.....

.....

[2 marks]

0 4 . 3

The student repeated the experiment in a sealed container.
Predict how the total mass of the container and its contents after heating would compare with the total mass before heating.
Give a reason for your answer.

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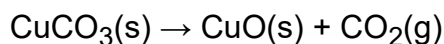
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[2 marks]

.....

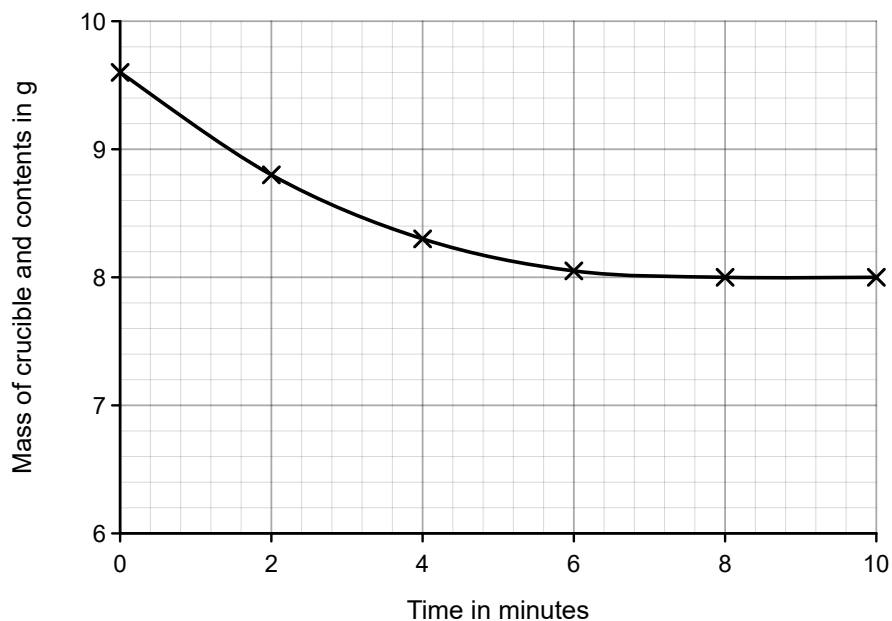
0 5

A student investigated the thermal decomposition of copper carbonate:



The student heated a sample in an open crucible on a balance and recorded the mass of the crucible and contents at intervals. Figure 1 shows the results.

Figure 1



0 5 . 1

Use Figure 1 to find the total mass of gas released during the reaction.

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.....

Mass of gas = g

[2 marks]

0 5 . 2

Explain why the mass becomes constant after about 8 minutes.

.....

.....

[1 mark]

0 5 . 3

Explain, using the equation, why the mass of the crucible and contents decreases as the reaction proceeds.

.....

.....

.....

.....

[2 marks]

0 6

A student added marble chips (calcium carbonate) to dilute hydrochloric acid in a conical flask. The flask was on a balance and had a loose cotton wool plug in its neck.



Table 2 shows the total mass of the flask and contents at different times.

Table 2

Time in minutes	0	1	2	3	4	5	6
Mass in g	184.60	184.02	183.68	183.49	183.42	183.40	183.40

0 6 . 1

Calculate the total mass of gas that escaped during the reaction.

.....

.....

.....

Mass of gas = g

[1 mark]

0 6 . 2

Explain why the mass of the flask and contents decreased.

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.....

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[2 marks]

0 6 . 3

Suggest why the mass did not change after 5 minutes.

.....

.....

[1 mark]

0 6 . 4

Suggest the purpose of the cotton wool plug.

.....

.....

[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: Mass changes when a reactant or product is a gas · 28 marks

Question 1 (4 marks)

01.1 [1 mark]

Correct: It increases, because oxygen from the air combines with the iron.

01.2 [1 mark]

Answer: closed

- closed (1)
-

01.3 [2 marks]

- the reading stays the same / does not change (1)
 - the gas cannot escape from the sealed flask, so no mass leaves the system (mass is conserved) (1)
-

Question 2 (5 marks)

02.1 [1 mark]

Answer: 0.48 g

- 0.48 (g) (1)
-

02.2 [1 mark]

Answer: 0.32 g

- 0.32 (g) (1)
-

02.3 [2 marks]

- magnesium reacts with oxygen (from the air) (1)
- the mass of the oxygen (a gas) is added to the solid product / magnesium oxide contains oxygen atoms that were not weighed at the start (1)

Notes: Do not accept 'magnesium oxide is heavier' without reference to oxygen.

02.4 [1 mark]

- to let more oxygen / air in (for the magnesium to react with) (1)

Notes: Ignore references to letting gas out.

Question 3 (4 marks)

03.1 [2 marks]

- some carbon dioxide had already escaped during the two minutes before student B started weighing (1)
- so student B's readings miss this early loss of mass, making the recorded total loss smaller (1)

03.2 [1 mark]

- record the mass at the moment the acid and marble chips are mixed (at time zero) / weigh the reactants separately before mixing and weigh the flask and contents again when the reaction has finished (1)

Notes: Allow: put a cotton wool plug in the neck of the flask to stop acid spray escaping.

03.3 [1 mark]

- if the flask were sealed the gas could not escape, so there would be no loss in mass to measure (1)

Question 4 (5 marks)

04.1 [1 mark]

Answer: 4.40 g

- 4.40 (g) (1)

04.2 [2 marks]

- carbon dioxide is produced, which is a gas / (g) (1)
- the carbon dioxide escapes into the air (so its mass is not included) (1)

Notes: Do not accept 'mass is lost / destroyed' or 'atoms are lost'.

04.3 [2 marks]

- the total mass would stay the same (1)
 - the carbon dioxide cannot escape / no atoms are lost or made (1)
-

Question 5 (5 marks)

05.1 [2 marks]

Answer: 1.60 g

- initial mass = 9.60 (g) and final mass = 8.00 (g) (1)
 - 1.60 (g) (1)
-

05.2 [1 mark]

- the reaction has finished / all the copper carbonate has decomposed, so no more carbon dioxide is produced (1)
-

05.3 [2 marks]

- carbon dioxide gas is produced by the reaction (1)
 - the carbon dioxide escapes from the open crucible into the air, so its mass is not included in later readings (1)
-

Question 6 (5 marks)

06.1 [1 mark]

Answer: 1.20 g

- 1.20 (g) (1)
-

06.2 [2 marks]

- carbon dioxide (gas) is produced (1)
 - the carbon dioxide escapes from the flask (through the cotton wool) (1)
-

06.3 [1 mark]

- the reaction had stopped because one of the reactants was used up / no more carbon dioxide was produced (1)
-

06.4 [1 mark]

- to let the gas escape but stop acid spray / droplets (of liquid) escaping (1)
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