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CHEMISTRY

0620/62

Paper 6 Alternative to Practical

February/March 2020

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [].

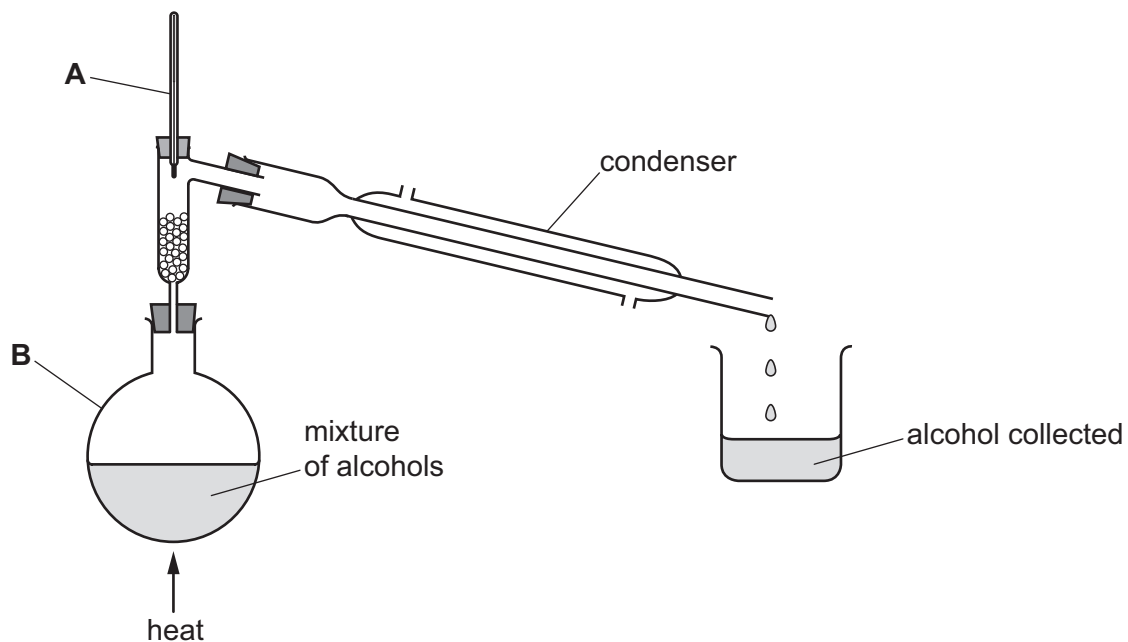
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1 The table gives the boiling points of four alcohols.

| alcohol | boiling point/°C |
|-------------|------------------|
| methanol | 65 |
| ethanol | 79 |
| propan-1-ol | 97 |
| butan-1-ol | 117 |

The apparatus shown can be used to separate a mixture of the four alcohols shown in the table.



(a) Name the apparatus labelled **A** and **B**.

A

B

[2]

(b) Add to the diagram **one** arrow to show where water enters the condenser.

[1]

(c) (i) Why is it **not** safe to heat the mixture of alcohols with a Bunsen burner?

..... [1]

(ii) Suggest how the mixture of alcohols can be heated safely?

..... [1]

(d) Describe how the condenser allows the alcohol to be collected as a liquid.

.....
..... [1]

(e) Which alcohol would be collected first?
Explain your answer.

alcohol collected first

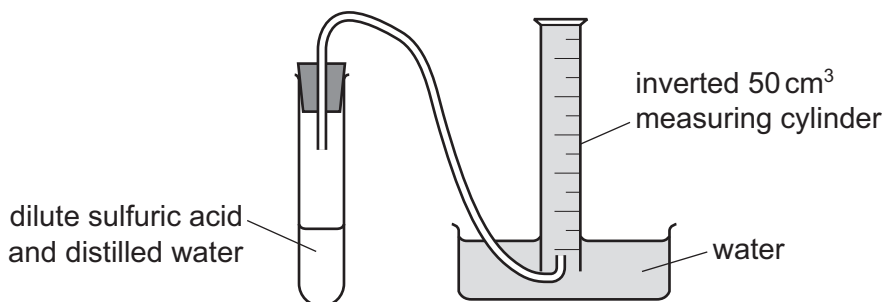
explanation

..... [2]

[Total: 8]

- 2 A student investigated the time taken to collect 40 cm^3 of hydrogen gas when magnesium reacts with dilute sulfuric acid.

Five experiments were done using the apparatus shown.



Experiment 1

- Using a measuring cylinder, 8 cm^3 of dilute sulfuric acid was poured into the boiling tube.
- Using a second measuring cylinder, 12 cm^3 of distilled water was added to the acid in the boiling tube.
- The apparatus was set up as shown in the diagram, ensuring the inverted measuring cylinder was full of water.
- The bung was removed from the boiling tube.
- A coiled length of magnesium ribbon was added to the boiling tube, the bung was immediately replaced and a timer started.
- The time taken for 40 cm^3 of gas to be collected was measured.
- The student felt the outside of the boiling tube.

- (a) (i) The student noticed that the boiling tube was warm.

What does this tell you about the type of reaction?

..... [1]

- (ii) Describe **one** change that could be made to the apparatus to help keep the temperature of the contents of the boiling tube constant during the reaction.

..... [1]

Experiment 2

- The boiling tube was rinsed out with distilled water.
- Experiment 1 was repeated using 10 cm^3 of dilute sulfuric acid and 10 cm^3 of distilled water.

Experiment 3

- Experiment 2 was repeated using 12 cm^3 of dilute sulfuric acid and 8 cm^3 of distilled water.

Experiment 4

- Experiment 2 was repeated using 16 cm^3 of dilute sulfuric acid and 4 cm^3 of distilled water.

Experiment 5

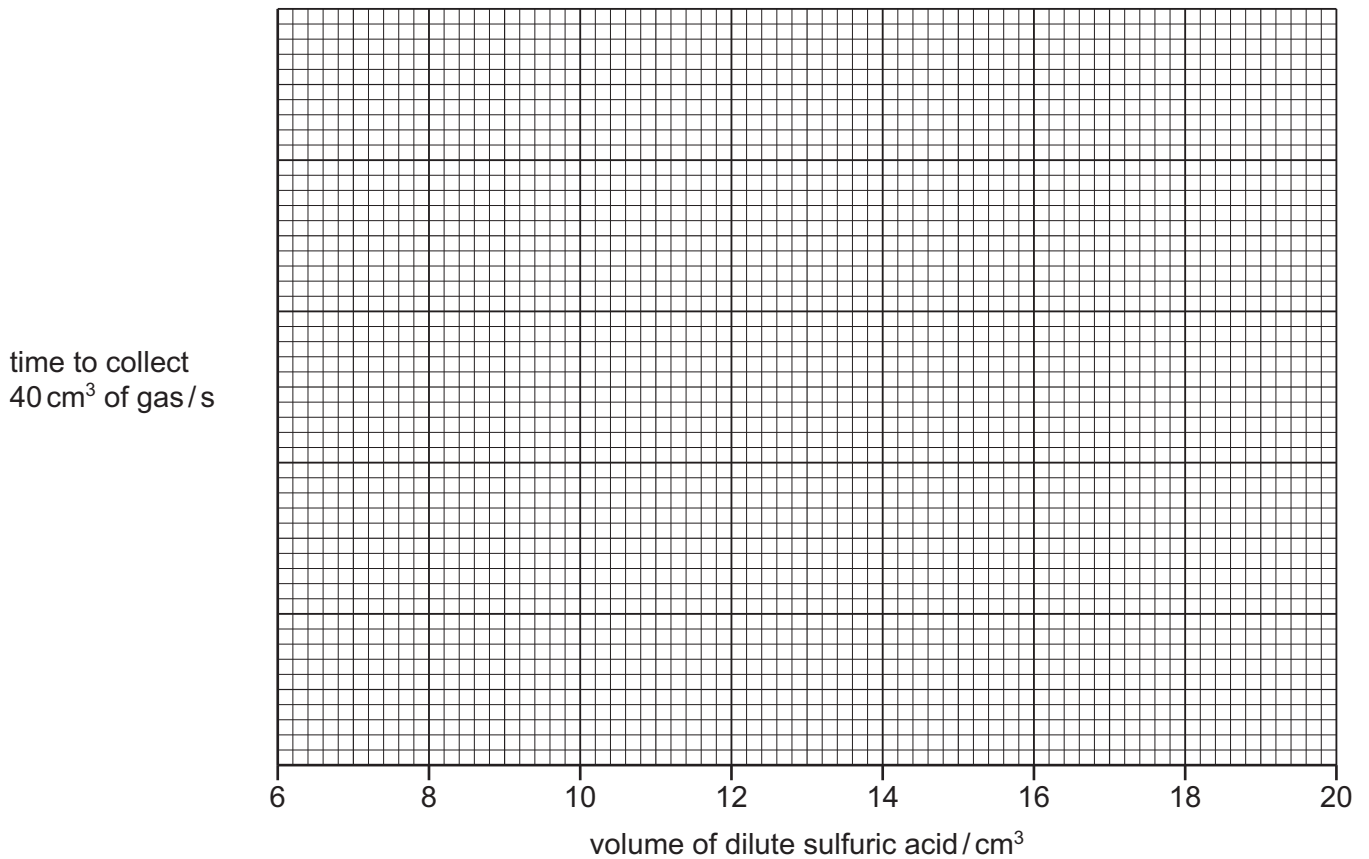
- Experiment 2 was repeated using 20 cm^3 of dilute sulfuric acid and no distilled water.

(b) Use the information in the description of the experiments and the timer diagrams to complete the table. Record the time in **seconds**.

| experiment | volume of dilute sulfuric acid / cm ³ | volume of distilled water / cm ³ | timer diagram | time to collect 40 cm ³ of gas/s |
|------------|--|---|---------------|---|
| 1 | 8 | | | |
| 2 | 10 | | | |
| 3 | 12 | | | |
| 4 | 16 | | | |
| 5 | 20 | | | |

[4]

- (c) Add a suitable scale to the y -axis and plot the results from Experiments 1 to 5 on the grid. Draw a smooth line graph.



[4]

- (d) (i) **From your graph**, deduce the time taken to collect 40 cm^3 of gas if the experiment was repeated using 9 cm^3 of dilute sulfuric acid.

Show clearly **on the grid** how you worked out your answer.

..... s
[2]

- (ii) What volume of distilled water would be needed if the experiment was repeated using 9 cm^3 of dilute sulfuric acid?

..... cm^3 [1]

(e) The rate of reaction can be calculated using the equation shown.

$$\text{rate of reaction} = \frac{\text{volume of gas collected}}{\text{time taken to collect the gas}}$$

(i) Use this equation to calculate the rate of reaction in Experiment 1. Give the units for the rate of reaction you have calculated.

rate of reaction = units = [2]

(ii) In which Experiment, 1, 2, 3, 4 or 5, was the rate of reaction greatest?

..... [1]

(f) Why would measuring the volume of dilute sulfuric acid with a burette rather than a measuring cylinder be an improvement?

..... [1]

(g) The magnesium starts to react with the dilute sulfuric acid as soon as it is added.

(i) Why does this decrease the accuracy of the investigation?

..... [1]

(ii) Describe **one** improvement that you could make to overcome this problem.

..... [1]

[Total: 19]

3 Solution **J** and solid **K** were analysed.

tests on solution J

| tests | observations |
|---|--|
| <p>Solution J was colourless. Solution J was divided into three portions in three test-tubes.</p> <p>test 1</p> <p>Universal indicator paper was dipped into the first portion of solution J.</p> | <p>the universal indicator paper turned red</p> |
| <p>test 2</p> <p>A spatula measure of sodium carbonate was added to the second portion of solution J. The gas given off was tested.</p> | <p>effervescence was seen, the gas produced turned limewater milky</p> |
| <p>test 3</p> <p>1 cm³ of dilute nitric acid and a few drops of aqueous silver nitrate were added to the third portion of solution J.</p> | <p>a white precipitate formed</p> |

(a) Use the observation from **test 1** to suggest the pH of solution **J**.

pH = [1]

(b) Name the gas given off in **test 2**.

..... [1]

(c) Identify solution **J**.

.....

..... [2]

tests on solid K

Solid **K** was ammonium nitrate.

Complete the expected observations.

Solid **K** was dissolved in water to produce solution **K**. Solution **K** was divided into two equal portions.

(d) About 1 cm³ of dilute nitric acid and a few drops of aqueous barium nitrate were added to the first portion of solution **K**.

observations [1]

(e) 2 cm³ of aqueous sodium hydroxide was added to the second portion of solution **K**. The mixture was warmed and the gas given off was tested.

observations

.....

..... [2]

[Total: 7]

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