

# Identification of Ions and Gases

## Question Paper 3

<b>Level</b>	IGCSE
<b>Subject</b>	Chemistry
<b>Exam Board</b>	CIE
<b>Topic</b>	Acids, Bases and Salts
<b>Sub-Topic</b>	Identification of Ions and Gases
<b>Paper Type</b>	Alternative to Practical
<b>Booklet</b>	Question Paper 3

**Time Allowed:** 57 minutes

**Score:** /47

**Percentage:** /100

- 1 Solid **E** was analysed. **E** was an aluminium salt.  
The tests on the solid and some of the observations are in the following table.  
Complete the observations in the table.

tests	observations
<p><u>tests on solid E</u></p> <p>(a) Appearance of solid <b>E</b>.</p>	<p>white crystalline solid</p>
<p>(b) A little of solid <b>E</b> was heated in a test-tube.</p>	<p>colourless drops of liquid formed at the top of the tube</p>
<p>(c) A little of solid <b>E</b> was dissolved in distilled water.</p> <p>The solution was divided into four test-tubes and the following tests were carried out.</p> <p>(i) To the first test-tube of solution, drops of aqueous sodium hydroxide were added. Excess sodium hydroxide was then added to the test-tube.</p> <p>(ii) Test (i) was repeated using aqueous ammonia solution instead of aqueous sodium hydroxide.</p> <p>(iii) To the third test-tube of solution, dilute hydrochloric acid was added, followed by barium chloride solution.</p> <p>(iv) To the fourth test-tube of solution, aqueous sodium hydroxide and aluminium powder were added. The mixture was heated.</p>	<p>.....</p> <p>.....</p> <p>..... [3]</p> <p>.....</p> <p>..... [2]</p> <p>no reaction</p> <p>effervescence pungent gas given off turned damp litmus paper blue</p>

**(d)** What does test **(b)** tell you about solid **E**.

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

**(e)** Identify the gas given off in test **(c)(iv)**.

..... [1]

**(f)** What conclusions can you draw about solid **E**?

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

[Total: 9]

- 2 Two different solutions, **X** and **Y**, were analysed. **X** was copper sulfate solution. The tests on the solutions, and some of the observations, are in the following table.

Complete the observations in the table.

tests	observations
<u>tests on solution X</u>	
<b>(a) (i)</b> Appearance of solution <b>X</b> .	..... [1]
<b>(ii)</b> To a little of solution <b>X</b> , aqueous sodium hydroxide was added.	..... [2]
<b>(iii)</b> To a little of solution <b>X</b> , aqueous ammonia was added drop by drop and shaken.	..... [1]
Excess aqueous ammonia solution was then added to the test-tube.	..... ..... [2]
<u>tests on solution Y</u>	
<b>(b) (i)</b> A little of solution <b>Y</b> was tested with Universal Indicator paper. The pH was recorded.	pH1
<b>(ii)</b> To about 3 cm <sup>3</sup> of solution <b>Y</b> a few drops of dilute hydrochloric acid and then aqueous barium chloride was added.	white precipitate

- (c)** Identify solution **Y**.

..... [2]

[Total: 8]

- 3 Describe a chemical test to distinguish between each of the following pairs of substances. An example is given.

Example: hydrogen and carbon dioxide

test lighted splint

result with hydrogen ..... gives a pop .....

result with carbon dioxide ..... splint is extinguished .....

- (a) zinc carbonate and zinc chloride

test .....

result with zinc carbonate .....

result with zinc chloride ..... [2]

- (b) ammonia and chlorine

test .....

result with ammonia .....

result with chlorine ..... [3]

- (c) aqueous iron(II) sulfate and aqueous iron(III) sulfate

test .....

result with aqueous iron(II) sulfate .....

result with aqueous iron(III) sulfate ..... [3]

[Total: 8]

- 4 Two solids, **S** and **V**, were analysed. **S** was copper(II) oxide.  
The tests on the solids, and some of the observations are in the following table.  
Complete the observations in the table. Do not write any conclusions in the table.

test	observation
<p><u>tests on solid S</u></p> <p>(a) Appearance of solid <b>S</b></p>	<p>black solid</p>
<p>(b) Hydrogen peroxide was added to solid <b>S</b> in a test-tube.</p> <p>A glowing splint was inserted into the tube.</p>	<p>slow effervescence</p> <p>splint relit</p>
<p>(c) Dilute sulfuric acid was added to solid <b>S</b> in a test-tube. The mixture was heated to boiling point.</p> <p>The solution was divided into three equal portions into test-tubes.</p> <p>(i) To the first portion of the solution, excess sodium hydroxide was added.</p> <p>(ii) To the second portion of the solution, about 1 cm<sup>3</sup> of aqueous ammonia solution was added.</p> <p>Excess ammonia solution was then added.</p> <p>(iii) To the third portion of the solution, dilute hydrochloric acid was added followed by barium chloride solution.</p>	<p>blue solution formed</p> <p>..... [1]</p> <p>..... [2]</p> <p>..... [2]</p> <p>..... [2]</p>

test	observation
<p><u>tests on solid V</u></p> <p><b>(d)</b> Appearance of solid <b>V</b></p>	<p>black solid</p>
<p><b>(e)</b> Hydrogen peroxide was added to solid <b>V</b> in a test-tube.</p> <p>A glowing splint was inserted into the tube.</p>	<p>rapid effervescence</p> <p>splint relit</p>

**(f) (i)** Compare the reactivity of solid **S** and solid **V** with hydrogen peroxide.

..... [1]

**(ii)** Identify the gas given off in test **(e)**.

..... [1]

**(g)** What conclusions can you draw about solid **V**?

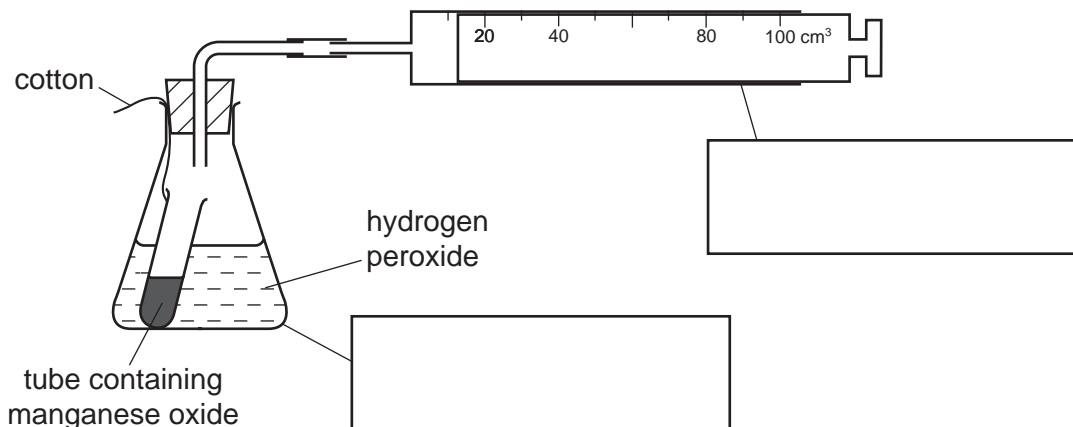
.....

.....

..... [2]

[Total: 11]

- 5 The apparatus below was used to make oxygen. The tube of manganese oxide was added to the hydrogen peroxide solution by releasing the cotton.



(a) Complete the boxes to identify the pieces of apparatus. [2]

(b) Why was the tube of manganese oxide suspended in the flask?  
..... [1]

(c) Give a test for oxygen.  
test .....  
result ..... [2]

[Total: 5]



6 Three unlabelled bottles of chemicals each contained one of the following liquids:

- sodium nitrate dissolved in water;
- pure water;
- hexene.

**(a)** Give a test by which you could identify sodium nitrate solution.

test .....

result ..... [2]

**(b)** Give a test by which you could identify pure water.

test .....

result ..... [2]

**(c)** Give a test by which you could identify hexene.

test .....

result ..... [2]

[Total: 6]