



# Cambridge IGCSE™ (9–1)

CANDIDATE  
NAME

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**CHEMISTRY**

**0971/62**

Paper 6 Alternative to Practical

**October/November 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.

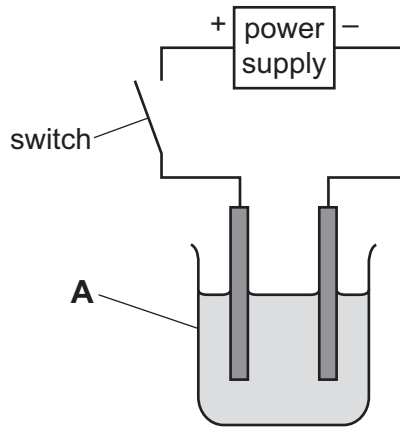
## INFORMATION

- 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.



- 1 The diagram shows the apparatus used to pass an electric current through concentrated hydrochloric acid. Hydrogen and chlorine were formed at the electrodes.



- (a) Name the item of apparatus labelled **A**.

..... [1]

- (b) The electrodes were made of platinum.

- (i) Give **two** reasons why platinum is a suitable material for the electrodes.

1 .....

2 .....

[2]

- (ii) Suggest another material suitable to use as electrodes in this experiment.

..... [1]

- (c) The teacher doing this experiment wore safety glasses, gloves, had their hair tied back and stood up throughout the experiment.

State **one** other safety precaution that should be taken when doing this experiment.  
Explain your answer.

safety precaution .....

explanation .....

[2]

[Total: 6]

- 2 A student investigated the rate of a reaction between sodium metabisulfite and potassium iodate. In the reaction, starch was used as an indicator. At first the reacting mixture remained colourless but then suddenly changed to a blue-black colour.

Five experiments were done. In each experiment the total volume of liquid was 45 cm<sup>3</sup>.

*Experiment 1*

- Using a 10 cm<sup>3</sup> measuring cylinder, 5 cm<sup>3</sup> of aqueous sodium metabisulfite was poured into a beaker.
- Using another 10 cm<sup>3</sup> measuring cylinder, 5 cm<sup>3</sup> of aqueous starch was poured into the beaker.
- Using a 25 cm<sup>3</sup> measuring cylinder, 15 cm<sup>3</sup> of distilled water was poured into the beaker.
- Using another 25 cm<sup>3</sup> measuring cylinder, 20 cm<sup>3</sup> of aqueous potassium iodate was poured into the beaker. At the same time a stop-clock was started.
- The mixture in the beaker was stirred until a sudden colour change was seen.
- The stop-clock was immediately stopped and the time recorded.
- The beaker was rinsed with water.

*Experiment 2*

- Experiment 1 was repeated using 17 cm<sup>3</sup> of distilled water and 18 cm<sup>3</sup> of aqueous potassium iodate.

*Experiment 3*

- Experiment 1 was repeated using 21 cm<sup>3</sup> of distilled water and 14 cm<sup>3</sup> of aqueous potassium iodate.

*Experiment 4*

- Experiment 1 was repeated using 23 cm<sup>3</sup> of distilled water and 12 cm<sup>3</sup> of aqueous potassium iodate.

*Experiment 5*

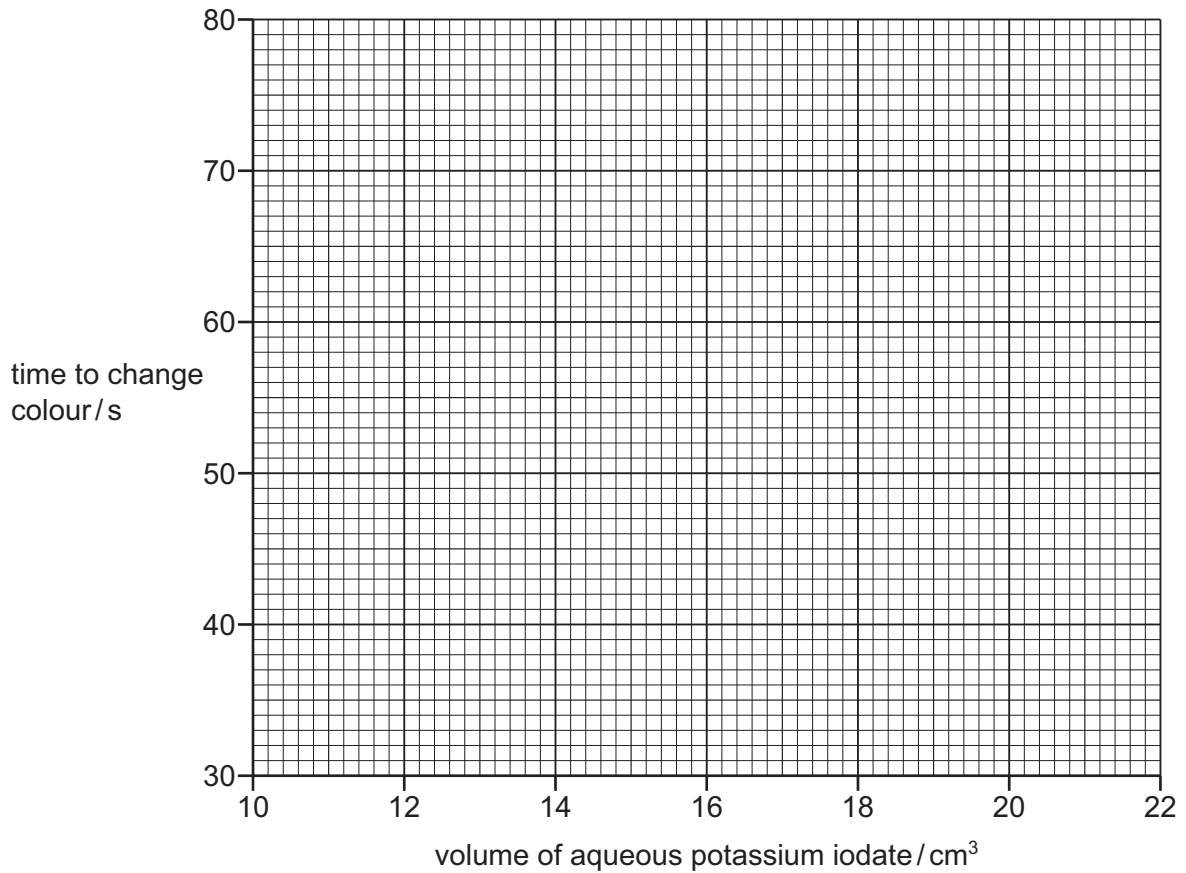
- Experiment 1 was repeated using 25 cm<sup>3</sup> of distilled water and 10 cm<sup>3</sup> of aqueous potassium iodate.

(a) Use the information in the description of the experiments and the stop-clock diagrams to complete the table. Record the times in **seconds**.

experiment	volume of aqueous sodium metabisulfite /cm <sup>3</sup>	volume of distilled water /cm <sup>3</sup>	volume of aqueous potassium iodate /cm <sup>3</sup>	stop-clock diagram	time to change colour /s
1			20		
2			18		
3			14		
4			12		
5			10		

[5]

- (b) Plot the results from Experiments 1 to 5 on the grid.  
Draw a smooth curve of best fit.



[3]

- (c) (i) **From your graph**, predict the time to change colour if  $16 \text{ cm}^3$  of aqueous potassium iodate was used.

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

time to change colour = ..... s [2]

- (ii) Calculate the volume of distilled water required if  $16 \text{ cm}^3$  of aqueous potassium iodate was used.

volume of distilled water = .....  $\text{cm}^3$  [1]

- (d) Sketch **on the grid** the graph you would expect if Experiments 1 to 5 were repeated at a higher temperature. [1]

- (e) The concentration of potassium iodate in the reaction mixture in each experiment can be calculated using the equation shown.

$$\text{concentration} = \frac{0.05 \times \text{volume of aqueous potassium iodate}}{45}$$

- (i) Calculate the concentration of potassium iodate in the reaction mixture in Experiment 2.

$$\text{concentration} = \dots\dots\dots \text{ mol/dm}^3 \quad [1]$$

- (ii) State which experiment, 1, 2, 3, 4 or 5, had the fastest rate of reaction.

..... [1]

- (f) Suggest why the volume of distilled water added to each experiment was increased as the volume of aqueous potassium iodate was decreased.

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

- (g) Give **one** change you could make to the apparatus used which would improve the results. Explain your answer.

change to apparatus .....

.....

explanation .....

..... [2]

- (h) How could the reliability of the results of this investigation be checked?

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

[Total: 18]

- 3 Solid **Q** and solid **R** were analysed. Solid **Q** was zinc carbonate.  
Tests were done on each solid.

**tests on solid Q**

Complete the expected observations.

- (a) Solid **Q** was placed in a boiling tube. About 10 cm<sup>3</sup> of dilute sulfuric acid was added to the boiling tube. Any gas produced was tested.  
The contents of the boiling tube were kept for (c).

observations .....

.....

..... [3]

- (b) Identify the gas given off in (a).

..... [1]

- (c) The reaction mixture from (a) was filtered.  
The filtrate was solution **S**. 1 cm depth of solution **S** was poured into a boiling tube.

- (i) Aqueous sodium hydroxide was added dropwise and then in excess to solution **S** in the boiling tube.

observations .....

.....

..... [2]

- (ii) Explain why it is **not** possible to identify the cation contained in solution **S** from your observations in (c)(i).

.....

..... [1]

- (iii) Suggest an additional test that can be done on solution **S** to confirm the cation was Zn<sup>2+</sup>.

.....

..... [1]

**tests on solid R**

Tests were done and the following observations were made.

tests on solid <b>R</b>	observations
<p><b>test 1</b></p> <p>A flame test was done on solid <b>R</b>.</p>	<p>yellow flame</p>
<p>Solid <b>R</b> was dissolved in distilled water to produce solution <b>R</b>. The solution was divided into two equal portions in two test-tubes.</p> <p><b>test 2</b></p> <p>About 1 cm<sup>3</sup> of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the first portion of solution <b>R</b>.</p>	<p>yellow precipitate formed</p>
<p><b>test 3</b></p> <p>The second portion of solution <b>R</b> was added to 1 cm<sup>3</sup> of aqueous bromine in a test-tube.</p>	<p>the solution changed colour from orange to brown</p>

(d) Identify solid **R**.

.....  
 ..... [2]

[Total: 10]









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