

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname _____

Forename(s) _____

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INTERNATIONAL GCSE CHEMISTRY

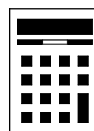
Paper 1

Friday 9 November 2018 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	
TOTAL	

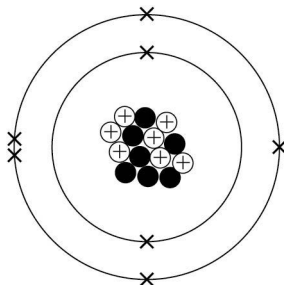


Answer **all** questions in the spaces provided.

0 1

Figure 1 shows a nitrogen atom.

Figure 1



0 1 . 1

The centre of the atom contains:

- neutrons
- particles with a positive charge.

What is the centre of the atom called?

[1 mark]

0 1 . 2

Give the name of the positively charged particles in **Figure 1**.

[1 mark]

0 1 . 3

The nitrogen atom in **Figure 1** has 7 neutrons.

Some atoms of the same element have different numbers of neutrons.
Give the name of these atoms.

[1 mark]

0 1 . 4

Which of the following represents a nitrogen atom with 8 neutrons?
Tick **one** box.

[1 mark]











0 1 . 5

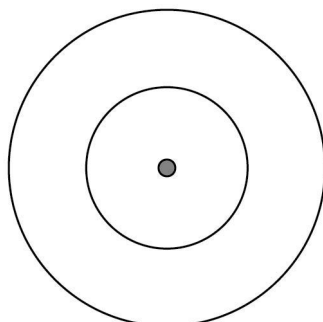
An atom of fluorine has 9 electrons.

Complete **Figure 2** to show the electronic structure of fluorine.

Use a cross (x) to represent an electron.

[1 mark]

Figure 2

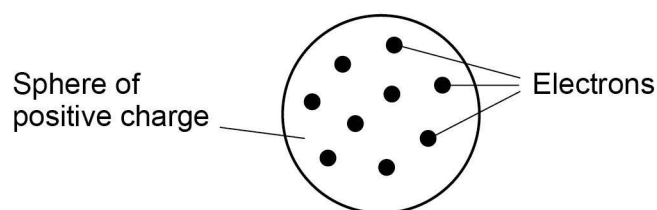


0 1 . 6

JJ Thomson developed an early model of the atom. It was called the plum pudding model.

Figure 3 shows the plum pudding model.

Figure 3



Give **three** differences between the plum pudding model and the model of the atom used in **Figure 1**.

[3 marks]

- 1 _____
- _____
- 2 _____
- _____
- 3 _____
- _____

8

Turn over ►

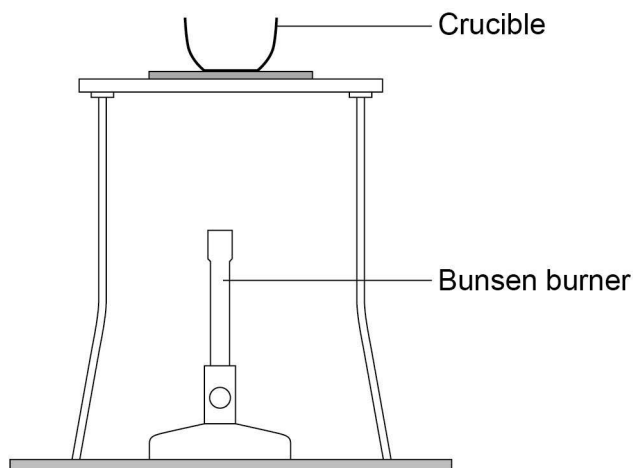


0 2

A student heated two different metal carbonates and measured the changes in mass.

Figure 4 shows the apparatus the student used.

Figure 4



This is the method used:

- 1 Put some zinc carbonate in a crucible and measure the mass of the crucible and contents.
- 2 Heat the crucible for 1 minute.
- 3 Allow to cool and measure the mass of the crucible and contents.
- 4 Repeat steps 2 and 3 four more times.
- 5 Repeat steps 1 to 4 using sodium carbonate.

Table 1 shows the student's results.

Table 1

Time in mins	Mass of crucible and contents in g	
	Zinc carbonate	Sodium carbonate
0	24.3	24.4
1	23.9	24.4
2	23.7	24.4
3	23.6	24.4
4	23.5	24.4
5	23.5	24.4



0 2 . 1 Complete the equation for the reaction of zinc carbonate by adding:

- state symbols for ZnCO_3 and CO_2
- the formula of the missing product.

[3 marks]



0 2 . 2 What is the name of the type of reaction shown in Question **02.1**?
Tick **one** box.

[1 mark]

Addition

Combustion

Decomposition

Oxidation

0 2 . 3 Give the reason why the mass changes in the zinc carbonate experiment.

[1 mark]

0 2 . 4 How do the results in **Table 1** show that zinc carbonate reacts completely?

[1 mark]

Question 2 continues on the next page

Turn over ►



0 2 . 5 The reaction of zinc carbonate is endothermic.

Explain why, in terms of bond energies.

[2 marks]

0 2 . 6 Explain the results for sodium carbonate.

Use data from **Table 1** in your answer.

[2 marks]

10

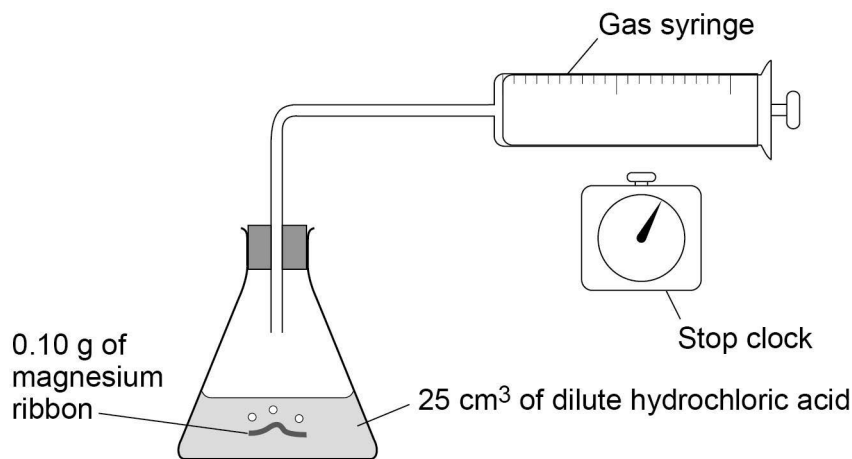


0 3

A student did an experiment to measure the rate of the reaction between magnesium and hydrochloric acid.

Figure 5 shows the apparatus at the start of the experiment.

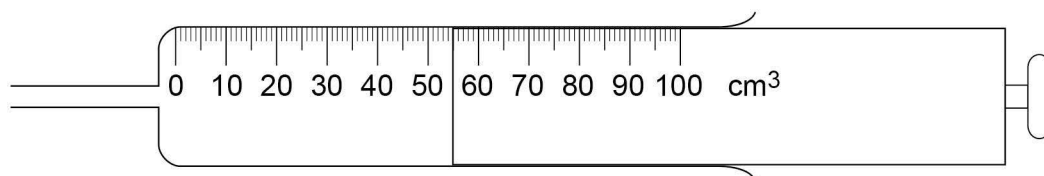
Figure 5



0 3 . 1

Figure 6 shows the gas syringe during the experiment.

Figure 6



What is the reading on the gas syringe in Figure 6?

[1 mark]

Reading = _____ cm³

0 3 . 2

90 cm³ of gas was collected in 1 minute.

Calculate the average rate of reaction in cm³/s.

[2 marks]

Average rate of reaction = _____ cm³/s

Question 3 continues on the next page

Turn over ►



0 3 . 3

The student repeated the experiment with 0.10 g of powdered magnesium instead of 0.10 g of magnesium ribbon.

Explain the effect on the rate of reaction.

[3 marks]

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

Table 2 shows the results.

Table 2

Concentration of hydrochloric acid in mol/dm ³	Rate of reaction in cm ³ /s
0.5	0.5
1.0	2.0
1.5	4.5
2.0	8.0
2.5	12.5

0 3 . 4

Describe the relationship between the concentration of hydrochloric acid and the rate of reaction.

Use data from **Table 2** in your answer.

[2 marks]



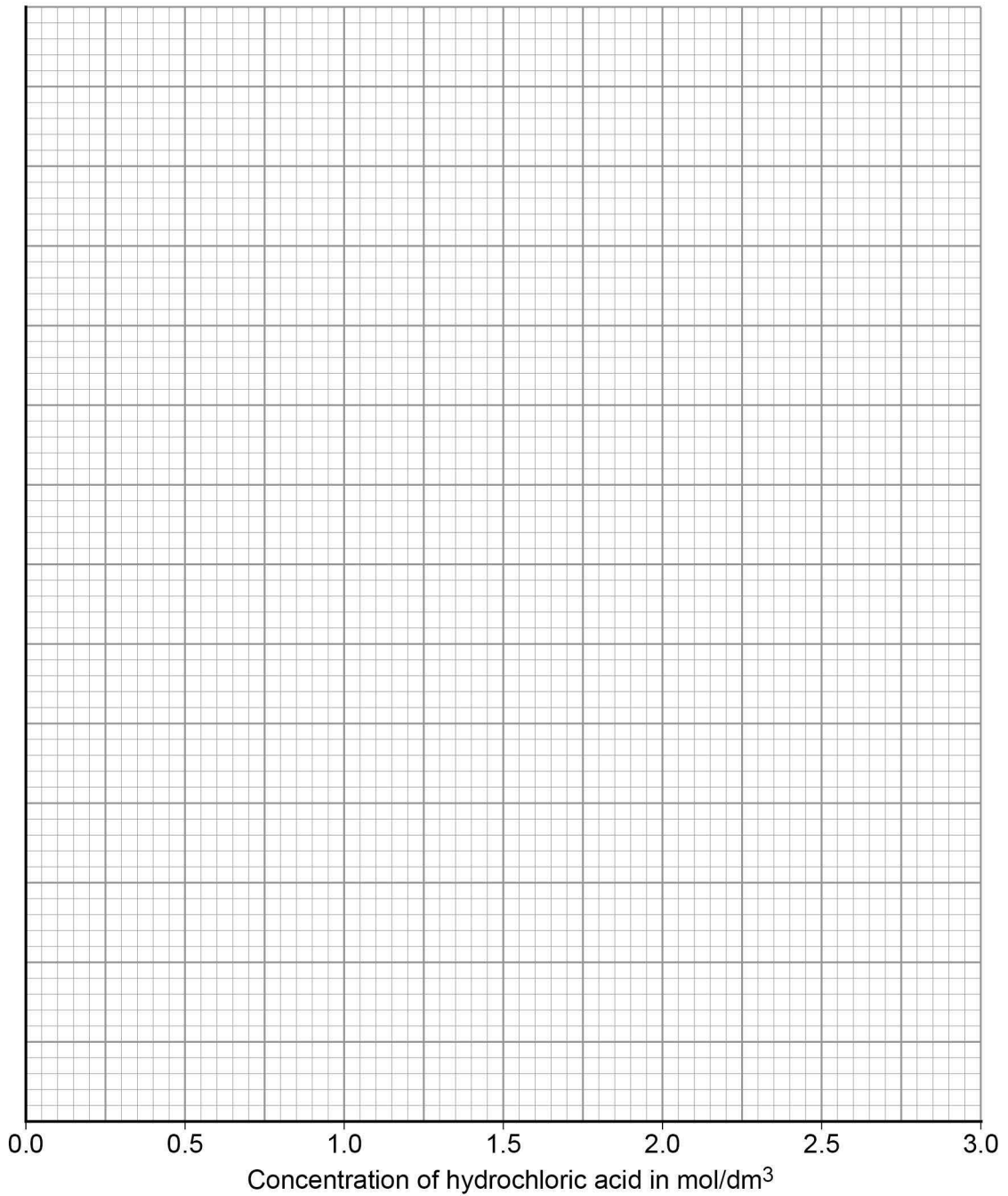
0 3 . 5 Plot the data from **Table 2** on **Figure 7**.

You should:

- label the y-axis
- choose a suitable scale for the y-axis
- draw a line of best fit.

[4 marks]

Figure 7



12

Turn over ►



0 4

Alcohols, carboxylic acids and esters are organic compounds with different functional groups.

0 4 . 1

What type of reaction can be used to convert ethanol into ethanoic acid?
Tick **one** box.

[1 mark]

addition

oxidation

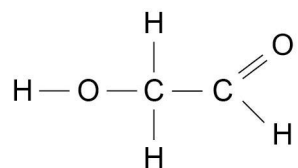
polymerisation

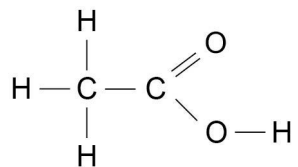
reduction

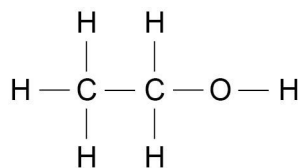
0 4 . 2

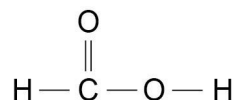
Which is the displayed structure of ethanoic acid?
Tick **one** box.

[1 mark]









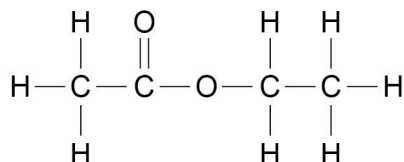


- 0 4 . 3 Ethanol and ethanoic acid react together in the presence of a catalyst to form the ester shown in **Figure 8**.

Draw a circle around the functional group in the ester.

[1 mark]

Figure 8



- 0 4 . 4 Which type of chemical is used as a catalyst in this reaction?

[1 mark]

- 0 4 . 5 A student wants to separate a mixture of ethanol and ethanoic acid.

Table 3 shows the boiling points of ethanol and ethanoic acid.

Table 3

Substance	Boiling point in °C
Ethanol	78
Ethanoic acid	118

Why does ethanoic acid have a higher boiling point than ethanol?
Tick **one** box.

[1 mark]

It has stronger covalent bonds

It has stronger intermolecular forces

It has weaker covalent bonds

It has weaker intermolecular forces

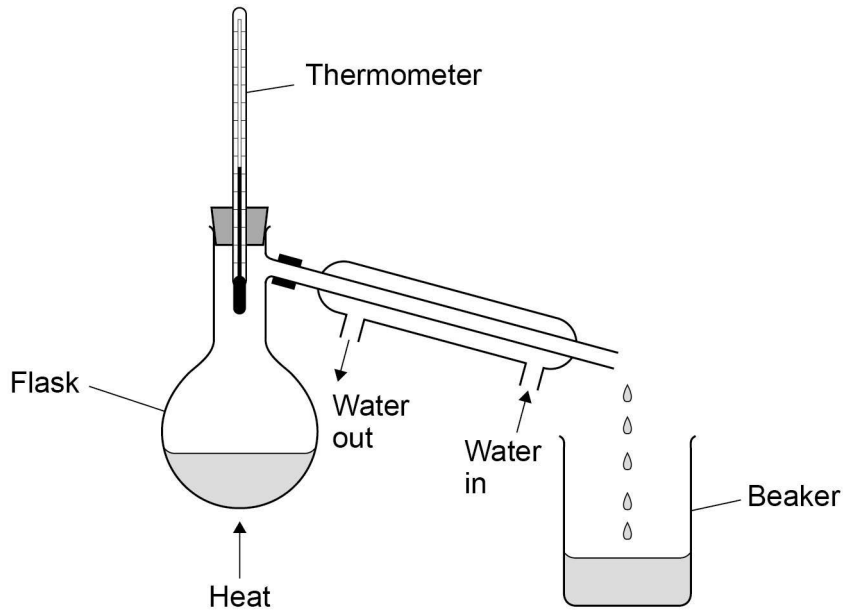
Question 4 continues on the next page

Turn over ►



Figure 9 shows the apparatus used to separate the mixture of ethanol and ethanoic acid.

Figure 9



0 4 . 6

Name the type of separation shown in **Figure 9**.

[1 mark]

0 4 . 7

Name the **two** changes of state that allow the liquid to move from the flask to the beaker in **Figure 9**.

Write the changes of state in the correct order.

[1 mark]

1 _____

2 _____

0 4 . 8

Describe how the student could test to see if the liquid that collects in the beaker is pure ethanol.

[2 marks]



0 5 . 1 Describe how hydrocarbons are cracked to produce smaller, more useful molecules. [2 marks]

0 5 . 2 Dodecane (C₁₂H₂₆) can be cracked into heptane (C₇H₁₆) and **two** different alkenes. Complete the equation for this reaction. [1 mark]



0 5 . 3 Give **one** use of alkenes. [1 mark]

0 5 . 4 Suggest why heptane (C₇H₁₆) is a better fuel than dodecane (C₁₂H₂₆). [1 mark]

0 5 . 5 Bromine water is used to test for alkenes. Complete the sentence. Use words from the box. [2 marks]

blue	colourless	green	orange	purple
------	------------	-------	--------	--------

Bromine water changes colour from _____ to _____ when it reacts with an alkene.

Question 5 continues on the next page

Turn over ►



Some alkene molecules have more than one carbon–carbon double bond.

Bromine water can be used to compare the number of double bonds.

A student used bromine water to investigate two alkenes **A** and **B**.

This is the method used:

- 1 Put 15 drops of alkene **A** in a boiling tube.
- 2 Add bromine water dropwise from a dropping pipette until the bromine water stops changing colour.
- 3 Repeat steps 1 and 2 for alkene **B**.

Table 5 shows the student's results.

Table 5

Alkene	Number of drops of bromine water added
A	30
B	60

0 5 . 6 A drop from the pipette has a volume of 0.10 cm^3

The bromine water has a concentration of 0.20 mol/dm^3

Calculate the number of moles of bromine added to alkene **B**.

[3 marks]

Number of moles of bromine = _____

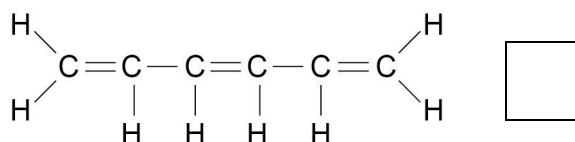
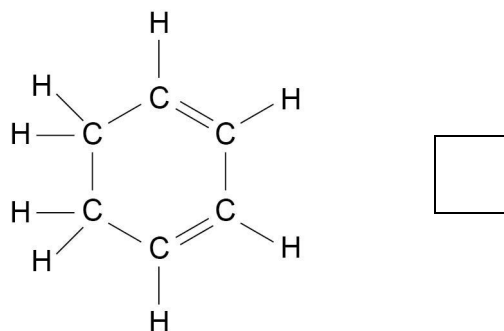
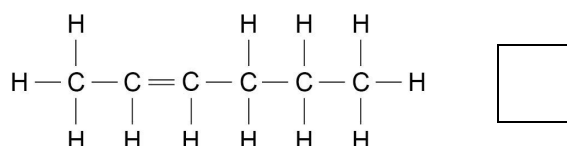
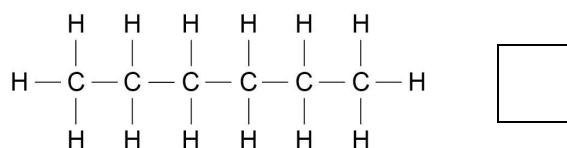


0 5 . 7

Figure 10 shows the structures of some hydrocarbons.

Write the letter **A** in the box next to the structure most likely to be alkene **A**.Write the letter **B** in the box next to the structure most likely to be alkene **B**.Equal numbers of moles of alkenes **A** and **B** were used in the student's experiment.**[1 mark]**

Figure 10



0 6

This question is about tests for positive and negative ions.

A student tested four unknown solutions, **C**, **D**, **E** and **F**.

Table 6 shows some of the results.

Table 6

Solution	Test	Result
C	Add sodium hydroxide solution	Blue precipitate forms
D	Add dilute sulfuric acid followed by barium chloride solution	White precipitate forms
E	Add dilute nitric acid followed by silver nitrate solution	Cream precipitate forms
F	Add dilute nitric acid followed by silver nitrate solution	Precipitate forms

0 6 . 1

Name the metal ion present in solution **C**.

[1 mark]

0 6 . 2

Which halide ion is present in solution **E**?
Tick **one** box.

[1 mark]

Bromide

Chloride

Fluoride

Iodide



0 6 . 3

The student concluded that solution **D** contains sulfate ions.

Is the conclusion correct?

Explain your answer.

[3 marks]

0 6 . 4

The student could not decide the colour of the precipitate formed in solution **F**.

To identify the halide ion the student added a known amount of silver nitrate solution to solution **F**.

Describe a method to find the mass of the precipitate formed.

You do **not** need to give details of the calculation.

[4 marks]

Question 6 continues on the next page

Turn over ►



0 6 . 5

The student added silver nitrate solution containing 0.005 mol of silver ions (Ag^+) to solution F.

The mass of the precipitate obtained was 1.18 g.

The ionic equation shows the reaction between silver ions (Ag^+) and the unknown halide ion (X^-).



Calculate the relative atomic mass (A_r) of X.

Give the name of the halide ion X^- .

Relative atomic mass (A_r): Ag = 108

[3 marks]

(A_r) X = _____

Name of halide ion, X^- = _____

12

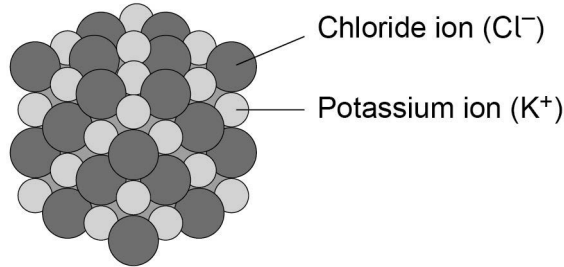


0 7

This question is about Group 1 chlorides.

Figure 11 shows the structure of potassium chloride (KCl).

Figure 11



0 7 . 1

Explain why potassium chloride has a high melting point.

[4 marks]

0 7 . 2

Give the reason why solid potassium chloride does **not** conduct electricity.

[1 mark]

Question 7 continues on the next page

Turn over ►



0 7 . 3

A single crystal of potassium chloride has a mass of 0.298 g.

Calculate the number of ions in this crystal.

Give your answer to 3 significant figures.

Avogadro's constant = 6.02×10^{23}

Relative atomic masses (A_r): Cl = 35.5 K = 39

[4 marks]

Number of ions = _____



0 7 . 4 Table 7 shows information about Group 1 chlorides.

Table 7

Compound	Metal ion present	Size of metal ion in nm	Melting point of chloride in °C
Lithium chloride	Li ⁺	0.074	605
Sodium chloride	Na ⁺	0.102	802
Potassium chloride	K ⁺	0.138	770
Rubidium chloride	Rb ⁺	0.149	718
Caesium chloride	Cs ⁺	0.170	645

A student saw the following statement in a chemistry textbook.

'The smaller the metal ion the higher the melting point of the metal chloride'

Evaluate how well the data in **Table 7** agrees with this statement.

[2 marks]

11

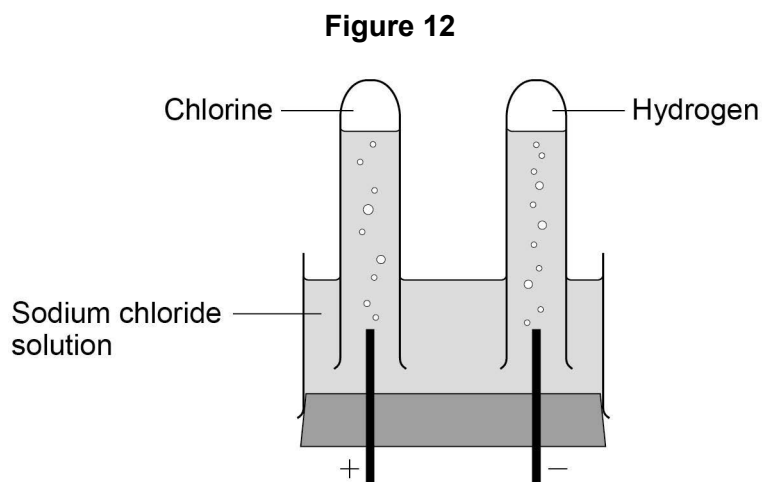
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0 8

Figure 12 shows the electrolysis of sodium chloride solution to produce hydrogen and chlorine gas.



0 8 . 1

Describe the effect of chlorine gas on damp blue litmus paper.

[2 marks]

0 8 . 2

Give **one** use for chlorine.

[1 mark]

0 8 . 3

Write the half equation for the formation of chlorine at the positive electrode.

[2 marks]



0 8 . 4 Give the reason why hydrogen is formed at the negative electrode instead of sodium. [1 mark]

0 8 . 5 Name the other product formed by the electrolysis of sodium chloride solution. [1 mark]

0 8 . 6 Chlorine can also be produced by reacting manganese oxide (MnO₂) with hydrochloric acid (HCl).



Calculate the maximum volume of chlorine gas produced by reacting 4.35 g of manganese oxide with an excess of hydrochloric acid.

The molar gas volume at room temperature and pressure is 24 dm³

Give the volume in cm³ at room temperature and pressure.

Relative atomic masses (A_r): O = 16 Mn = 55

[4 marks]

Maximum volume of chlorine gas = _____ cm³

11

END OF QUESTIONS



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