

Chemistry Calculations

1.

] **Table 1** shows the mass numbers and percentage abundances of the isotopes of gallium.

Table 1

| Mass number | Percentage abundance (%) |
|-------------|--------------------------|
| 69 | 60 |
| 71 | 40 |

Calculate the relative atomic mass (A_r) of gallium.

Give your answer to 1 decimal place.

[2 marks]

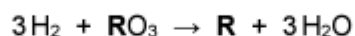
Relative atomic mass (1 decimal place) = _____

2.

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:



The sum of the relative formula masses (M_r) of the reactants ($3\text{H}_2 + \text{RO}_3$) is 150

Calculate the relative atomic mass (A_r) of **R**.

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

[2 marks]

Relative atomic mass (A_r) of **R** = _____

Identify element **R**.

You should use:

- your answer to **question 03.1**
- the periodic table.

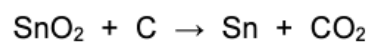
[1 mark]

Identity of **R** = _____

3.

Carbon is used to extract tin (Sn) from tin oxide (SnO₂).

The equation for the reaction is:



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

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

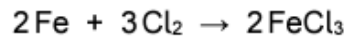
[3 marks]

Percentage atom economy = _____ %

4.

Iron chloride is produced by heating iron in chlorine gas.

The equation for the reaction is:



Calculate the volume of chlorine needed to react with 14 g of iron.

You should calculate:

- the number of moles of iron used
- the number of moles of chlorine that react with 14 g of iron
- the volume of chlorine needed.

Relative atomic mass (A_r): Fe = 56

The volume of 1 mole of gas = 24 dm³

[3 marks]

Volume of chlorine = _____ dm³

5.

Ethanedioic acid is a solid at room temperature.

Calculate the mass of ethanedioic acid ($\text{H}_2\text{C}_2\text{O}_4$) needed to make 250 cm^3 of a solution with concentration 0.0480 mol/dm^3

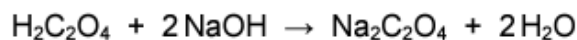
Relative formula mass (M_r): $\text{H}_2\text{C}_2\text{O}_4 = 90$

[2 marks]

Mass = _____ g

The student found that 25.0 cm^3 of the sodium hydroxide solution was neutralised by 15.00 cm^3 of the 0.0480 mol/dm^3 ethanedioic acid solution.

The equation for the reaction is:



Calculate the concentration of the sodium hydroxide solution in mol/dm^3

[3 marks]

6.

Ethanol and butanol can be used as fuels for cars.

] A car needs an average of 1.95 kJ of energy to travel 1 m

Ethanol has an energy content of 1300 kilojoules per mole (kJ/mol).

Calculate the number of moles of ethanol needed by the car to travel 200 km

[3 marks]

Number of moles = _____ mol