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CHEMISTRY

0620/62

Paper 6 Alternative to Practical

May/June 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

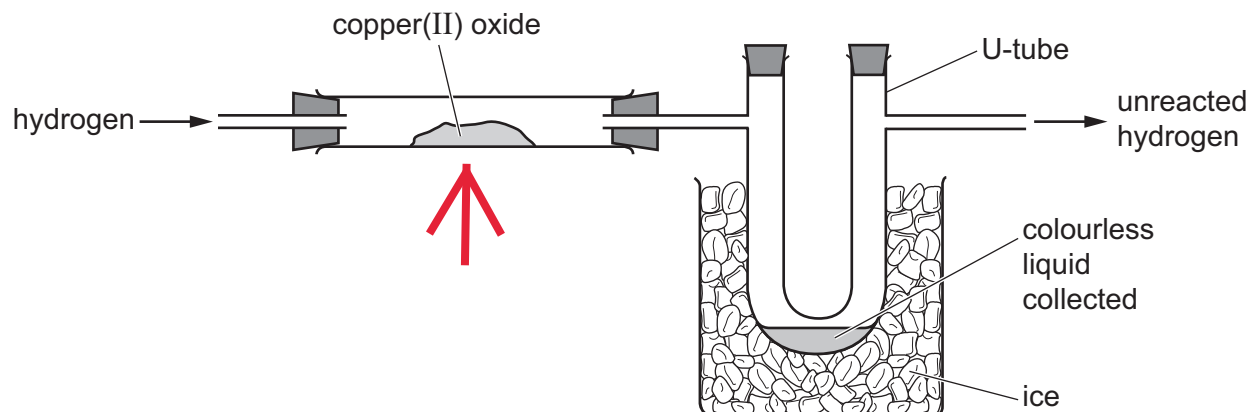
- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [].

This document has **12** pages. Blank pages are indicated.

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- 1 Hot copper(II) oxide reacts with hydrogen. The products are copper and steam.

The apparatus used to react copper(II) oxide with hydrogen is shown.



- (a) Draw an arrow **on the diagram** to show where the apparatus should be heated. [1]

- (b) During the reaction the colour of the copper(II) oxide changes.

State the colour change.

from **black** to **brown** [1]

- (c) Identify the colourless liquid collected.

Water [1]

- (d) Explain why the U-tube is in ice.

To cool so that the steam changes into liquid
 [2]

- (e) (i) Large amounts of unreacted hydrogen should **not** be allowed to escape into the laboratory.

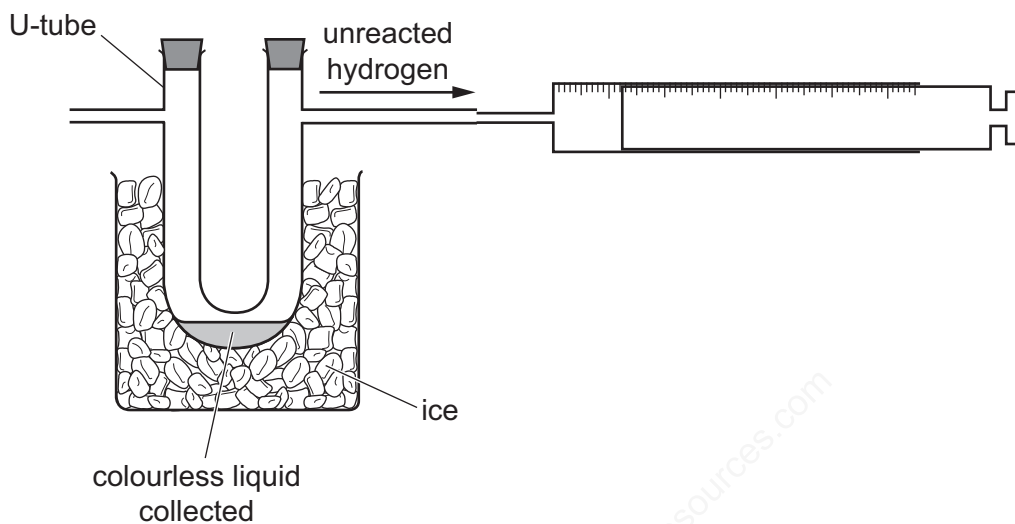
State why.

Because it is flammable

[1]

- (ii) Complete the diagram to show how the unreacted hydrogen could be collected and its volume measured.

Label any apparatus that you draw.



[2]

[Total: 8]

- 2 A student investigated the temperature change when magnesium ribbon reacts with dilute sulfuric acid.

Five experiments were done.

Experiment 1

- Using a measuring cylinder, 20 cm³ of dilute sulfuric acid were poured into a boiling tube.
- A thermometer was used to measure the initial temperature of the acid.
- A 1 cm length of magnesium ribbon was added to the acid in the boiling tube.
- The acid and magnesium ribbon in the boiling tube were stirred continuously using a thermometer.
- The highest temperature reached by the mixture was measured.
- The boiling tube was rinsed out with distilled water.

Experiment 2

- Experiment 1 was repeated using a 2 cm length of magnesium ribbon instead of the 1 cm length.

Experiment 3

- Experiment 1 was repeated using a 3 cm length of magnesium ribbon instead of the 1 cm length.

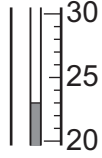
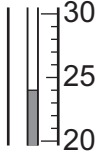
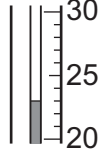
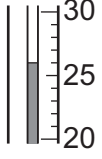
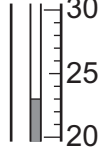
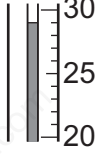
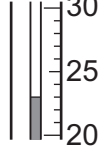
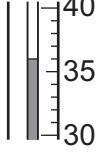
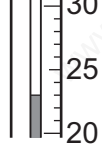
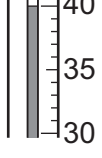
Experiment 4

- Experiment 1 was repeated using a 5 cm length of magnesium ribbon instead of the 1 cm length.

Experiment 5

- Experiment 1 was repeated using a 6 cm length of magnesium ribbon instead of the 1 cm length.

(a) Use the information in the description of the experiments and the thermometer diagrams to complete the table.

experiment	length of magnesium ribbon / cm	initial temperature		highest temperature		temperature increase / °C
		thermometer diagram	initial temperature of acid / °C	thermometer diagram	highest temperature of acid / °C	
1	1		23°C		24°C	1°C
2	2		23°C		26°C	3°C
3	3		23°C		29°C	6°C
4	5		23°C		36°C	13°C
5	6		23°C		40°C	17°C

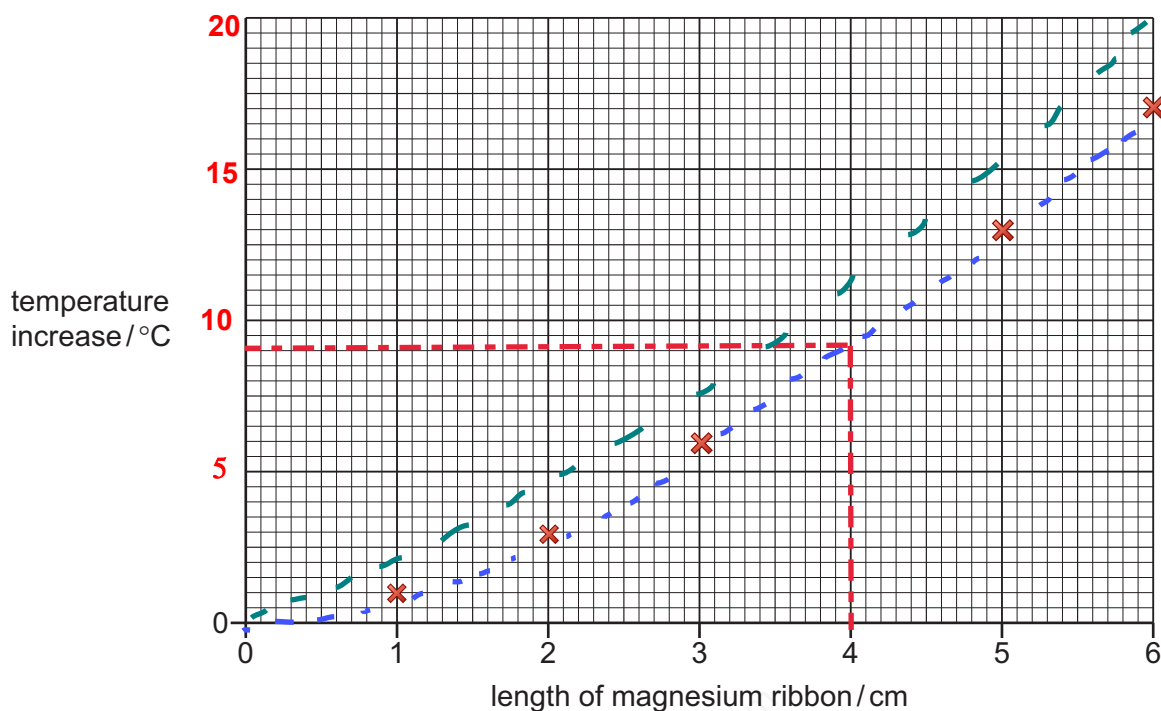
[4]

(b) In which experiment, 1, 2, 3, 4 or 5, was the temperature increase the largest?

5

..... [1]

- (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, making sure that your line passes through (0,0).



[5]

- (d) Explain why the graph line must pass through (0,0).

Because there is no reaction with magnesium

[1]

- (e) From your graph, deduce the temperature increase if Experiment 1 is repeated using a 4 cm length of magnesium ribbon.

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

9°C

[3]

- (f) (i) Why would carrying out the experiment in a polystyrene cup rather than a boiling tube improve the accuracy of the results?

Because polystyrene is a better insulator

[1]

- (ii) Sketch on the grid the graph you would expect if the experiment was repeated using a polystyrene cup instead of a boiling tube. [1]

(g) The volume of dilute sulfuric acid could be measured with a 20 cm³ pipette.

(i) State **one** advantage of using a pipette rather than a measuring cylinder.

More accurate

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

(ii) State **one** disadvantage of using a pipette rather than a measuring cylinder.

Slower

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

[Total: 18]

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- 3 Two solids, solid **L** and solid **M**, were analysed. Solid **L** was chromium(III) chloride. Tests were done on each solid.

tests on solid L

Complete the expected observations.

Solid **L** was dissolved in distilled water to produce solution **L**. Solution **L** was divided into four portions in three test-tubes and a boiling tube.

- (a) To the first portion of solution **L** in the boiling tube, about 1 cm depth of dilute hydrochloric acid was added. The boiling tube was warmed gently.

A strip of filter paper was dipped in acidified potassium manganate(VII) solution and held at the mouth of the boiling tube.

observations **Stays purple** [1]

- (b) To the second portion of solution **L** aqueous sodium hydroxide was added slowly until it was in excess and no further changes were seen.

observations **Green precipitate dissolves producing a green solution**

.....

..... [2]

- (c) To the third portion of solution **L** aqueous ammonia was added slowly until it was in excess and no further changes were seen.

observations **Grey-green precipitate that does not dissolve in excess**

.....

..... [2]

- (d) To the fourth portion of solution **L** about 1 cm depth of dilute nitric acid was added followed by about 1 cm depth of aqueous silver nitrate.

observations **White precipitate**

..... [1]

tests on solid M

Tests were done and the following observations made.

tests on solid M	observations
test 1 Flame test	yellow flame seen
test 2 About 10 cm ³ of dilute nitric acid was added to solid M . Any gas produced was tested.	effervescence limewater turned milky
test 3 About 1 cm depth of aqueous barium nitrate was added to the solution formed by adding dilute nitric acid to solid M in test 2 .	no change

(e) Identify solid **M**.

sodium carbonate

..... [2]

[Total: 8]

- 4 Many window-cleaning products contain aqueous ammonia. Aqueous ammonia is an alkali that reacts with dilute acids.

Plan an investigation to find which of two window-cleaning products contains the most concentrated aqueous ammonia. Include in your plan:

- the method you will use
- how your results will be used to determine which window-cleaning product contains the most concentrated aqueous ammonia.

You are provided with an aqueous solution of the two window-cleaning products, dilute hydrochloric acid of known concentration and common laboratory apparatus.

Take equal volumes of each cleaner into a beaker. Use a pipette to measure off this cleaner. Then add drops of phenolphthalein indicator to it. Next add hydrochloric acid from a burette until the phenolphthalein indicator changes colour. Record the volume acid added. The reading that shows the biggest volume of acid is the one that neutralises the cleaner which is the most concentrated .

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..... [6]

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