OCR GCSE GATEWAY CHEMISTRY A · J248

CHEMISTRY



EXAM QUESTION PACK

WS1.2 EXPERIMENTAL SKILLS AND STRATEGIES

SCORE	PERCENTAGE
/77	%

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Gateway Chemistry A (9-1)

Experimental skills and strategies

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **77**.
- The total number of marks may take into account some 'either/or' question choices.

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1 Which separation technique is this equipment used for?



A Crystallisation
B Distillation
C Evaporation
D Filtration

Your answer ☐ [1]

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2(a) The table shows the properties of different substances.

Substance	Melting point (°C)	Boiling point (°C)	Soluble in water?	Conducts electricity in solid state?	Conducts electricity in molten state?
A	–210	–196	No	No	No
B	1084	2562	No	Yes	Yes
C	605	1137	Yes	No	Yes
D	–78	–34	Yes	No	No

(i) Which **two** substances are gases at room temperature?

Tick (✓) **two** boxes.

A ☐

B ☐

C ☐

D ☐

[1]

(ii) Substance **C** is an ionic substance.

Use the information in the table to explain why.

---

[2]

(b) You are provided with a mixture of substances **B** and **C**.

Substance **B** is insoluble in water. Substance **C** is soluble in water.

(i) Describe how you could separate substance **B** from the mixture.

---

[3]

(ii) Describe how you would then obtain substance **C** after separating substance **B**.

---

[2]

3(a) A student investigates the reaction of an aqueous solution of sodium hydroxide and sulfuric acid. During the experiment, the student tests the pH of the solution with universal indicator.

(i) Suggest a piece of equipment that the student could use instead of universal indicator paper to test the pH of the solution.

---

[1]

(ii) Describe how to use the equipment suggested in **(i)**.

---

[2]

(b) * Potassium chloride is a mineral found in many foods.

A student wants to make a salt called potassium chloride, KC*l*, by neutralisation of an acid by an alkali.

Describe how to make a pure, dry sample of potassium chloride in a laboratory by neutralisation.

[6]

4 Electrolysis can be used to separate the elements in some compounds using electricity.

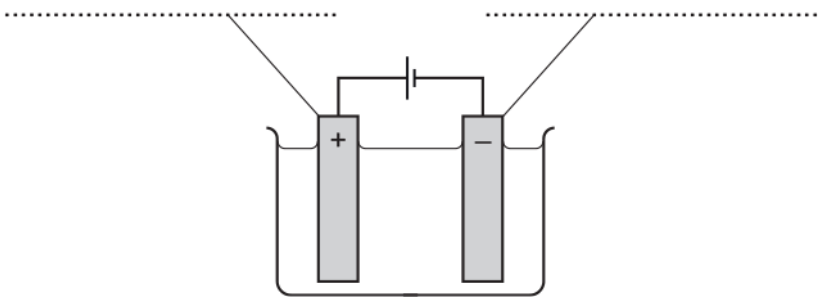
(i) Look at the diagram of an electrolysis experiment.

Complete the diagram using the words in the list.

You may use each word once, more than once or not at all.

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cathode anode battery



[2]

(ii) A teacher demonstrates the electrolysis of molten lead bromide.

Predict the products made at each electrode.

Positive electrode _____

Negative electrode _____

[2]

(iii) Molten lead bromide contains lead ions, Pb^{2+}, and bromide ions, Br^-.

What is the formula for lead bromide?

Tick (✓) **one** box.

PbBr ☐

$PbBr_2$ ☐

Pb_2Br ☐

Pb_2Br_2 ☐

[1]

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5 A student investigates the combustion of ethanol.

Fig. 19.3 shows the apparatus the student uses.

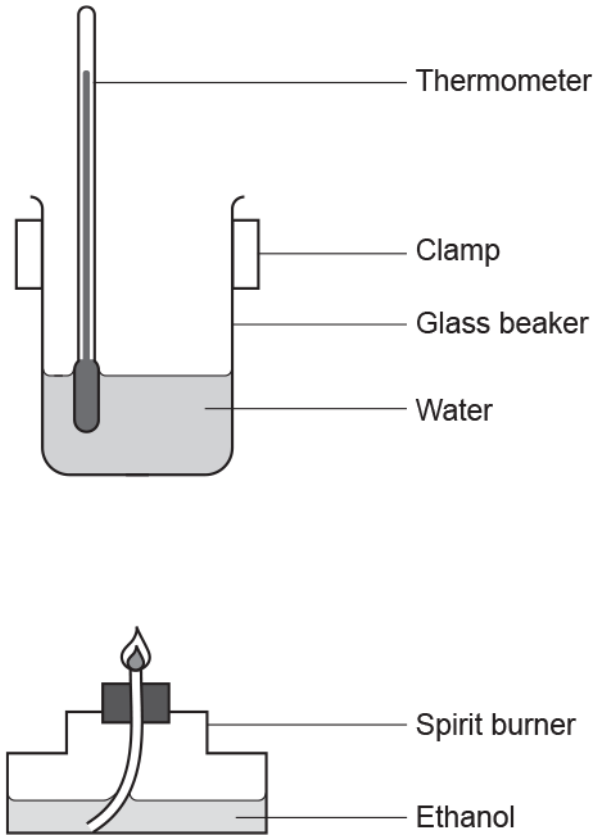


Fig. 19.3

The temperature change is much lower than the textbook value.

Suggest **two** ways that the student could improve the set-up of the apparatus in **Fig. 19.3**, so the temperature change is closer to the textbook value.

1 _____

_____

2 _____

_____

[2]

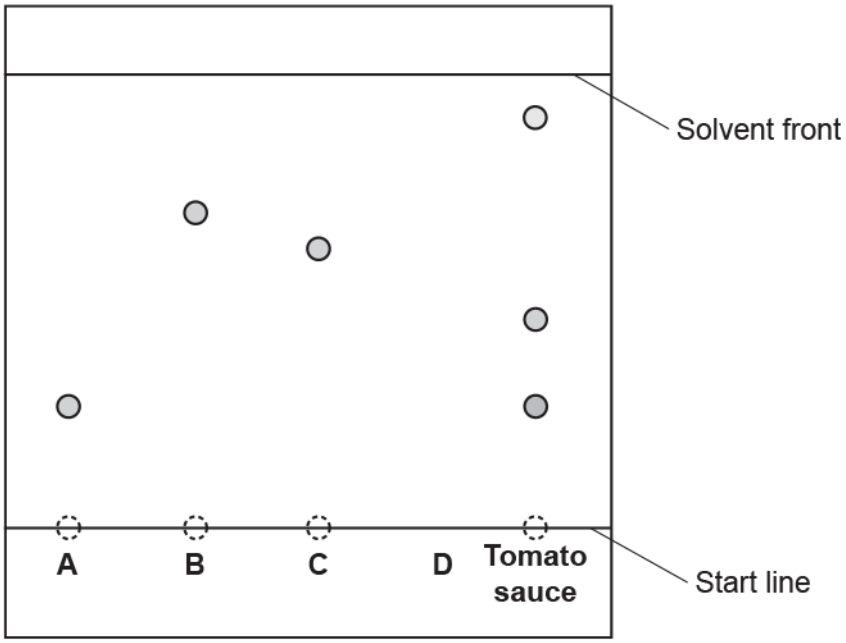
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6(a) A scientist analyses a sample of tomato sauce using chromatography.

The tomato sauce is compared to four known food additives, **A**, **B**, **C** and **D**, as shown in the chromatogram.



The start line is **not** drawn in ink.

Explain why.

---

[1]

(b) Food additive **D** is insoluble in the solvent used.

Draw on the diagram the spot for food additive **D** at the end of the experiment. **[1]**

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(c) Which additive is in the **tomato sauce**?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

[1]

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7 A student is making perfume using violet flowers.

The student does an experiment to extract the perfume from the flowers using the apparatus shown in **Fig. 21.1**.

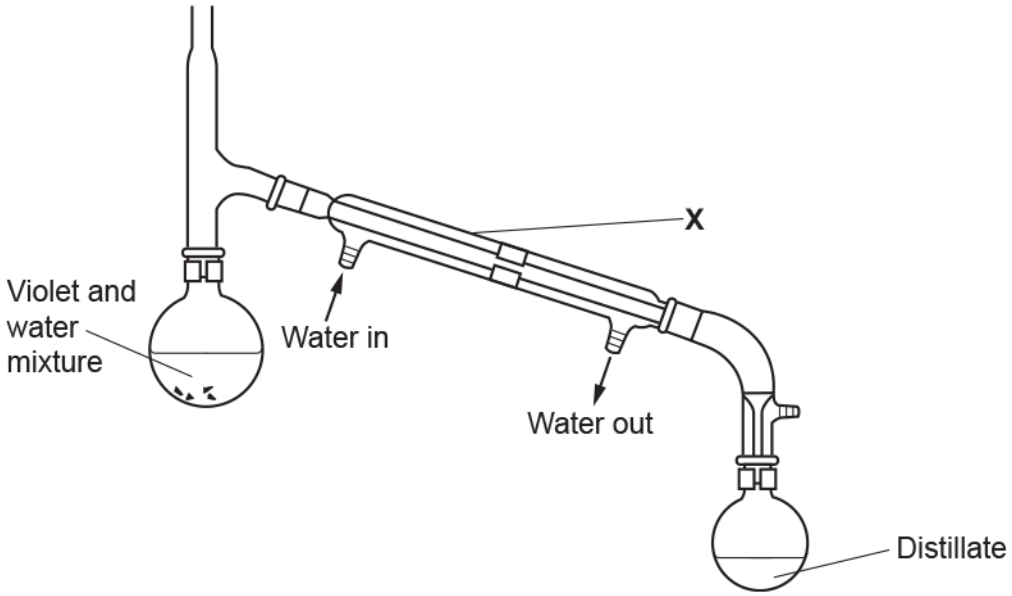


Fig. 21.1

The teacher says the apparatus is not set-up correctly.

(i) What is the name of the piece of apparatus labelled **X**?

[1]

(ii) Name the process shown in **Fig. 21.1**.

[1]

(iii) Suggest **two** changes that the student should make to set-up the apparatus correctly.

1

2

[2]

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8 Which purification technique is used to separate ethanol and water from a mixture?

A Chromatography
B Distillation
C Evaporation
D Filtration

Your answer [1]

9 The table shows the stages in a flame test.

Stage	Process
1	Dip a nichrome wire loop into the test solution.
2	Observe and record the flame colour.
3	Clean a nichrome wire loop with hydrochloric acid, then rinse with distilled water.
4	Hold the nichrome wire loop in the edge of a roaring blue flame.

Which is the correct order for the stages in a flame test?

A 1, 4, 2, 3
B 1, 4, 3, 2
C 3, 1, 4, 2
D 3, 4, 1, 2

Your answer [1]

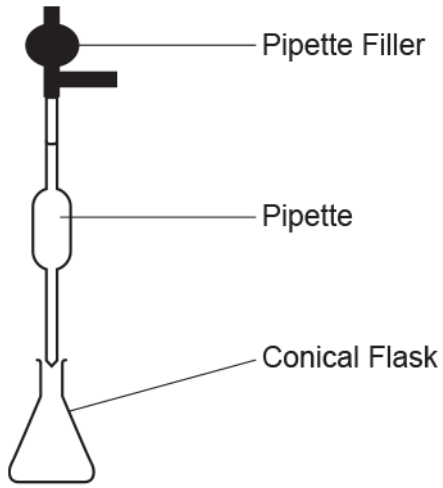
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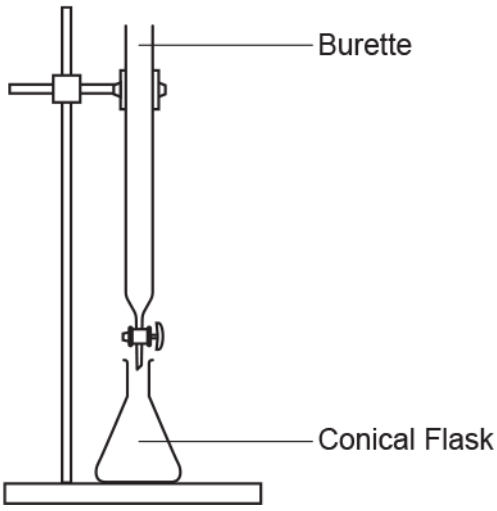
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10(a) A student neutralises an alkali with an acid in a titration experiment.

Look at the student's method for her experiment.





- Measure 25.0 cm^3 of alkali solution into a conical flask using a pipette.
- Add a few drops of universal indicator to the alkali solution.
- Fill the burette to above the 0.0 cm^3 line with acid.
- Quickly add the acid to alkali until the indicator changes colour.
- Repeat the experiment until consistent results are obtained.

Describe and explain **one** improvement the student should make to her method to get a more accurate titration result.

[2]

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(b) The student repeats the experiment three times.

Look at the student's results.

Titration number	1	2	3
Volume of acid (cm^3)	25.75	23.60	23.70

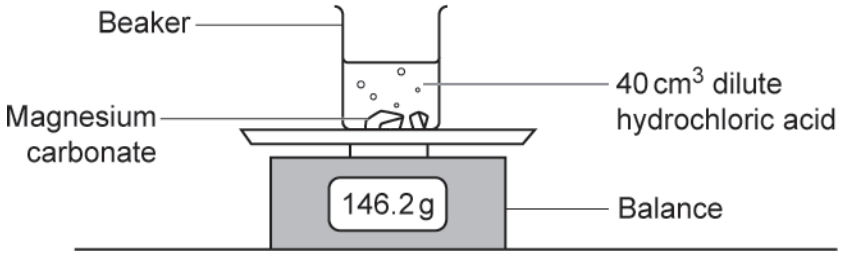
Calculate the **accurate** volume of the acid that reacts with the alkali.

Accurate volume of acid = ... cm^3 **[2]**

11(a) A student investigates the rate of reaction between dilute hydrochloric acid and magnesium carbonate.

She wants to find out how the concentration of the acid changes the rate of reaction.

Look at the apparatus she uses.



Carbon dioxide gas is given off in the reaction.

The student measures the loss in mass every 30 seconds for 5 minutes.

Another student also investigates the rate of reaction between dilute hydrochloric acid and magnesium carbonate.

He also wants to find out how the **concentration** of the acid changes the rate of reaction. He uses a **different** method.

Describe the **method** he uses.

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Include a **labelled diagram** of the setup of the apparatus he uses.

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[5]

(b) Some students investigate the reaction between sodium thiosulfate and dilute hydrochloric acid.

They want to find out how **temperature** changes the rate of reaction.

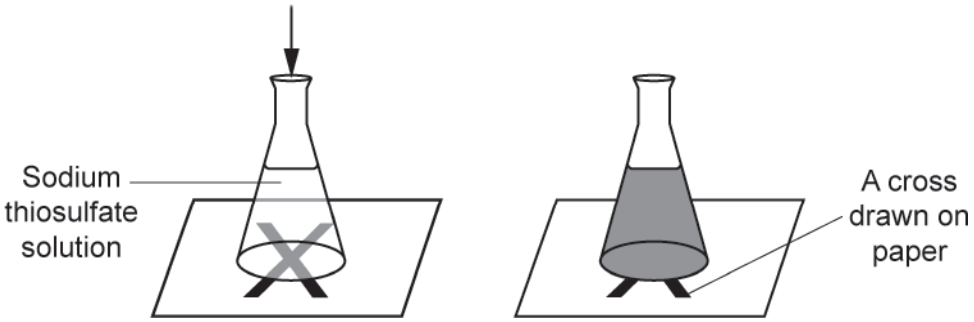
Look at the diagram of their experiment.

Add dilute hydrochloric acid and start timing

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A yellow solid is made during the reaction.

The students time how long it takes for the cross to disappear. This is the reaction time.

Look at their results.

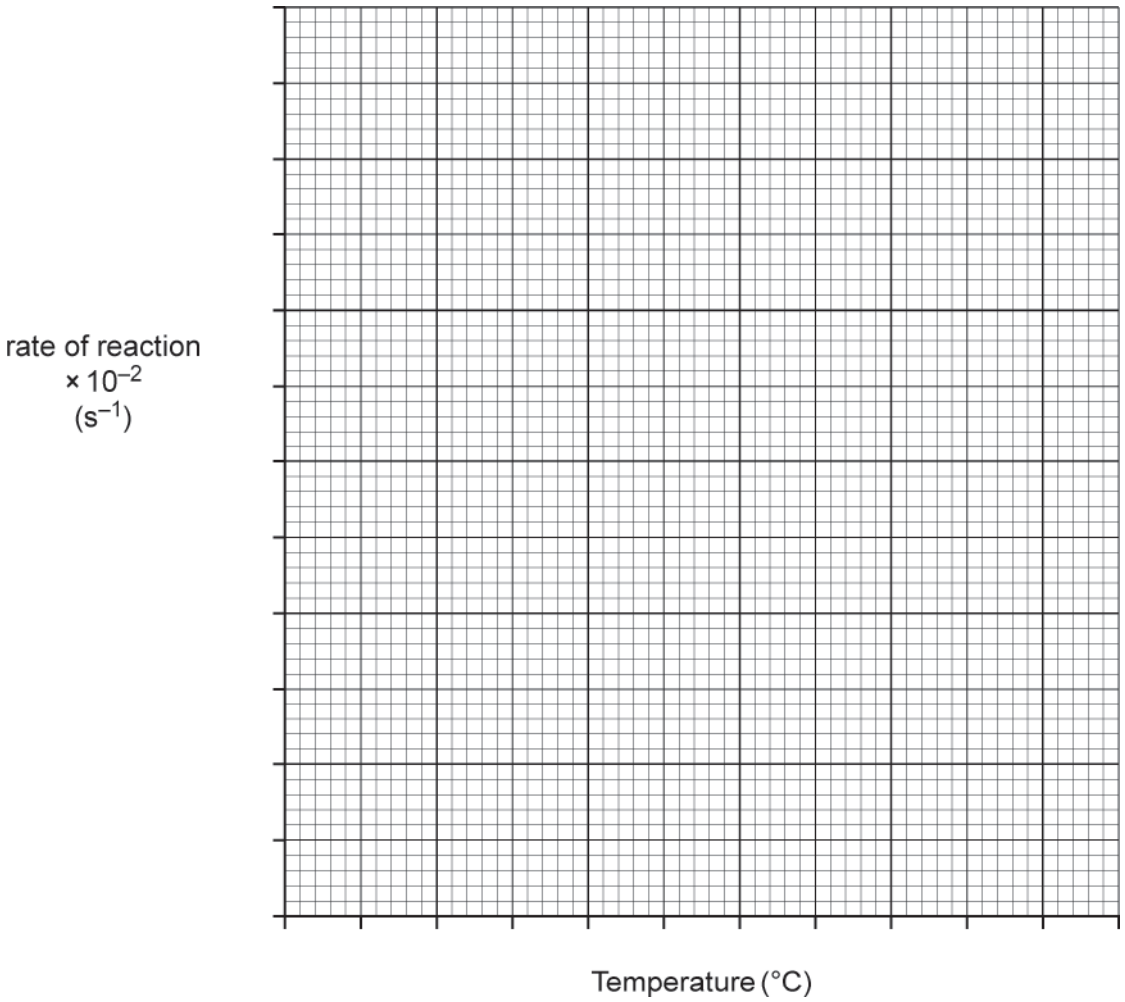
Temperature (°C)	Reaction time (s)	Rate of reaction (s^{-1})
10	140	7×10^{-3}
20	56	2×10^{-2}
30	34	3×10^{-2}
40	26	4×10^{-2}
50	22	5×10^{-2}

(i) Plot a graph of the results on the grid. Draw a line of best fit.

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[4]

(ii) What happens to the **rate of reaction** as the temperature increases?

[1]

(iii) Explain your answer to **(ii)**.

Use ideas about collisions between particles in your answer.

[3]

12 * A student has unlabelled samples of three liquids.

The student knows that the three liquids are:

- pentane, C_5H_{12}
- pentene, C_5H_{10}
- ethanoic acid, CH_3COOH.

Describe tests that the student should do to identify each of the three liquids.

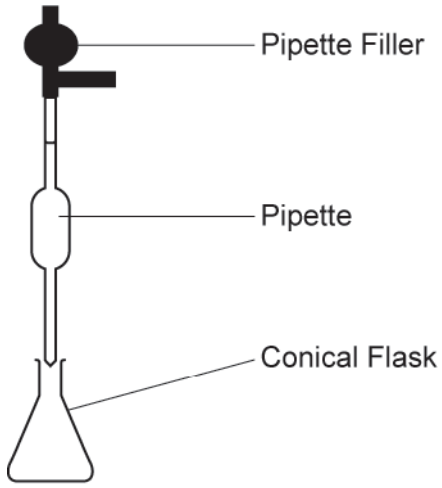
Include **balanced symbol** equations for the reactions described.

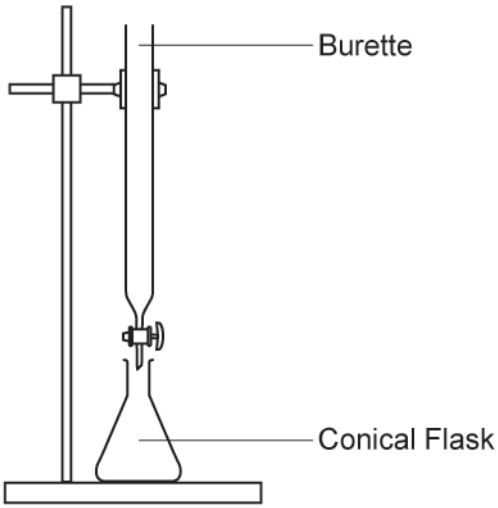
[6]

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13(a) A student neutralises potassium hydroxide with dilute sulfuric acid in a titration experiment.

Look at the student's method for her experiment.





- Measure 25.0 cm^3 of 0.200mol / dm^3 potassium hydroxide into a conical flask using a pipette.
- Add a few drops of universal indicator to the potassium hydroxide.
- Fill the burette to above the 0.00 cm^3 line with dilute sulfuric acid.
- Quickly add the dilute sulfuric acid to the potassium hydroxide until the indicator changes colour.
- Repeat the experiment.

Describe and explain **one** improvement the student should make to her method to get a more accurate titration result.

---

[2]

(b) The student repeats the experiment four times.

Look at the student's results.

Titration number	1	2	3	4
Volume of acid (cm^3)	25.75	23.60	23.70	23.65

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(i) Calculate the **accurate** volume of the acid that reacts with the alkali.

Accurate volume of acid = ... cm^3 **[2]**

(ii) Look at the equation for the reaction between sulfuric acid and potassium hydroxide.

$H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$

Use your answer from part **(i)** to calculate the concentration of the dilute sulfuric acid, H_2SO_4, that reacted with the 25.0 cm^3 of 0.200mol / dm^3 potassium hydroxide.

Give your answer to **3** significant figures.

Concentration of dilute sulfuric acid = ... mol / dm^3 **[4]**

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14 A student investigates the rate of reaction between dilute hydrochloric acid and magnesium carbonate.

She wants to find out how the concentration of the acid changes the rate of reaction.

Fig. 18.1 shows the apparatus she uses.

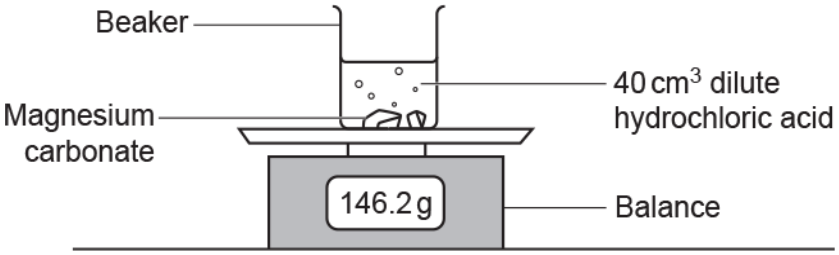


Fig. 18.1

Carbon dioxide gas is given off in the reaction.

The student measures the loss in mass every 30 seconds for 5 minutes.

Another student also investigates the rate of reaction between dilute hydrochloric acid and magnesium carbonate.

Fig. 18.2 shows diagrams of some of the apparatus he uses.

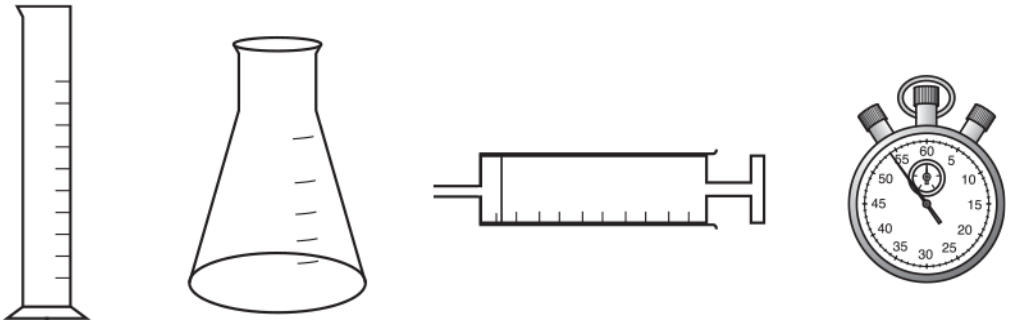


Fig. 18.2

The student also wants to find out how the **concentration** of the acid changes the rate of reaction.

Describe the **method** he follows using the apparatus in **Fig. 18.2**.

Include a **labelled diagram** of the set-up of the apparatus he uses.

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[4]

15(a) A student investigates the electrolysis of aqueous solutions of ionic compounds.

Why is it important that the investigation is done with **inert** electrodes?

[1]

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(b) Electroplating is used to cover a metal with another metal.

(i) Which aqueous solution would you use to electroplate a metal spoon with copper using a safe method?

Tick (✓) **one** box.

Copper sulfate	☐
Zinc bromide	☐
Copper chloride	☐
Sulfuric acid	☐

[1]

(ii) Give **two** reasons for your answer to **(i)**.

1 ----------

---

2 ----------

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[2]

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(c)

(i) Predict the product made at the anode when sodium sulfate solution is electrolysed.

[1]

(ii) Hydrogen gas is made at the cathode instead of sodium metal.

Explain why.

[1]

(iii) Write the **balanced half equation** for the formation of hydrogen gas.

Use e^- to represent an electron.

[2]

END OF QUESTION PAPER

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