

Identification of Ions and Gases

Question Paper 8

Level	IGCSE
Subject	Chemistry
Exam Board	CIE
Topic	Acids, Bases and Salts
Sub-Topic	Identification of Ions and Gases
Paper Type	Alternative to Practical
Booklet	Question Paper 8

Time Allowed: 58 minutes

Score: /48

Percentage: /100

1 A student extracted and investigated the orange colour in some sweets.
The student followed these instructions:

- 1 Collect sweets, a watch glass, a beaker, eye protection and 100 cm³ of ethanol.
- 2 Crush the sweets.
- 3 Place the crushed sweets in the beaker containing 100 cm³ of ethanol.
- 4 Boil the mixture with the watch glass covering the beaker.
- 5 Decant the liquid and concentrate it by evaporation until the colour is dark orange.
- 6 Investigate which colours are present in the orange solution.

(a) Why should the sweets be crushed?

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

(b) Why should the experiment be carried out in a well-ventilated laboratory?

.....[1]

(c) State **one** safety precaution that the student should have taken, other than carrying out the experiment in a well-ventilated laboratory and using eye protection.

.....[1]

(d) State the purpose of the watch glass.

.....[1]

(e) Explain the term *decant*.

.....[1]

(f) Describe how the student could carry out instruction 6. You may draw a diagram in the space below to help you answer the question.

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.....
.....
.....[5]

- 2 A student investigated the speed of reaction between aqueous potassium bromate and potassium iodide solution.

A burette was filled up to the 0.0 cm^3 mark with aqueous potassium iodide.

To each of 5 test-tubes was added 6 cm^3 of aqueous potassium iodide to be used in the 5 following experiments.

Experiment 1

By using a measuring cylinder 12 cm^3 of aqueous potassium bromate was poured into a small beaker. To this solution was added 4 cm^3 of water, 2 cm^3 of hydrochloric acid, 5 cm^3 of starch solution and 1 cm^3 of sodium thiosulphate solution.

The beaker was placed on a cross drawn on a piece of paper.

From one of the test-tubes 6 cm^3 of aqueous potassium iodide was added to the mixture in the beaker and the timer started. A dark blue colour formed. The timer was stopped when the cross on the paper could not be seen.

Use the stop clock diagram to record the time in the table.

Experiment 2

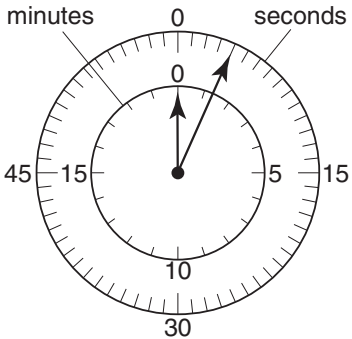
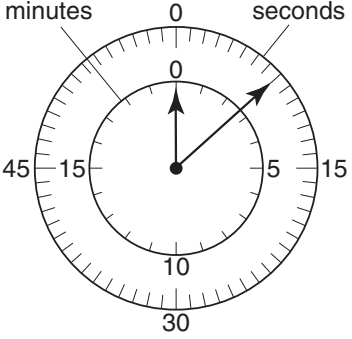
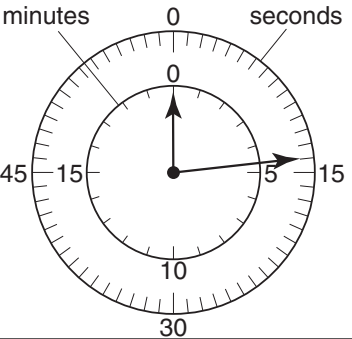
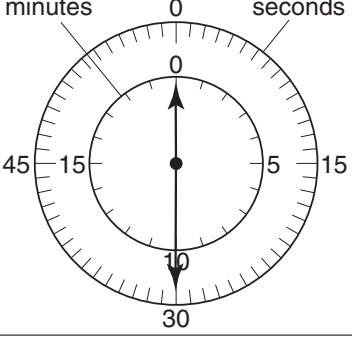
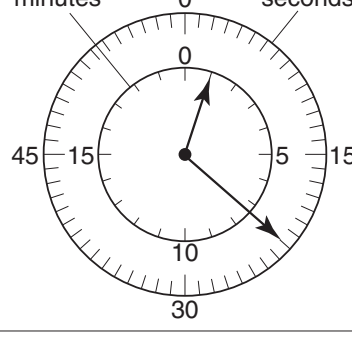
By using a measuring cylinder 10 cm^3 of potassium bromate solution was poured into a beaker. The instructions were repeated exactly as given for Experiment 1, but 6 cm^3 of water was added to the beaker.

Use the diagram to record the time in the table.

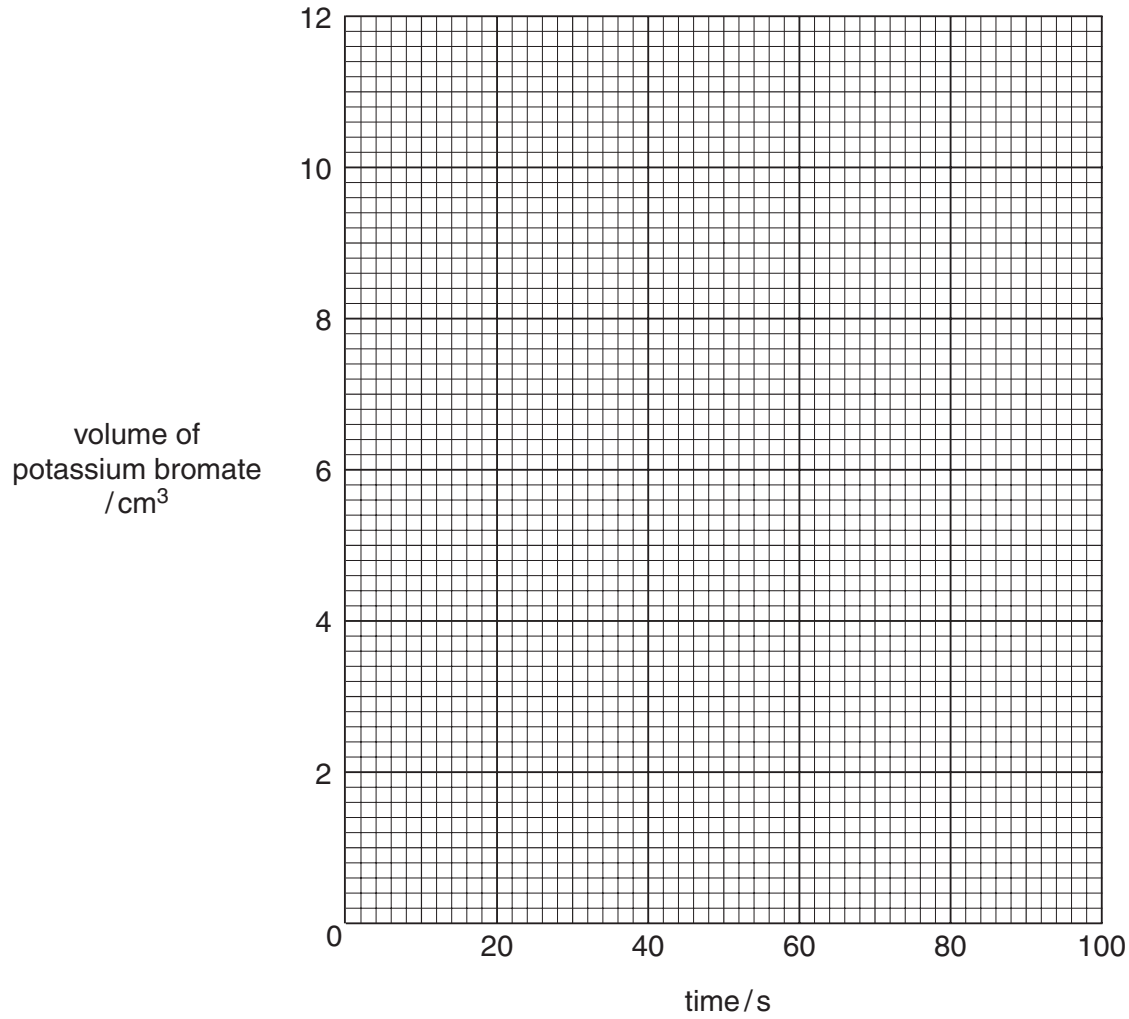
Experiments 3, 4 and 5

Experiment 1 was repeated using the volumes of aqueous potassium bromate and water specified in the table of results. Record the times in the table.

Table of results

Experiment	volume		clock diagram	time/s
1	potassium bromate/cm ³ 12	water/cm ³ 4		
2	10	6		
3	8	8		
4	6	10		
5	4	12		

(a) Plot the results on the grid. Draw a smooth line graph.



[4]

(b) From your graph estimate the time of the reaction if Experiment 1 was repeated using 5 cm³ of potassium bromate and 11 cm³ of water.

.....

Show clearly on your graph how you worked out your answers. [3]

(c) (i) Which experiment is the quickest?

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(ii) Explain why this experiment is the quickest.

.....

.....

.....[3]

(d) (i) State **two** possible sources of error in the experiments.

1

.....

2

.....

(ii) Suggest **two** improvements to reduce the sources of error in the experiments.

1

.....

2

.....[4]

- 3 An aqueous solution of substance **X** was analysed. Substance **X** was an iron(III) salt containing one other cation. The tests on **X** and some of the observations are in the following table. Complete the observations in the table.

<i>Tests</i>	<i>Observations</i>
(a) Colour of solution X	dark yellow
<p>(b) (i) Drops of aqueous sodium hydroxide were added to about 2 cm³ of the solution. Excess aqueous sodium hydroxide was added to the test-tube.</p> <p>(ii) The mixture was heated. The gas given off was tested with damp indicator paper.</p>	<p>.....</p> <p>.....</p> <p>.....[3]</p> <p>pungent smell indicator turned blue, pH 10</p>
<p>(c) Experiment (b)(i) was repeated using aqueous ammonia instead of aqueous sodium hydroxide.</p>	<p>.....</p> <p>.....</p> <p>.....[2]</p>
<p>(d) To about 2 cm³ of solution X was added dilute sulphuric acid. Two pieces of zinc were added. The mixture was heated and the gas given off tested.</p> <p>After 10 minutes the mixture was filtered and test (b)(i) was repeated.</p>	<p>lighted splint</p> <p>popped</p> <p>green precipitate insoluble in excess</p>
<p>(e) A few drops of hydrochloric acid were added to about 2 cm³ of solution X. About 1 cm³ of barium chloride solution was added to the mixture.</p>	white precipitate

(f) (i) Name the gas given off in (d).

.....

(ii) What type of chemical reaction occurs in (d). Explain your answer.

.....

.....[3]

(g) What conclusions can you draw about the anion and the other cation in substance X?

anion

cation[2]

- 4 Two liquids, **F** and **G**, were tested. The tests and some of the observations are in the following table. **G** was an aqueous solution of a metal iodide.

Complete the observations in the table.

tests	observations
<p>(a) (i) Appearance of liquid F.</p> <p>(ii) Appearance of liquid G.</p>	<p>colourless smells like petrol</p> <p>colourless no smell</p>
<p>(b) (i) About 1 cm³ of liquid F was added to a crystal of iodine. The test-tube was shaken.</p> <p>(ii) About 1 cm³ of liquid G was added to a crystal of iodine. The test-tube was shaken.</p> <p>The mixture from (b)(i) was added to the mixture in (b)(ii).</p>	<p>purple solution</p> <p>red/brown solution</p> <p>two layers formed</p>
<p>(c) A few drops of F were placed on a dry watch glass.</p> <p>The liquid was touched with a lighted splint.</p>	<p>.....</p> <p>.....[2]</p>
<p>(d) To about 1 cm³ of liquid G was added a few drops of dilute nitric acid followed by aqueous lead(II) nitrate.</p>	<p>.....</p> <p>.....[2]</p>
<p>(e) To about 1 cm³ of liquid G was added a few drops of dilute nitric acid followed by aqueous silver nitrate.</p>	<p>.....</p> <p>.....</p> <p>.....[2]</p>

- (f) What type of substance is liquid **F**?

.....

.....[2]