AQA GCSE Chemistry

Quantitative chemistry · Foundation tier

Questions only

All 4 quantitative chemistry questions on the Foundation papers

Questions	Total marks	Time allowed
4	**39**	**41 min**

Name _____ Class or teacher _____ Date _____

Instructions

- Answer all questions in the spaces provided.
- Use black ink. Show your working for every calculation.
- You may use a scientific calculator and the periodic table insert.
- Print the separate mark scheme when you are ready to mark your answers.

For marking

Q	Source	Marks	Score
1	2023 P1F Q8	10	
2	2025 P1F Q10 / P1H Q3	11	
3	2021 P1F Q10 / P1H Q3	10	
4	2021 P2F Q6	8	

Total _____ / 39 **Percentage** _____ %

Questions from AQA GCSE past papers, 2021–2025, reproduced for revision. Practise these topics online, with instant marking:
`whiteboardchemistry.com/revision/gcse-chemistry/exam-questions?topics=c3-quantitative-chemistry&demand=low,standard&len=0`

Questions

Quantitative chemistry · Foundation tier · 4 questions · 39 marks · time allowed 41 min

Q1 · June 2023 · Paper 1 Foundation · Q8 · [10 marks]

This question also needs Atomic structure and the periodic table and Chemical changes.

This question is about displacement reactions.

Iron is extracted from iron oxide by a displacement reaction with carbon.

08.1 Balance the equation for the reaction.

$Fe_2O_3 + 3C \rightarrow$ _____ Fe + _____ CO

[2 marks]

08.2 Iron oxide is reduced in this reaction.

How does the equation show that iron oxide is reduced?

[1 mark]

08.3 Calculate the relative formula mass (M_r) of Fe_2O_3

Relative atomic masses (A_r): O = 16 Fe = 56

M_r = _____

[2 marks]

08.4 Copper oxide reacts with hydrogen to produce copper.

The equation for the reaction is:

$CuO + H_2 \rightarrow Cu + H_2O$

Calculate the percentage atom economy for obtaining copper from this reaction.

Use the equation:

$$\text{Percentage atom economy} = \frac{A_r \text{ of Cu}}{M_r \text{ of } H_2 + M_r \text{ of CuO}} \times 100$$

Relative atomic mass (A_r): Cu = 63.5

Relative formula masses (M_r): H_2 = 2 CuO = 79.5

Percentage atom economy = _____ %

[2 marks]

08.5 A student investigated the reactivity of four different metals, A, B, C and D.

The student:

- added each metal to aqueous solutions of each of the metal sulfates
- observed whether a reaction took place.

Give **one** observation that would show a reaction took place.

[1 mark]

08.6 Table 4 shows the results.

Table 4

Metal sulfate solution				
Metal	**A sulfate**	**B sulfate**	**C sulfate**	**D sulfate**
A	×	×	✓	×
B	✓	×	✓	×
C	×	×	×	×
D	✓	✓	✓	×

✓ shows that a displacement reaction took place.

× shows that a displacement reaction did not take place.

Write metals A, B, C and D in order of reactivity.

Give a reason for your order of reactivity.

Most reactive _____ _____ _____ _____ Least reactive

Reason

[2 marks]

Q2 · June 2025 · Paper 1 Foundation · Q10 · Paper 1 Higher · Q3 · [11 marks]

This question also needs Atomic structure and the periodic table and Chemical changes.

This question is about metals and metal oxides.

Tin (Sn) is extracted from tin oxide using carbon.

The equation for the reaction is:

$SnO_2 + C \rightarrow Sn + CO_2$

10.1 Which substance is reduced in this reaction?

Give **one** reason for your answer.

Answer in terms of oxygen.

[2 marks]

Substance reduced

Reason

10.2 Why can carbon be used to extract tin from tin oxide?

[1 mark]

10.3 Cadmium (Cd) can be extracted by the reaction of cadmium oxide with carbon.

The equation for the reaction is:

$CdO + C \rightarrow Cd + CO$

Calculate the percentage atom economy for the production of cadmium in this reaction.

Relative atomic masses (A_r): C = 12 Cd = 112

Relative formula mass (M_r): CdO = 128

Percentage atom economy = _____ %

[3 marks]

10.4 Tungsten is a transition metal.

Potassium is a Group 1 metal.

Give **two** differences between the properties of tungsten and the properties of potassium.

[2 marks]

1

2

10.5 Tungsten oxide reacts with hydrogen to give tungsten (W) and water.

The equation for the reaction is:

$WO_3 + 3H_2 \rightarrow W + 3H_2O$

The law of conservation of mass states:

'The mass of the products equals the mass of the reactants during a chemical reaction.'

Show that the equation obeys the law of conservation of mass.

Relative atomic mass (A_r): W = 184

Relative formula masses (M_r): H_2 = 2 WO_3 = 232 H_2O = 18

[2 marks]

10.6 The reaction producing tungsten has a high atom economy.

Why is it important to use reactions with a high atom economy in industry?

[1 mark]

Q3 · November 2021 · Paper 1 Foundation · Q10 · Paper 1 Higher · Q3 · [10 marks]

This question also needs Atomic structure and the periodic table and Chemical changes.

This question is about the extraction of metals.

Element R is extracted from its oxide by reduction with hydrogen.

The equation for the reaction is:

$3H_2 + RO_3 \rightarrow R + 3H_2O$

10.1 The sum of the relative formula masses (M_r) of the reactants ($3H_2 + RO_3$) is 150

Calculate the relative atomic mass (A_r) of R.

Relative atomic masses (A_r): H = 1 O = 16

Relative atomic mass (A_r) of R = _____

[2 marks]

10.2 Identify element R.

You should use:

- your answer to question 10.1
- the periodic table.

Identity of R = _____

[1 mark]

10.3 Carbon is used to extract tin (Sn) from tin oxide (SnO_2).

The equation for the reaction is:

$SnO_2 + C \rightarrow Sn + CO_2$

Calculate the percentage atom economy for extracting tin in this reaction.

Relative atomic masses (A_r): C = 12 O = 16 Sn = 119

Percentage atom economy = _____ %

[3 marks]

10.4 Tungsten (W) is a metal.

Tungsten is extracted from tungsten oxide (WO_3).

All other solid products from the extraction method must be separated from the tungsten.

Table 9 shows information about three possible methods to extract tungsten from tungsten oxide.

Table 9

Method	Reactant	Relative cost of reactant	Products
1	Carbon	Low	Tungsten solid Carbon dioxide gas Tungsten carbide solid
2	Hydrogen	High	Tungsten solid Water vapour
3	Iron	Low	Tungsten solid Iron oxide solid

Evaluate the three possible methods for extracting tungsten from tungsten oxide.

[4 marks]

Q4 · November 2021 · Paper 2 Foundation · Q6 · [8 marks]

This question also needs Chemical analysis.

Potash alum is a chemical compound.

Potash alum contains potassium ions, aluminium ions and sulfate ions.

06.1 Which **two** methods can be used to identify the presence of potassium ions in potash alum solution?

Tick (✓) **two** boxes.

Flame emission spectroscopy	☐
Flame test	☐
Measuring boiling point of solution	☐
Paper chromatography	☐
Using litmus paper	☐

[2 marks]

06.2 Sodium hydroxide solution is used to test for some metal ions.

Sodium hydroxide solution is added to a solution of potash alum until a precipitate forms.

Complete the sentence.

Choose the answer from the box.

blue brown green white

The colour of the precipitate formed is _____ .

[1 mark]

06.3 Complete the sentence.

Choose the answer from the box.

[1 mark]

barium chloride solution limewater

red litmus paper silver nitrate solution

Sulfate ions can be identified using dilute hydrochloric acid and _____ .

06.4 A solution of potash alum has a concentration of 258 g/dm^3

Calculate the mass of potash alum needed to make 800 cm^3 of a solution of potash alum with a concentration of 258 g/dm^3

Give your answer to 3 significant figures.

Mass (3 significant figures) = _____ g

[4 marks]

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