

Please write clearly in block capitals.

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INTERNATIONAL GCSE CHEMISTRY

Paper 1

Tuesday 14 May 2019

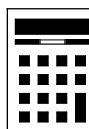
07:00 GMT

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a pencil and a ruler
- a scientific calculator
- the periodic table (enclosed).



Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- Show all your working.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
- You are expected to use a scientific calculator where appropriate.
- A periodic table is provided as a loose insert.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	



0 1 . 3 Which **two** elements in **Figure 1** have the same number of outer shell electrons in their atoms?

Tick (✓) **two** boxes.

[1 mark]

A		B		C		D		E		F	
----------	--	----------	--	----------	--	----------	--	----------	--	----------	--

0 1 . 4 Which statement is correct for elements with the same number of outer shell electrons in their atoms?

Tick (✓) **one** box.

[1 mark]

They burn with the same coloured flame.

They have the same number of protons in their atoms.

They have similar boiling points.

They have similar chemical properties.

0 1 . 5 Which element in **Figure 1** forms ions with a 1– charge?

Tick (✓) **one** box.

[1 mark]

A		B		C		D		E		F	
----------	--	----------	--	----------	--	----------	--	----------	--	----------	--

0 1 . 6 Name the type of substance formed when two or more different elements are chemically combined.

[1 mark]

6

Turn over for the next question

Turn over ►



0 2

This question is about crude oil and substances found in it.

0 2 . 1

Complete the sentence.

Choose the answer from the box.

[1 mark]

base	mixture	non-metal	polymer
------	---------	-----------	---------

Crude oil is a _____.

0 2 . 2

Crude oil contains alkanes.
Alkanes are hydrocarbons.

What is a hydrocarbon?

[1 mark]

0 2 . 3

The general formula of the alkanes is C_nH_{2n+2}

Calculate the formula of an alkane with four carbon atoms.

[1 mark]

Formula = _____

0 2 . 4

Describe how crude oil is separated into fractions by fractional distillation.

[4 marks]



Octane (C_8H_{18}) is used as a fuel.

The carbon and hydrogen in octane are oxidised during combustion.

0 2 . 5 What does oxidised mean?

[1 mark]

0 2 . 6 Give the names of the **two** products formed by the complete combustion of octane.

[2 marks]

1 _____

2 _____

10

Turn over for the next question

Turn over ►



0 3

This question is about the viscosity of fuels.
Table 1 gives some information about four fuels.

Table 1

Fuel	Average number of carbon atoms per molecule	Viscosity at 40 °C in arbitrary units
Petrol	7	27
Kerosene	12	33
Diesel	16	34
Fuel oil	22	36

0 3 . 1

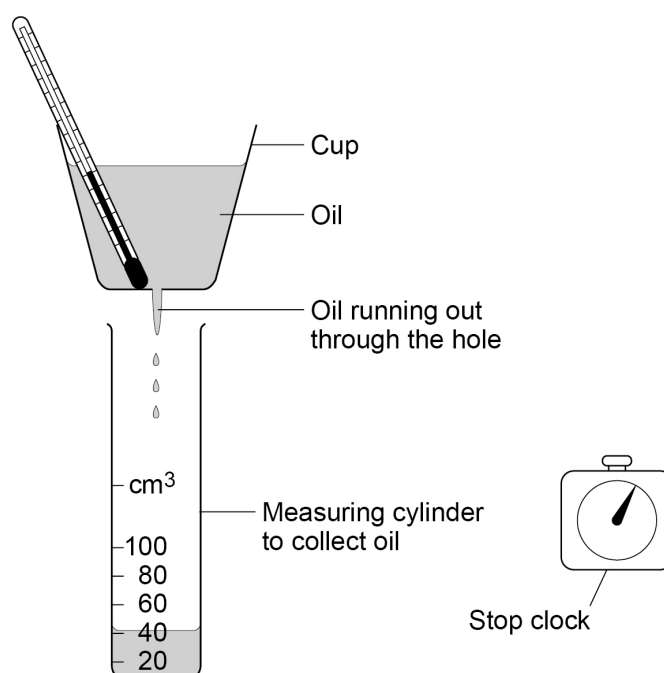
Describe how the viscosity is related to the average number of carbon atoms per molecule in **Table 1**.

[1 mark]

0 3 . 2

It is possible to find the viscosity of a liquid by measuring how quickly it flows. A liquid with a high viscosity will flow slowly.

Figure 2 shows the equipment used to measure the flow rate of a liquid.

Figure 2

0 4 . 1 Name **one** metal that is found in the ground as the metal itself.

Give the reason why.

[2 marks]

Metal _____

Reason _____

0 4 . 2 Iron is found in the ground as a compound with the formula Fe_2O_3

Name the compound with the formula Fe_2O_3

[1 mark]

0 4 . 3 Iron is extracted in a blast furnace.

Balance the equation for the reaction.

[2 marks]



0 4 . 4 Electrolysis can be used to electroplate objects made from iron.

Give **two** reasons why objects are electroplated.

[2 marks]

1 _____

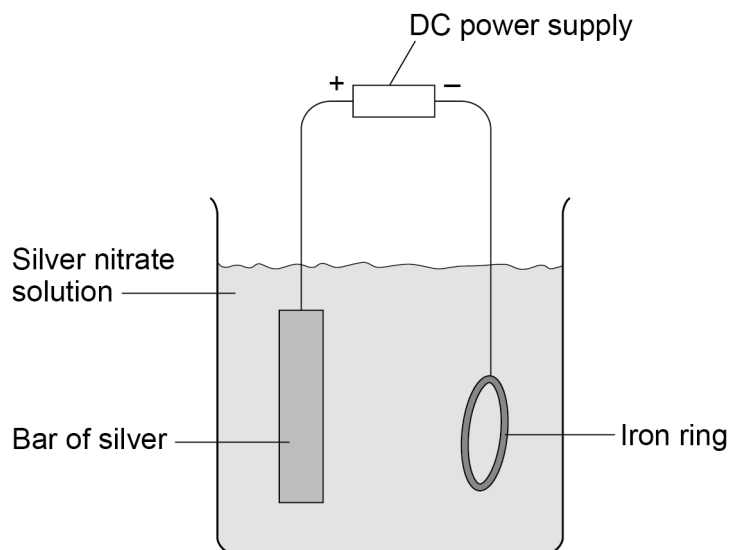
2 _____



Figure 3 shows the apparatus used to electroplate an iron ring with silver.

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box

Figure 3



0 4 . 5 Silver ions (Ag^+) are attracted towards the negatively charged iron ring.

Describe how silver is produced on the iron ring.

Refer to electrons in your answer.

[2 marks]

Question 4 continues on the next page

Turn over ►



0 4 . 6

Silver is deposited on the iron ring at a rate of 12.0 g per hour.

Calculate the time needed for the iron ring to increase in mass by 3.4 g.
Give your answer in minutes.

[2 marks]

Time needed = _____ minutes

0 4 . 7

Silver is a metal.

Describe the structure and bonding in a metal.

[4 marks]

15

0 5

The reaction of zinc carbonate with dilute nitric acid produces carbon dioxide gas.

0 5 . 1

Name the salt produced when zinc carbonate reacts with nitric acid.

[1 mark]

0 5 . 2

Carbon dioxide is tested by bubbling through limewater.

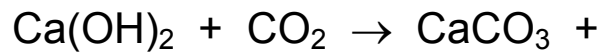
What is the result of the test?

[1 mark]

0 5 . 3

When carbon dioxide reacts with limewater it produces calcium carbonate and one other product.

Write the formula of the missing product.

[1 mark]

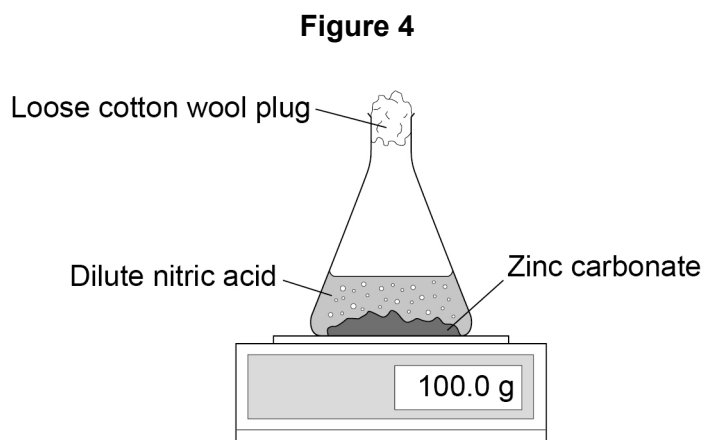
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A student investigated the rate of the reaction between zinc carbonate and dilute nitric acid.

Figure 4 shows the apparatus used.



0 5 . 4

Suggest **two** reasons why the student used a loose cotton wool plug in the top of the conical flask.

[2 marks]

1 _____

2 _____



0 5 . 5

The student investigated the effect of changing the concentration of nitric acid on the rate of reaction.

Table 2 shows the results.

Table 2

Concentration of nitric acid in mol/dm ³	Rate of reaction in g/min
1.2	0.90
1.3	0.95

The student cannot make a firm conclusion from these results.

Suggest **two** reasons why.

[2 marks]

1 _____

2 _____

0 5 . 6

The rate of reaction is also affected by changing the temperature.

Explain the effect of an increase in temperature on the rate of reaction.

Use ideas about colliding particles in your answer.

[4 marks]



0 6 . 1 Atoms contain sub-atomic particles.

Complete **Table 3**.

[3 marks]

Table 3

Sub-atomic particle	Relative mass
	1
Neutron	
	Very small

0 6 . 2 The relative atomic mass (A_r) of an element compares the mass of atoms of the element with a standard isotope.

Which is the standard isotope?

Tick (✓) **one** box.

[1 mark]

^1H

^4He

^{12}C

^{16}O



The two most common isotopes of copper are ${}^{63}_{29}\text{Cu}$ and ${}^{65}_{29}\text{Cu}$.

0 6 . 3 How many neutrons are there in one atom of ${}^{65}_{29}\text{Cu}$?

[1 mark]

0 6 . 4 One mole of ${}^{65}_{29}\text{Cu}$ contains 6.02×10^{23} atoms.

Calculate the mass in grams of one atom of ${}^{65}_{29}\text{Cu}$.

Give your answer in standard form.

[2 marks]

Mass of one atom of ${}^{65}_{29}\text{Cu}$ = _____ g

0 6 . 5 The radii of atoms of ${}^{63}_{29}\text{Cu}$ and ${}^{65}_{29}\text{Cu}$ are both 0.128 nm.

Suggest why the two isotopes have the same atomic radius.

[1 mark]

8

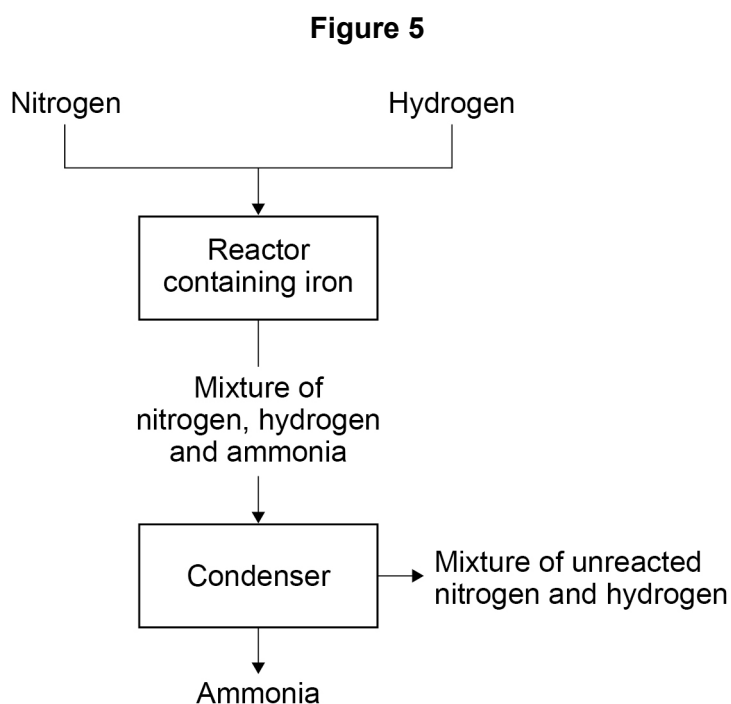
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07

Figure 5 shows a flow diagram for the production of ammonia in the Haber process.



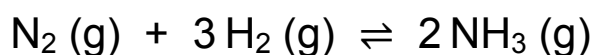
07.1

What is the source of the nitrogen used in the Haber process?

[1 mark]

07.2

The equation for the reaction in the Haber process is:



What does the symbol \rightleftharpoons mean?

[1 mark]

07.3

What is the role of the iron in the reactor in **Figure 5**?

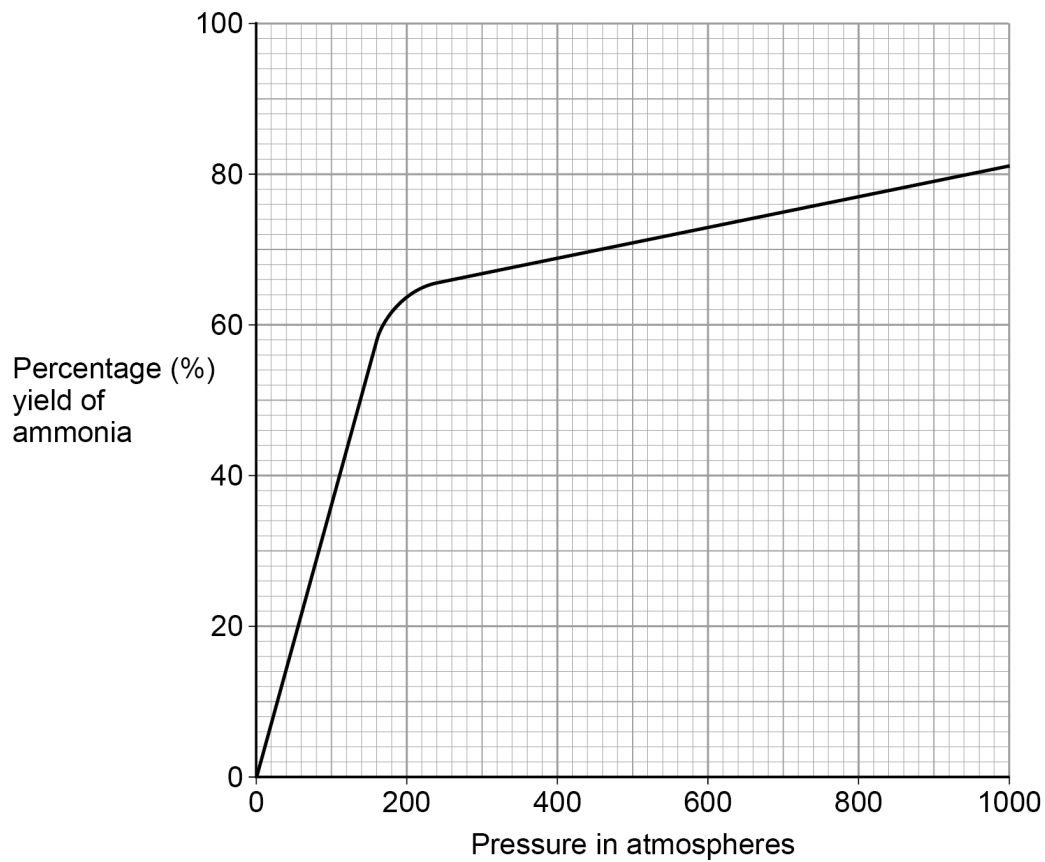
[1 mark]



Figure 6 shows the effect of pressure change on the yield of ammonia.

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Figure 6



07.4

Explain the effect of pressure on the yield of ammonia.
Use **Figure 6** and the equation in Question **07.2**.

[2 marks]

07.5

Explain why the optimum pressure used in the industrial process is 200 atmospheres.
Use **Figure 6**.

[2 marks]

Question 7 continues on the next page

Turn over ►



07.6

Table 4 shows the boiling points of the substances entering the condenser as shown in Figure 5.

Table 4

Substance	Boiling point in °C
Nitrogen	-196
Hydrogen	-253
Ammonia	-33

Explain why ammonia separates from nitrogen and hydrogen in the condenser.

Use Table 4.

[2 marks]

9



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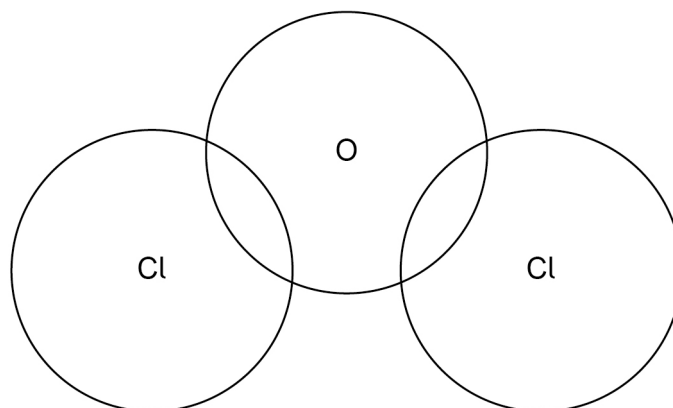
0 8 . 1 Chlorine reacts with oxygen to form a covalent compound Cl_2O .

Complete **Figure 7** to show the arrangement of the outer shell electrons in Cl_2O .

Use dots or crosses to represent the electrons.

[2 marks]

Figure 7



0 8 . 2 Aluminium forms a compound with chlorine.

15 g of the compound contains 3 g of aluminium.

Calculate the empirical formula of the compound.

Relative atomic masses (A_r): Al = 27 Cl = 35.5

[4 marks]

Empirical formula = _____



0 8 . 3

Compound **X** is a compound of chlorine with the empirical formula CH_2Cl .

0.05 mol of compound **X** has a mass of 4.95 g.

Calculate the molecular formula of compound **X**.

Relative atomic masses (A_r): H = 1 C = 12 Cl = 35.5

[3 marks]

Molecular formula = _____

0 8 . 4

Compound **X** has the following properties:

- melting point = $-97\text{ }^\circ\text{C}$
- boiling point = $57\text{ }^\circ\text{C}$
- no electrical conductivity.

Give the type of bonding and the type of structure of compound **X**.

[2 marks]

Type of bonding: _____

Type of structure: _____

11

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0 9

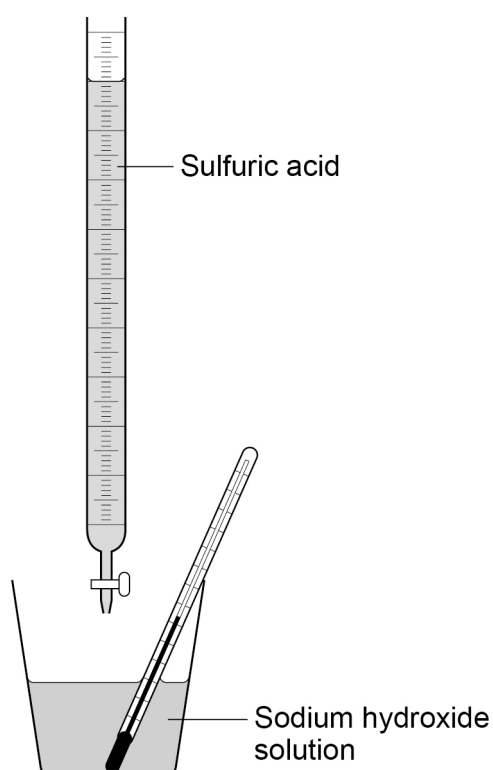
A student investigated the change in temperature as sulfuric acid was added to sodium hydroxide solution.

This is the method used:

- 1 Put 40.0 cm^3 of 2.0 mol/dm^3 sodium hydroxide solution into a plastic cup.
- 2 Measure the temperature of the sodium hydroxide solution.
- 3 Add 4.0 cm^3 of sulfuric acid to the sodium hydroxide solution.
- 4 Stir the mixture.
- 5 Measure the temperature of the mixture.
- 6 Repeat steps 3–5 until 40.0 cm^3 of sulfuric acid has been added.

Figure 8 shows the apparatus the student used.

Figure 8

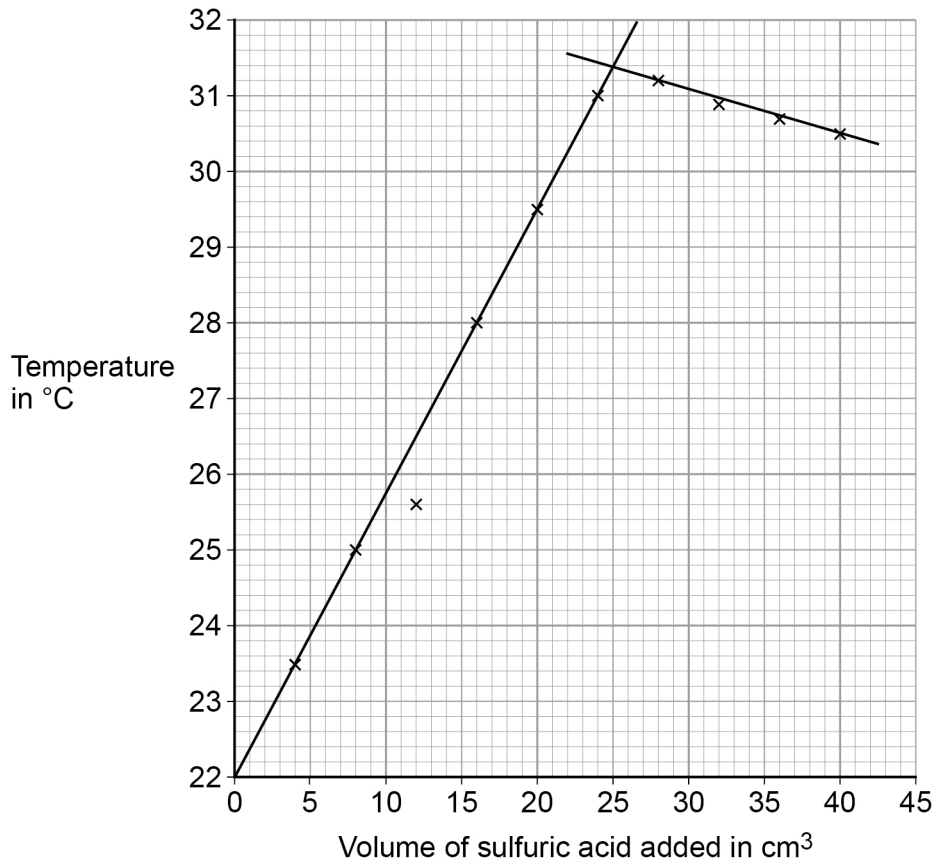


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Figure 9 shows the student's results.

Figure 9



0 9 . 1

Explain the **two** trends shown on **Figure 9**.

[4 marks]

Question 9 continues on the next page

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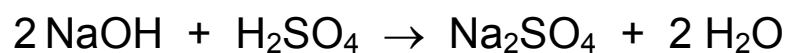


0 9 . 2 One of the results plotted on **Figure 9** is anomalous.

Suggest **one** mistake the student could have made when completing the method to cause the anomalous result.

[1 mark]

0 9 . 3 The equation for the reaction is:



25.0 cm³ of sulfuric acid completely neutralised 40.0 cm³ of sodium hydroxide solution of concentration 2.0 mol/dm³

Calculate the concentration of the sulfuric acid in mol/dm³

[3 marks]

Concentration of the sulfuric acid = _____ mol/dm³



0 9 . 4

The student wanted to repeat the experiment using sodium hydroxide solution of higher concentration.

Calculate the mass of sodium hydroxide (NaOH) needed to make 40.0 cm³ of 4.0 mol/dm³ solution.

Relative atomic masses (A_r): H = 1 O = 16 Na = 23

[3 marks]

Mass of sodium hydroxide = _____ g

0 9 . 5

The student repeated the experiment using sodium hydroxide of concentration 4.0 mol/dm³ instead of 2.0 mol/dm³

All other quantities were kept the same.

The student drew a graph to show the results of the second experiment.

The graph did **not** show the point of neutralisation.

Explain why.

[2 marks]

13

END OF QUESTIONS

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