Cambridge Assessment International Education

# Cambridge IGCSE™

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*4026350879*

**CHEMISTRY** **0620/63**

Paper 6 Alternative to Practical **October/November 2021**

**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 [ ].

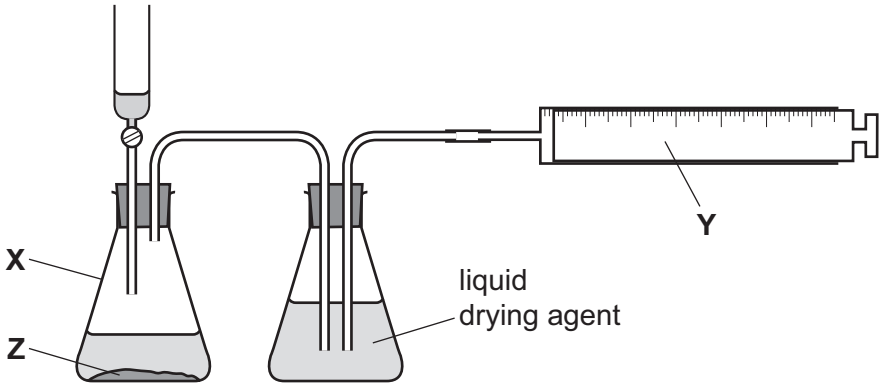
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**[Turn over**

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**1** Hot concentrated hydrochloric acid reacts with solid manganese(IV) oxide to make chlorine gas. Chlorine gas can be dried by bubbling it through a liquid drying agent.

The diagram shows the apparatus used to make and collect a sample of dry chlorine gas. There is one error in the diagram.




**(a)** Name the items of apparatus labelled **X** and **Y**.

**X** .....

**Y** .....
[2]

**(b)** Name the substance labelled **Z**.

..... [1]

**(c)** **On the diagram** draw **one** arrow to show where heat should be applied so that chlorine gas is made. [1]

**(d)** There is one error in the way the apparatus has been set up.

**(i)** **On the diagram** draw a circle around the error in the apparatus. [1]

**(ii)** Describe what would happen if the apparatus is used before the error is corrected.

.....

..... [1]

[Total: 6]

**2** A student investigated the temperature change when zinc reacted with two different aqueous solutions of copper(II) sulfate, solution **Q** and solution **R**.

Two experiments were done.

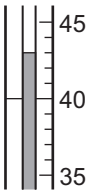
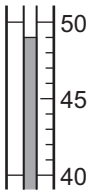
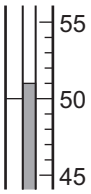
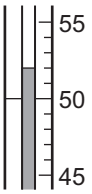
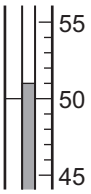
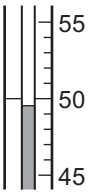
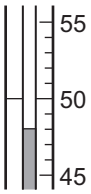
**(a)** *Experiment 1*

- A polystyrene cup was placed in a 250 $cm^3$ beaker for support.
- Using a measuring cylinder, 25 $cm^3$ of solution **Q** was poured into the polystyrene cup.
- Using a thermometer, the initial temperature of solution **Q** was measured.
- 3 g of zinc powder was added to the polystyrene cup. At the same time a stop-clock was started.
- Using the thermometer, the mixture in the polystyrene cup was continually stirred and the temperature measured every 30 seconds.

| | |
|---|---|
| initial temperature in Experiment 1 | 23 °C |

Use the thermometer diagrams and the initial temperature to complete the table.
Calculate the temperature changes using the equation:

temperature change = temperature – initial temperature

| time / s | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 |
|---|---|---|---|---|---|---|---|---|
| thermometer diagram |  |  |  |  |  |  |  |  |
| temperature / °C | | | | | | | | |
| temperature change / °C | | | | | | | | |

[3]

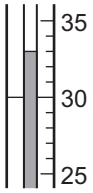
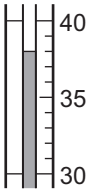
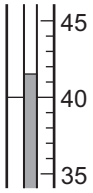
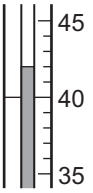
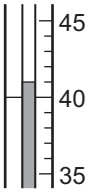
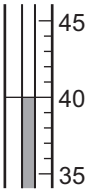
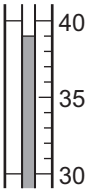
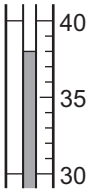
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**(b)** *Experiment 2*

- The polystyrene cup was washed out with distilled water.
- Experiment 1 was repeated using solution **R** instead of solution **Q**.

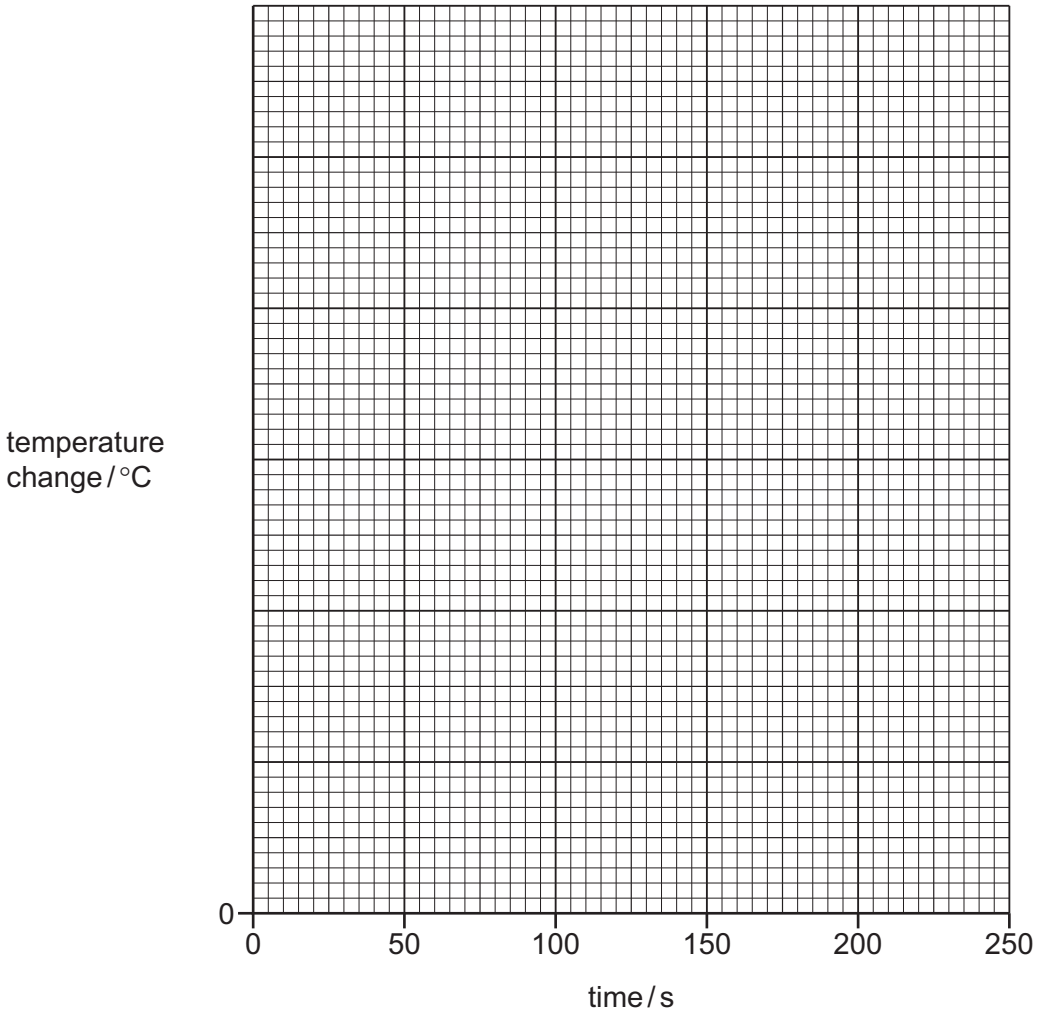
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|---|---|
| initial temperature in Experiment 2 | 24 °C |

Use the thermometer diagrams and the initial temperature to complete the table.

| time / s | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 |
|---|---|---|---|---|---|---|---|---|
| thermometer diagram |  |  |  |  |  |  |  |  |
| temperature / °C | | | | | | | | |
| temperature change / °C | | | | | | | | |

[3]

**(c)** Complete a suitable scale on the *y*-axis and plot the results from Experiment 1 and Experiment 2 on the grid. Draw two curves of best fit. Both curves must start at (0,0). Label your curves.




[5]

**(d)** **From your graph**, deduce the temperature change at 110 seconds in Experiment 1.

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

..... °C
[2]

**(e)** Predict the temperature of the solution in Experiment 2 after 5 hours. Explain your answer.

.....

..... [2]

**(f)** **(i)** Suggest why the experiments were done in a polystyrene cup rather than a glass beaker.

..... [1]

**(ii)** Describe how the results would be different if a glass beaker is used in place of the polystyrene cup.

..... [1]

**(g)** Suggest **one** change that could be made to the apparatus that would improve the accuracy of the results. Explain why this change would improve the accuracy of the results.

change .....

explanation .....

.....
[2]

[Total: 19]

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**3** Solid **S** and solid **T** were analysed.
Tests were done on each substance.

**tests on solid S**

| tests | observations |
|---|---|
| **test 1**<br><br>Solid **S** was placed in a boiling tube and 10 $cm^3$ of dilute hydrochloric acid was added. | effervescence |
| The solution formed in **test 1** was decanted from the remaining solid **S**. The solution is solution **U**.<br><br>**test 2**<br><br>Aqueous sodium hydroxide was added dropwise and then in excess to solution **U**. | white precipitate,<br>insoluble in excess |

The gas given off in **test 1** was carbon dioxide.

**(a)** Describe how the gas produced in **test 1** could be tested to show that it was carbon dioxide. Give the expected result of the test.

test .....

result .....
[2]

**(b)** Identify solid **S**.

.....

..... [2]

**tests on solid T**

Solid **T** was iron(III) chloride.

Solid **T** was dissolved in water to form solution **T**. Solution **T** was divided into four equal portions in four test-tubes.

**(c)** To the first portion of solution **T**, aqueous sodium hydroxide was added dropwise and then in excess.

observations .....

..... [2]

**(d)** To the second portion of solution **T**, 2 $cm^3$ of aqueous ammonia was added.

observations ..... [1]

**(e)** To the third portion of solution **T**, 1 $cm^3$ of dilute nitric acid followed by a few drops of aqueous silver nitrate were added.

observations ..... [1]

**(f)** To the fourth portion of solution **T**, 1 $cm^3$ of dilute nitric acid followed by a few drops of aqueous barium nitrate were added.

observations ..... [1]

[Total: 9]

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**4** Catalysts are substances which increase the rate of a reaction but are unchanged at the end of the reaction.

Aqueous hydrogen peroxide decomposes slowly to form water and oxygen.

$$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$$

Copper(II) oxide is an insoluble solid.

Plan an investigation to find out if copper(II) oxide is a catalyst for the decomposition of hydrogen peroxide. You must include how your results will tell you if copper(II) oxide is a catalyst. You have access to copper(II) oxide, aqueous hydrogen peroxide and all normal laboratory apparatus.

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..... [6]

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