PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

CHEMISTRY



EXAM QUESTION PACK

TOPIC 1: KEY CONCEPTS IN CHEMISTRY: CALCULATIONS INVOLVING MASSES (PAPER 1)

SCORE	PERCENTAGE
/130	%

STEMUP

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Q1.

(a) An acid can be reacted with a base in a titration experiment.

(i) State the name of the type of reaction when an acid reacts with a base.

(1)

.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The general equation for the reaction of an acid with a base is

(1)

☒ **A** acid + base → alkali + water

☒ **B** acid + base → salt + carbon dioxide

☒ **C** acid + base → salt + water + hydrogen

☒ **D** acid + base → salt + water

(b) A solution of sodium hydroxide is prepared.

The mass of a container with solid sodium hydroxide is determined.
The sodium hydroxide is transferred to a flask.
The mass of the empty container is determined.
The sodium hydroxide is dissolved in water and the volume made up to 2 dm^3.

The results are
mass of container + solid sodium hydroxide = 17.12g
mass of empty container = 7.02g

The results are used to calculate the concentration of the sodium hydroxide solution.

(i) Calculate the mass of solid sodium hydroxide transferred to the flask.

(1)

.....

mass of solid sodium hydroxide = ... g

(ii) Calculate the concentration of the sodium hydroxide solution in g dm^{-3}.

(1)

.....

.....

concentration of sodium hydroxide solution = ... g dm^{-3}

Q2.

(a) An acid can be reacted with a base in a titration experiment.

(i) State the name of the type of reaction when an acid reacts with a base.

(1)

.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The general equation for the reaction of an acid with a base is

(1)

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☒ **B** acid + base → salt + carbon dioxide

☒ **C** acid + base → salt + water + hydrogen

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mass of container + solid sodium hydroxide = 17.12g
mass of empty container = 7.02g

The results are used to calculate the concentration of the sodium hydroxide solution.

(i) Calculate the mass of solid sodium hydroxide transferred to the flask.

(1)

.....

mass of solid sodium hydroxide = ... g

(ii) Calculate the concentration of the sodium hydroxide solution in g dm^{-3}.

(1)

.....

.....

concentration of sodium hydroxide solution = ... g dm^{-3}

(**Q15 1SC0/2CF, June 2015**)

Q3.

Figure 5 shows the molecular formulae and boiling points of four alkanes.

alkane	molecular formula	boiling point in °C
propane	C_3H_8	–42
butane	C_4H_{10}	0
pentane	C_5H_{12}	36
hexane	C_6H_{14}	69

Figure 5

(i) Describe how the boiling points of these alkanes change as the numbers of carbon atoms in one of their molecules change.

(1)

.....

.....

(ii) Calculate the relative formula mass of a molecule of propane, C_3H_8. (relative atomic masses: C = 12, H = 1)

(1)

.....

relative formula mass = ...

(iii) Propane reacts with excess oxygen to form carbon dioxide and water.

Write the word equation for this reaction.

(2)

.....

.....

(iv) Explain a problem caused by the incomplete combustion of propane.

(2)

.....

.....

.....

.....

(Total for question = 6 marks)

(**Q03b 1SC0/2CF/S2, SAM**)

Q4.

An excess of magnesium is added to some dilute hydrochloric acid of pH 2.
The mass of hydrogen gas produced is measured.

The experiment is repeated with excess magnesium but with the same volume of dilute hydrochloric acid of pH 1.

(i) State how many times greater the concentration of hydrogen ions is in the acid of pH 1 than in the acid of pH 2.

(1)

.....

.....

(ii) With the acid of pH 2, the mass of hydrogen gas produced when the reaction is complete is 0.005 g.

Predict the mass of hydrogen gas produced in the reaction with acid of pH 1.

(1)

.....

.....

mass = ... g

(Total for question = 2 marks)

(**QU02c 1SC0/1CH, June 2023**)

Q5.

Answer the question with a cross in the box you think is correct (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

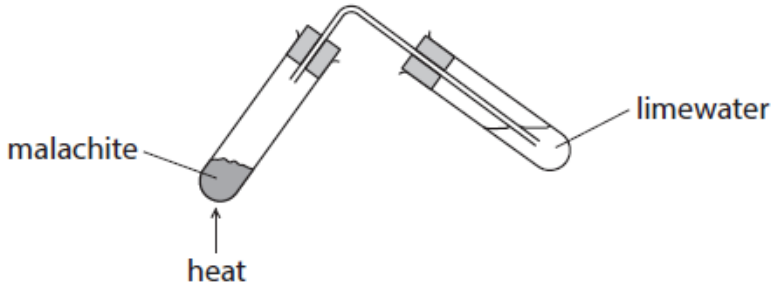
Malachite, $Cu_2CO_3(OH)_2$, is a mineral containing copper.

When heated, malachite decomposes to form copper oxide, carbon dioxide and water.

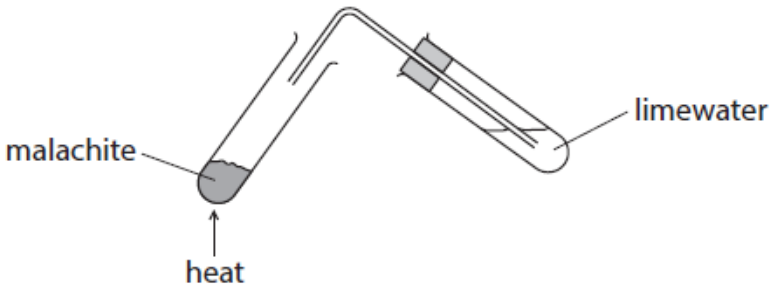
(i) Which apparatus should be used to heat the malachite and test for carbon dioxide?

(1)

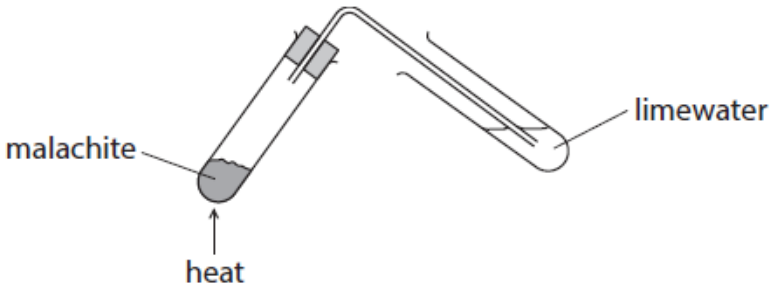
☐ **A**



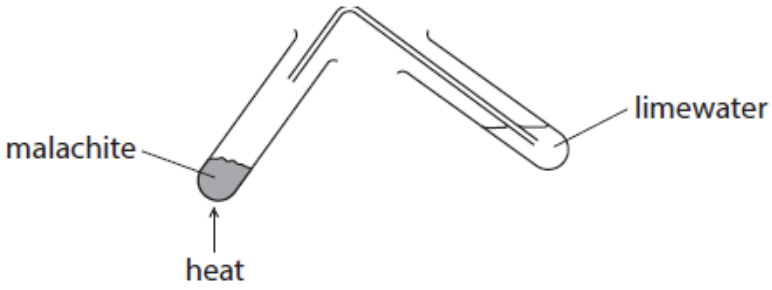
☐ **B**



☐ **C**



☐ **D**



(ii) When carbon dioxide is bubbled through limewater, a precipitate forms.

This precipitate solid makes the limewater cloudy.

Name the precipitate that makes the limewater cloudy.

(1)

.....

(iii) The equation for the decomposition of malachite when it is heated is

$$Cu_2CO_3(OH)_2 \rightarrow 2CuO + CO_2 + H_2O$$

Calculate the maximum mass of copper oxide that can be formed when 22.1 g of malachite is decomposed completely.

(relative atomic masses: Cu = 63.5, O = 16.0, C = 12.0, H = 1.0)

(4)

.....

.....

.....

.....

.....

maximum mass of CuO = ... g

(Total for question = 6 marks)

(**QU04a 1SC0/1CH, June 2025**)

Q6.

Figure 8 shows part of the reactivity series of metals.

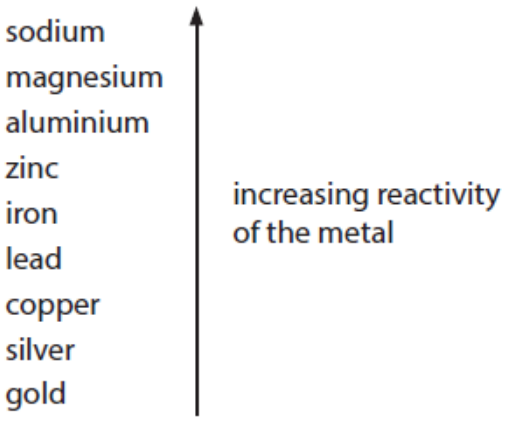


Figure 8

When copper oxide is heated with carbon, the products are copper and carbon dioxide.

(i) Write the word equation for this reaction.

(1)

.....

(ii) In this reaction, copper oxide loses oxygen.

State the type of reaction when copper oxide loses oxygen.

(1)

.....

(iii) In one reaction, 159.0 g of copper oxide was heated with excess carbon to produce 127.0 g of copper.

Use this information to calculate the mass of copper formed, in g, when 238.5 g of copper oxide is reacted with excess carbon.

(2)

.....

.....

mass of copper = ... g

(iv) State why this reaction with copper oxide uses excess carbon.

(1)

.....

.....

(Total for question = 5 marks)

(**QU04c 1SC0/1CF, June 2025**)

Q7.

Lithium is an alkali metal.

A teacher adds a small piece of lithium to water containing universal indicator.

The universal indicator changes colour.

(i) State the colour change shown by the universal indicator.

(1)

from ..... to .....

(ii) Place ticks (✓) in boxes next to **two** observations that are made when lithium reacts with water.

(2)

observations	(✓)
a green precipitate forms	
effervescence is seen	
the lithium sinks in the water	
the lithium gets smaller and disappears	
the temperature of the solution decreases	

Answer the question with a cross in the box you think is correct ☒ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒ .

(iii) When lithium is added to water, lithium hydroxide and a gas are produced.

What is the name of the gas produced in this reaction?

(1)

☒ **A** carbon dioxide

☒ **B** chlorine

☒ **C** hydrogen

☒ **D** oxygen

(iv) Lithium hydroxide contains lithium ions, Li^+.

Describe how a lithium atom becomes a lithium ion.

(2)

.....

.....

.....

.....

(v) Calculate the percentage by mass of hydrogen in lithium hydroxide, LiOH.

$$\% \text{ by mass of element} = \frac{\text{relative atomic mass of element}}{\text{relative formula mass of compound}} \times 100$$

(relative atomic masses: Li = 7, O = 16, H = 1.0)

(3)

.....

.....

.....

.....

percentage by mass of hydrogen = ...

(Total for question = 9 marks)

(**QU04b 1SC0/2CF, June 2025**)

Q8.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 5 shows the structure of one molecule of three different compounds, **X**, **Y** and **Z**.

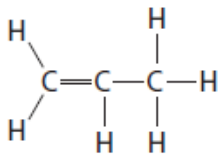
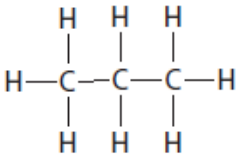
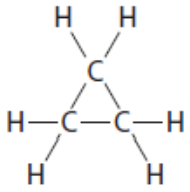
X	Y	Z
		

Figure 5

The molecules of the compounds shown in Figure 5 all contain the same number of carbon atoms.

(i) Give the number of carbon atoms in a molecule of compound **X**.

(1)

.....

(ii) Compound **X** contains carbon and one other element.

Give the **name** of the other element in compound **X**.

(1)

.....

(iii) Which of the compounds in Figure 5 is a hydrocarbon?

(1)

☒ **A** **X** only

☒ **B** **Y** only

☒ **C** **X** and **Y** only

☒ **D** **X**, **Y** and **Z**

(iv) Which of the compounds in Figure 5 have the same molecular formula?

(1)

☒ **A** none of them

☒ **B** **X** and **Y** only

☒ **C** **X** and **Z** only

☒ **D** **X**, **Y** and **Z**

(Total for question = 4 marks)

(**QU03a 1SC0/2CF, June 2024**)

Q9.

(i) When hydrocarbon fuels are burned, the products are water and carbon dioxide.

Describe what needs to be done to the apparatus in Figure 5 to collect the water and show that carbon dioxide has been produced.

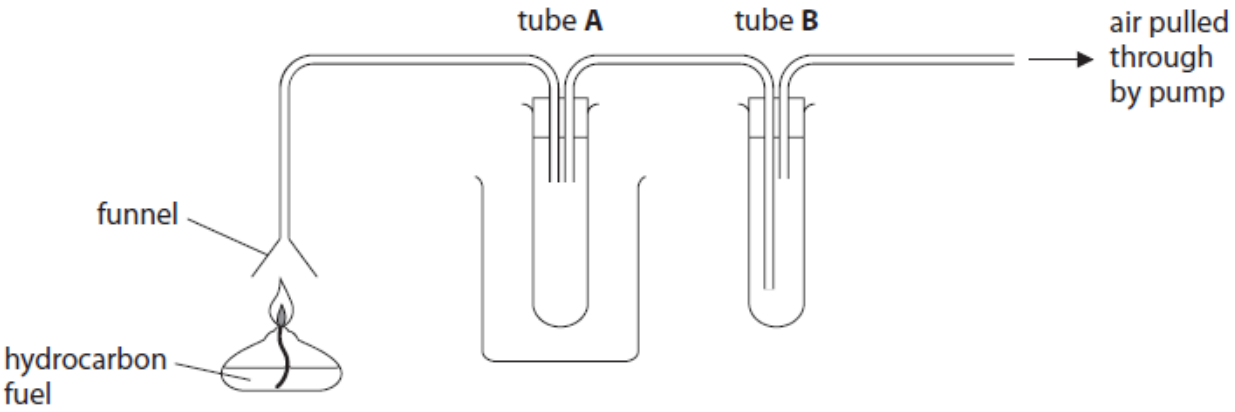


Figure 5

(2)

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(ii) A hydrocarbon, C_xH_y, is burned in excess oxygen, forming 26.4 g of carbon dioxide and 5.4 g of water.

The relative formula mass of C_xH_y is 78.

Calculate the molecular formula of the hydrocarbon C_xH_y.

(relative atomic masses: H = 1.0, C = 12;
relative formula masses: H_2O = 18, CO_2 = 44)

(4)

.....

.....

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.....

.....

molecular formula = ...

(Total for question = 6 marks)

(**QU04b 1SC0/2CH, June 2024**)

Q10.

(a) Magnesium sulfate solution can be made by reacting magnesium oxide with dilute sulfuric acid.

The word equation for the reaction is

magnesium oxide + sulfuric acid → magnesium sulfate + water

Describe how solid magnesium oxide and dilute sulfuric acid are used to prepare a sample of pure magnesium sulfate solution.

(2)

.....

.....

.....

.....

(b) Magnesium carbonate, $MgCO_3$, can be reacted with dilute sulfuric acid, H_2SO_4, to form magnesium sulfate, water and carbon dioxide.

Write the balanced equation for this reaction.

(2)

.....

(c) Samples of tap water from city A and city B were investigated.

Each sample of water was treated as follows.
The mass of an empty evaporating basin was determined.
500 cm^3 of tap water was added and evaporated to dryness.
The mass of the evaporating basin and remaining solid was determined.

Here are the results.

	city A	city B
mass of evaporating basin / g	261.500	258.450
mass of evaporating basin + solid / g	261.611	258.515
mass of solid / g	0.111	
concentration of dissolved solid in tap water / g dm^{-3}	0.222	

Calculate the concentration, in g dm–3, of dissolved solid in the tap water from city B.

(2)

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.....

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.....

.....

.....

concentration of solid = ... g dm^{-3}

*(d) Some dissolved solids cause hardness in water.
Hard water can be softened.
Water hardness can be temporary hardness or permanent hardness.
Not all softening processes remove both types of hardness.

Describe and explain different methods of softening water, indicating the type of hardness each method removes.

(6)

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(Total for Question = 12 marks)

(**Q32 1SC0/1CF, June 2013**)

Q11.

(a) Magnesium sulfate solution can be made by reacting magnesium oxide with dilute sulfuric acid.

The word equation for the reaction is

magnesium oxide + sulfuric acid → magnesium sulfate + water

Describe how solid magnesium oxide and dilute sulfuric acid are used to prepare a sample of pure magnesium sulfate solution.

(2)

.....

.....

.....

.....

(b) Magnesium carbonate, $MgCO_3$, can be reacted with dilute sulfuric acid, H_2SO_4, to form magnesium sulfate, water and carbon dioxide.

Write the balanced equation for this reaction.

(2)

.....

(c) Samples of tap water from city A and city B were investigated.

Each sample of water was treated as follows.
The mass of an empty evaporating basin was determined.
500 cm^3 of tap water was added and evaporated to dryness.
The mass of the evaporating basin and remaining solid was determined.

Here are the results.

	city A	city B
mass of evaporating basin / g	261.500	258.450
mass of evaporating basin + solid / g	261.611	258.515
mass of solid / g	0.111	
concentration of dissolved solid in tap water / g dm^{-3}	0.222	

Calculate the concentration, in g dm–3, of dissolved solid in the tap water from city B.

(2)

.....

.....

.....

.....

.....

.....

concentration of solid = ... g dm^{-3}

*(d) Some dissolved solids cause hardness in water.
Hard water can be softened.
Water hardness can be temporary hardness or permanent hardness.
Not all softening processes remove both types of hardness.

Describe and explain different methods of softening water, indicating the type of hardness each method removes.

(6)

.....

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.....

(Total for Question = 12 marks)

(**Q40 1SC0/2CF, June 2013**)

Q12.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

The particles in atoms are electrons, neutrons and protons.

The mass of an electron is

(1)

☒ **A** greater than the mass of a neutron

☒ **B** the same as the mass of a proton

☒ **C** smaller than the mass of a proton

☒ **D** the same as the mass of a neutron

(b) The atomic number of oxygen is 8.

The mass number of an atom of oxygen is 17.

Describe the number and type of particles in the nucleus of this atom.

(2)

.....

.....

.....

.....

(c) Sulfur and oxygen are both in group 6 of the periodic table.

Explain, in terms of their electronic configurations, why they are both in group 6.

(2)

.....

.....

.....

.....

(d) An atom of phosphorus contains 15 electrons.

Describe how these 15 electrons are arranged in a phosphorus atom.

(2)

.....

.....

.....

.....

(e) Phosphorus oxide is a compound that contains covalent bonds.

(i) Describe what is meant by a **covalent bond.**

(2)

.....

.....

.....

.....

(ii) The formula of a molecule of phosphorus oxide is P_4O_{10}

Give the empirical formula of this oxide.

(1)

.....

(Total for Question = 10 marks)

(**Q46 1SC0/1CH, June 2013**)

Q13.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer.

The particles in atoms are electrons, neutrons and protons.

The mass of an electron is

(1)

☒ **A** greater than the mass of a neutron

☒ **B** the same as the mass of a proton

☒ **C** smaller than the mass of a proton

☒ **D** the same as the mass of a neutron

(b) The atomic number of oxygen is 8.

The mass number of an atom of oxygen is 17.

Describe the number and type of particles in the nucleus of this atom.

(2)

.....

.....

.....

.....

(c) Sulfur and oxygen are both in group 6 of the periodic table.

Explain, in terms of their electronic configurations, why they are both in group 6.

(2)

.....

.....

.....

.....

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Describe how these 15 electrons are arranged in a phosphorus atom.

(2)

.....

.....

.....

.....

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(i) Describe what is meant by a **covalent bond.**

(2)

.....

.....

.....

.....

(ii) The formula of a molecule of phosphorus oxide is P_4O_{10}

Give the empirical formula of this oxide.

(1)

.....

(Total for Question = 10 marks)

(**Q43 1SC0/2CH, June 2013**)

Q14.

The rate of reaction between magnesium ribbon and dilute hydrochloric acid at room temperature is investigated.

The apparatus used is shown in Figure 11.

The volume of hydrogen gas given off was measured at regular intervals during the reaction.

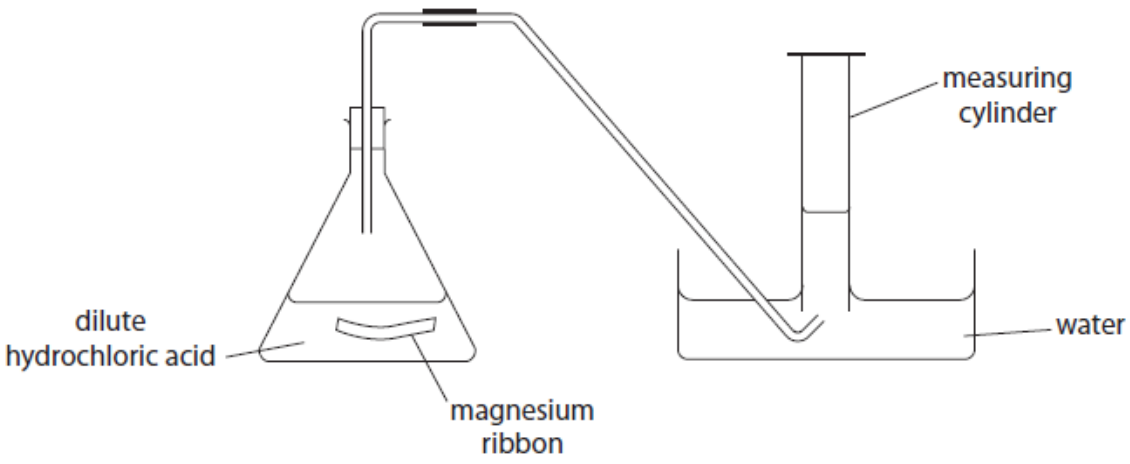


Figure 11

The graph in Figure 12 shows the results of this experiment.

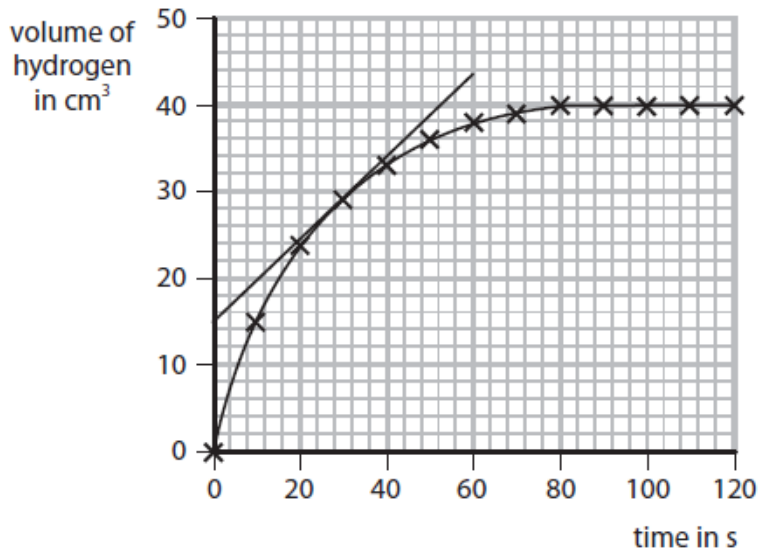


Figure 12

The balanced equation for this reaction is

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

(i) In another experiment, 0.1 moles of hydrochloric acid, HCl, were reacted with 0.1 g of magnesium ribbon.

Calculate the number of moles of magnesium, Mg, in the 0.1 g sample of magnesium ribbon.

(relative atomic mass: Mg = 24)

(1)

.....

.....

.....

number of moles = ...

(ii) In a further experiment, 0.5 mol of hydrochloric acid, HCl, were mixed with 0.5 mol of magnesium, Mg.

Use the equation to show that, in this experiment, the magnesium is in excess.

(1)

.....

.....

(Total for question = 2 marks)

Q15.

Bonding and separation techniques

(a) The diagram shows the structure of diamond.



(i) Describe what each ● represents.

(2)

.....

.....

(ii) State the type of bonding in the diamond structure.

(1)

.....

(b) Give the name of the process used to obtain oxygen from liquid air.

(2)

.....

.....

(c) A colouring in some sweets was analysed using paper chromatography.

One of the dyes in the colouring moved 2 cm up the paper while the solvent moved 8 cm.

What is the R_f value of this dye?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** 0.25

☒ **B** 2

☒ **C** 4

☒ **D** 6

*(d) Here is some information about magnesium, oxygen and magnesium oxide.

The electronic configuration of magnesium atoms is 2.8.2
The electronic configuration of oxygen atoms is 2.6
Magnesium oxide is an ionic compound.

When magnesium ribbon is heated, it reacts with oxygen from the air to form magnesium oxide, MgO.

Describe how the reaction can be carried out, including an explanation of what happens to the magnesium and oxygen atoms when they form magnesium oxide.

(6)

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(Total for question = 12 marks)

(**Q05 1SC0/1CF, June 2014**)

Q16.

Bonding and separation techniques

(a) The diagram shows the structure of diamond.



(i) Describe what each ● represents.

(2)

.....

.....

(ii) State the type of bonding in the diamond structure.

(1)

.....

(b) Give the name of the process used to obtain oxygen from liquid air.

(2)

.....

.....

(c) A colouring in some sweets was analysed using paper chromatography.

One of the dyes in the colouring moved 2 cm up the paper while the solvent moved 8 cm.

What is the R_f value of this dye?

Put a cross (☒) in the box next to your answer.

(1)

☐ **A** 0.25

☐ **B** 2

☐ **C** 4

☒ **D** 6

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The electronic configuration of magnesium atoms is 2.8.2
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When magnesium ribbon is heated, it reacts with oxygen from the air to form magnesium oxide, MgO.

Describe how the reaction can be carried out, including an explanation of what happens to the magnesium and oxygen atoms when they form magnesium oxide.

(6)

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(Total for question = 12 marks)

(**Q05 1SC0/2CF, June 2014**)

Q17.

Lithium, sodium and potassium are metals in group 1 of the periodic table.

When heated calcium burns in air to form calcium oxide.

(i) Write the word equation for this reaction.

(2)

.....

.....

(ii) In an experiment to determine the empirical formula for calcium oxide, 1.05 g of calcium combined with 0.42 g of oxygen.

Calculate the empirical formula of the calcium oxide.
(relative atomic masses: Ca = 40, O = 16)

You must show your working.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

empirical formula of calcium oxide = ...

(Total for question = 5 marks)

(**Q04e 1SC0/2CF/S2, SAM**)

Q18.

A sample of calcium bromide contains 0.2 g calcium and 0.8 g bromine by mass.

Calculate the empirical formula of calcium bromide.

(relative atomic masses: Ca = 40, Br = 80)

(3)

empirical formula = ...

(Total for question = 3 marks)

(**Q05g 1SC0/2CF, SAM 2016**)

Q19.

A sample of calcium bromide contains 0.2 g calcium and 0.8 g bromine by mass.

Calculate the empirical formula of calcium bromide.

(relative atomic masses: Ca = 40, Br = 80)

(3)

empirical formula = ...

(Total for question = 3 marks)

(**Q02d 1SC0/2CH, SAM 2016**)

Q20.

Two oxides of lead, **R** and **S**, were analysed.

The empirical formula of oxide **R** was found to be PbO.

The results of the analysis of oxide **S** showed it contained 0.207 g of lead combined with 0.032 g of oxygen.

Show, by calculation, that the two oxides had different empirical formulae. (relative atomic masses: O = 16, Pb = 207)

(3)

(Total for question = 3 marks)

(**Q04d 1SC0/1CF, SAM 2016**)

Q21.

In an electrolysis, molten sodium fluoride is decomposed.

$$2NaF \rightarrow 2Na + F_2$$

(relative atomic masses: F = 19, Na = 23)
(relative formula mass NaF = 42)

Calculate the maximum mass of sodium that could be formed from 168 g of sodium fluoride.

(2)

mass = ... g

(Total for question = 2 marks)

(**Q03d 1SC0/1CF, SAM 2016**)

Q22.

A student investigates the reaction that occurs when zinc carbonate is heated.

Figure 1 shows the apparatus the student uses.

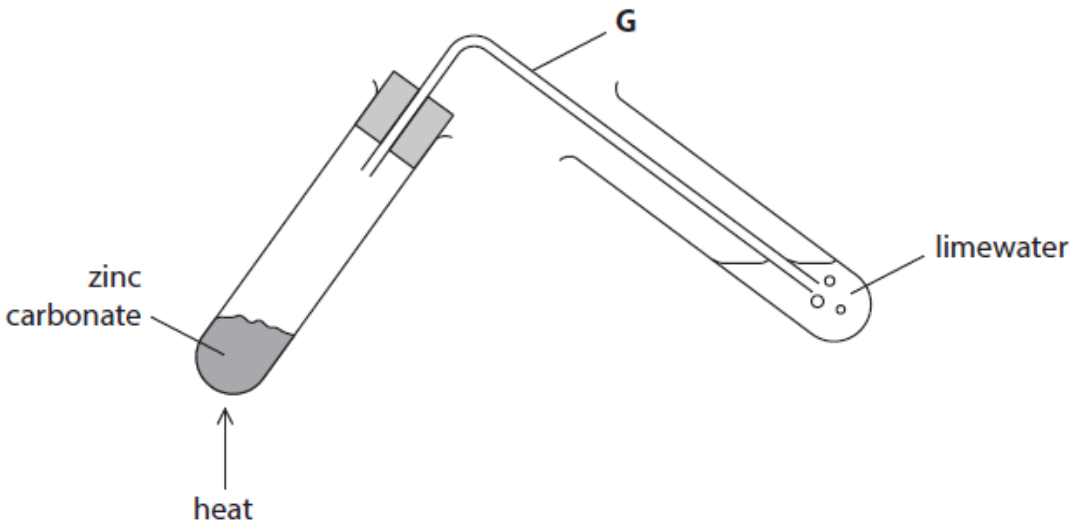


Figure 1

Another student investigates the change in mass that takes place when zinc carbonate is heated.

(i) Figure 2 shows the results the student records at the start of the investigation.

mass of empty test tube	14.62 g
mass of test tube + zinc carbonate	17.83 g

Figure 2

Using the results in Figure 2, calculate the mass of zinc carbonate in the test tube.

(1)

.....

mass of zinc carbonate = ... g

(ii) The student then

- heats the test tube containing the zinc carbonate for five minutes
- places the hot test tube on a bench mat to cool
- finds the mass of the test tube and contents.

Describe what the student should do next to make sure that all the zinc carbonate has reacted completely.

(2)

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.....

(Total for question = 3 marks)

(**QU01d 1SC0/1CF, June 2025**)

Q23.

50 cm^3 of potassium hydroxide solution of concentration 40 g dm^{-3} is needed for an experiment.

Calculate the mass of potassium hydroxide that must be dissolved in water to make 50 cm^3 of solution of this concentration.

(2)

mass of potassium hydroxide = ... g

(Total for question = 2 marks)

(**Q06c 1SC0/1CH, SAM 2016**)

Q24.

Calcium nitrate contains calcium ions and nitrate ions.

Calculate the relative formula mass of calcium nitrate, $Ca(NO_3)_2$.
(relative atomic masses: Ca = 40, N = 14, O = 16)

(2)

relative formula mass = ...

(Total for question = 2 marks)

(**Q04c 1SC0/1CF, SAM 2016**)

Q25.

Calcium nitrate contains calcium ions and nitrate ions.

Calculate the relative formula mass of calcium nitrate, $Ca(NO_3)_2$.

(relative atomic masses: Ca = 40, N = 14, O = 16)

(2)

relative formula mass = ...

(Total for question = 2 marks)

(**Q02b 1SC0/1CH, SAM 2016**)

Q26.

Group 1 elements are known as the alkali metals.

The relative atomic mass of caesium is 132.905.

Calculate the average mass of one atom of caesium.

(Avogadro constant = 6.02×10^{23})

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.....

mass = ... g

(Total for question = 2 marks)

Q27.

Figure 6 shows the apparatus that can be used to electrolyse sodium sulfate solution using inert electrodes.

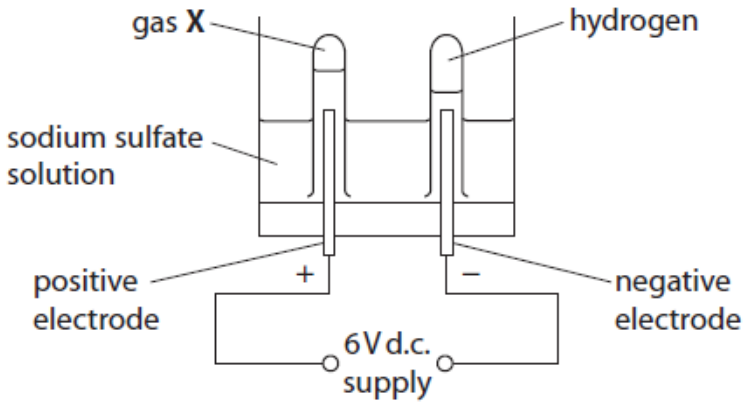


Figure 6

The sodium sulfate solution was made by dissolving 28.4 g of sodium sulfate in water to make 250 cm^3 of solution.

Calculate the concentration of this solution in g dm^{-3}.

Give your answer to three significant figures.

(3)

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.....

.....

.....

concentration = ... g dm^{-3}

(Total for question = 3 marks)

(**Q05b 1SC0/1CF, Nov 2020**)

Q28.

100 g of strontium nitrate is dissolved in water to make 400 cm^3 of solution.

Calculate the concentration of this solution in g dm^{-3}.

(3)

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concentration = ... g dm^{-3}

(Total for question = 3 marks)

(**Q05c 1SC0/1CF, SAM**)

Q29.

The concentration of a solution can be calculated using the equation

$$\text{concentration of solution} = \frac{\text{mass of solid}}{\text{volume of solution}}$$

A student dissolved 9.25 g of ammonium chloride in water and made up the solution to a volume of 200 cm^3.

Use the equation to calculate the concentration of this solution in g dm^{-3}.

(2)

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.....

.....

concentration = ... g dm^{-3}

(Total for question = 2 marks)

(**Q05a 1SC0/2CF, Nov 2021**)

Q30.

The sodium sulfate solution was made by dissolving 28.4 g of sodium sulfate in water to make 250 cm^3 of solution.

Calculate the concentration of this solution in g dm^{-3}.

Give your answer to three significant figures.

(3)

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concentration = ... g dm^{-3}

(Total for question = 3 marks)

(**Q01b 1SC0/1CH, Nov 2020**)

Q31.

3.14 g of solid copper sulfate was dissolved in water and made up to 250 cm^3 of solution.

$$\text{concentration (g dm}^{-3}\text{)} = \frac{\text{mass of solid (g)}}{\text{volume of solution (dm}^3\text{)}}$$

Calculate the concentration of this copper sulfate solution in g dm^{-3}.

(2)

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.....

.....

concentration = ... g dm^{-3}

(Total for question = 2 marks)

(**Q04a 1SC0/1CF, June 2022**)

Q32.

A 250 cm^3 solution of copper sulfate contains 6.52 g of dissolved solid.

Calculate the concentration of this copper sulfate solution in g dm^{-3}.

$$\text{concentration (g dm}^{-3}) = \frac{\text{mass of solid (g)}}{\text{volume of solution (dm}^3)}$$

(2)

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.....

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concentration = ... g dm^{-3}

(Total for question = 2 marks)

(**Q04a 1SC0/1CF, June 2024**)

Q33.

Figure 8 shows part of the reactivity series of metals.

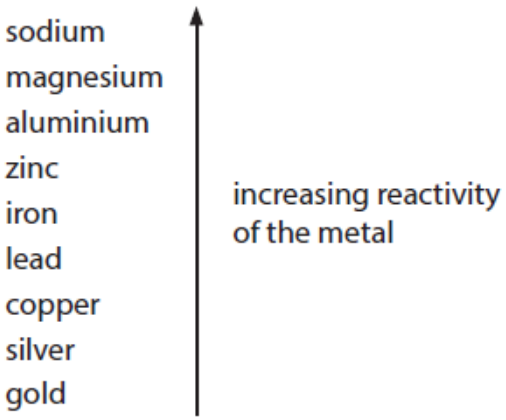


Figure 8

A solution of zinc sulfate was made by dissolving 23.8 g of the compound in water and was made up to a total volume of 250cm^3 with water.

Calculate the concentration of this solution in g dm^{-3}.

$$\text{concentration (g dm}^{-3}\text{)} = \frac{\text{mass of solid (g)}}{\text{volume of solution (dm}^3\text{)}}$$

Give your answer to 2 significant figures.

(3)

.....

.....

concentration = ... g dm^{-3}

(Total for question = 3 marks)

(**QU04d 1SC0/1CF, June 2025**)

Q34.

Tin reacts with chlorine to form tin chloride.
A sample of tin chloride contains 1.19 g of tin and 1.42 g of chlorine.

Calculate the empirical formula of this tin chloride.

(relative atomic masses: Cl = 35.5, Sn = 119.0)

You must show your working.

(3)

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empirical formula of this tin chloride = ...

(Total for question = 3 marks)

(**Q03b 1SC0/2CF, Nov 2021**)

Q35.

In Figure 5, the letters **A**, **E**, **G**, **J**, **X** and **Z** show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

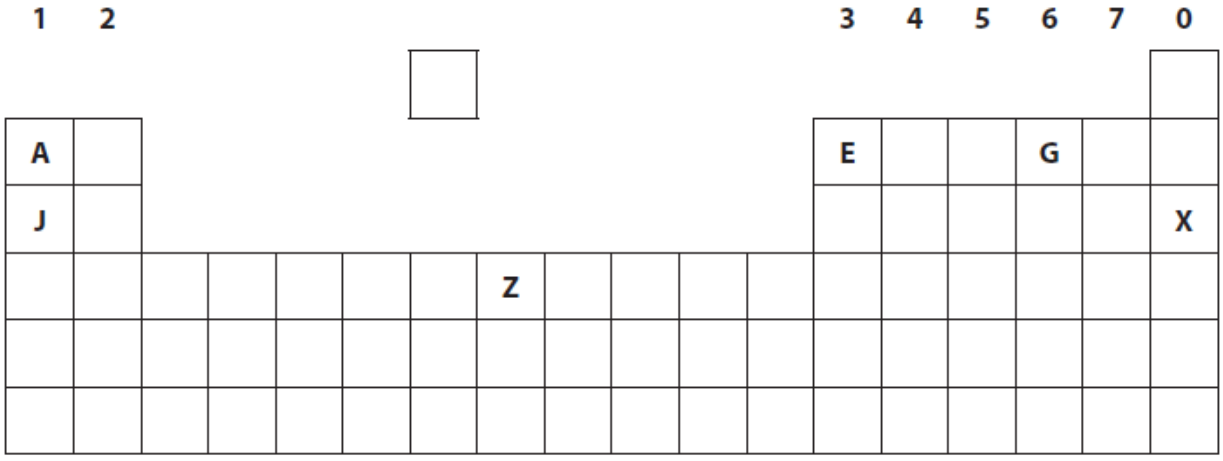


Figure 5

In an experiment, 3.5 g of element **A** reacted with 4.0 g of element **G** to form a compound.

Calculate the empirical formula of this compound.
(relative atomic masses: **A** = 7, **G** = 16)

You must show your working.

(3)

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empirical formula of this compound = ...

(Total for question = 3 marks)

(**Q05d 1SC0/1CF, June 2019**)

Q36.

In Figure 1, the letters **A**, **E**, **G**, **J**, **X** and **Z** show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

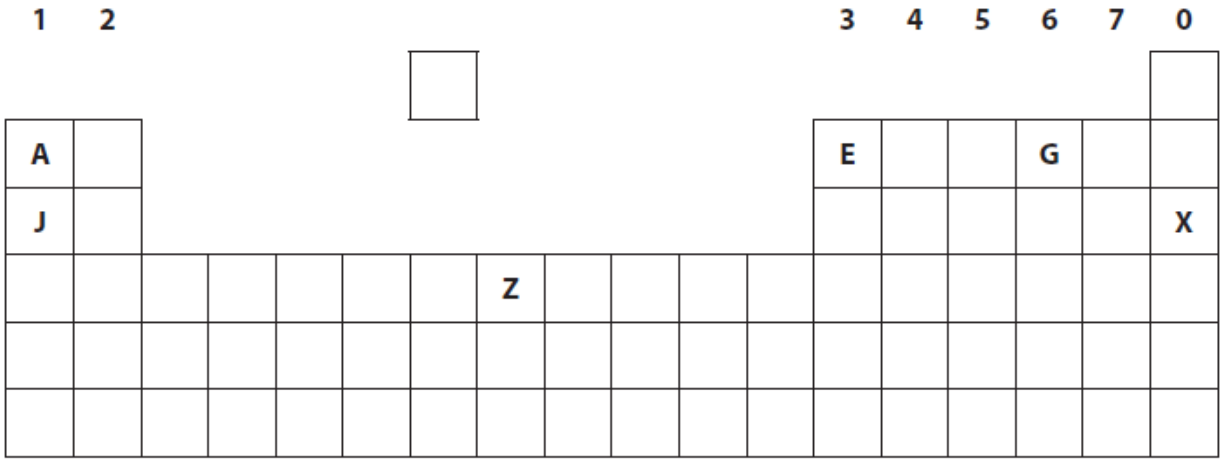


Figure 1

In an experiment, 3.5 g of element **A** reacted with 4.0 g of element **G** to form a compound.

Calculate the empirical formula of this compound.
(relative atomic masses: **A** = 7, **G** = 16)

You must show your working.

(3)

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empirical formula of this compound = ...

(Total for question = 3 marks)

(**Q01d 1SC0/1CH, June 2019**)

Q37.

1.20 g of magnesium reacts completely with 3.55 g of chlorine to form magnesium chloride.

Calculate the empirical formula of the magnesium chloride.

(relative atomic masses: Mg = 24.0, Cl = 35.5)

You must show your working.

(3)

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empirical formula = ...

(Total for question = 3 marks)

(**Q04c 1SC0/1CF, June 2023**)

Q38.

Crude oil is a mixture of hydrocarbons.

One compound in crude oil contains 0.96 g of carbon atoms combined with 0.32 g of hydrogen atoms.

Calculate the empirical formula of this compound.

(relative atomic masses: C = 12, H = 1.0)

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empirical formula of this compound = ...

(Total for question = 3 marks)

(**QU06c 1SC0/2CF, June 2025**)

Q39.

Crude oil is a mixture of hydrocarbons.

One compound in crude oil contains 0.96 g of carbon atoms combined with 0.32 g of hydrogen atoms.

Calculate the empirical formula of this compound.

(relative atomic masses: C = 12, H = 1.0)

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empirical formula of this compound = ...

(Total for question = 3 marks)

(**QU02c 1SC0/2CH, June 2025**)

Q40.

Aluminium reacts with bromine to form aluminium bromide.
A sample of aluminium bromide contains 1.35 g of aluminium atoms and 12.00 g of bromine atoms.

Calculate the empirical formula of this sample of aluminium bromide.

(relative atomic masses: Al = 27.0, Br = 80.0)

(3)

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empirical formula = ...

(Total for question = 3 marks)

(**Q03b 1SC0/1CF, June 2022**)