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|---------------|------------------|------|
| Centre Number | Candidate Number | Name |
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**CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
International General Certificate of Secondary Education

**CHEMISTRY**

**0620/05**

Paper 5 Practical Test

May/June 2003

**1 hour 15 minutes**

Candidates answer on the Question Paper.

Additional Materials: As listed in Instructions to Supervisors

**READ THESE INSTRUCTIONS FIRST**

Write your name, Centre number and candidate number in the spaces at the top of this page.  
 Write in dark blue or black pen in the spaces provided on the Question Paper.  
 You may use a pencil for any diagrams, graphs or rough working.  
 Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

The number of marks is given in brackets [ ] at the end of each question or part question.

Practical notes are provided on page 8.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

| FOR EXAMINER'S USE |  |
|--------------------|--|
| <b>1</b>           |  |
| <b>2</b>           |  |
| <b>TOTAL</b>       |  |

1 You are going to investigate the redox reaction between potassium iodate(V) and iodide ions.

Read **all** the instructions below carefully before starting the two experiments.

**Instructions**

*Experiment 1*

Fill the burette provided up to the 0.0 cm<sup>3</sup> mark with the solution **A** of sodium thiosulphate.

By using a measuring cylinder, pour 10 cm<sup>3</sup> of the solution **B** of potassium iodate into the conical flask provided.

Add 10 cm<sup>3</sup> of dilute sulphuric acid to the flask followed by about 20 cm<sup>3</sup> of the aqueous potassium iodide and shake to mix thoroughly.

Add solution **A** slowly to the flask until there is a pale yellow colour in the contents of the flask. Now add about 2 cm<sup>3</sup> of starch solution into the flask.

Continue to add solution **A** to the flask until the colour just disappears.

Record the burette readings in the table.

*Experiment 2*

Pour away the contents of the flask and rinse with distilled water.

Fill the burette up again to the 0.0 cm<sup>3</sup> mark with the solution **A** of sodium thiosulphate. Repeat Experiment 1 using solution **C** of potassium iodate instead of solution **B**.

Record your burette readings in the table and complete the table.

*Table of results*

| burette readings/cm <sup>3</sup> | Experiment 1 | Experiment 2 |
|----------------------------------|--------------|--------------|
| final reading                    |              |              |
| initial reading                  |              |              |
| difference                       |              |              |

[6]

(a) Describe the appearance of the mixture in the conical flask before solution **A** was added.

.....[1]

(b) How did the colour of the solution in the flask change when 2.0 cm<sup>3</sup> of starch was added?

From ..... to .....[2]



The reaction of the mixture of potassium iodate(V), sulphuric acid and potassium iodide in the flask produces iodine. Sodium thiosulphate then reacts with the iodine.

(c) (i) In which Experiment was the greatest volume of aqueous sodium thiosulphate used?

.....[1]

(ii) Compare the volumes of sodium thiosulphate used in Experiments 1 and 2.

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

(iii) Suggest an explanation for the difference in the volumes.

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

(iv) Predict the volume of solution **A** which would be needed to react completely if Experiment 1 was repeated with 20.0 cm<sup>3</sup> of the solution of potassium iodate. Explain your prediction.

volume of solution **A** .....

explanation .....

.....[3]

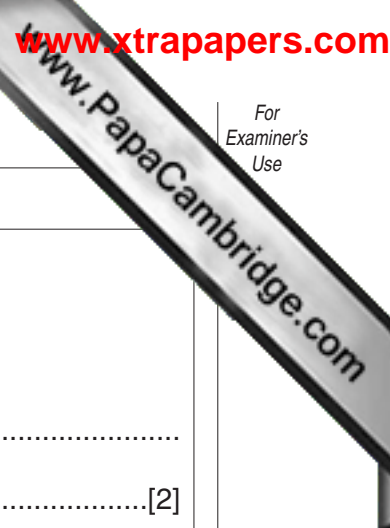
(d) What is the purpose of the starch?

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

2 You are provided with a mixture of two solid compounds, **D** and **E**. **D** is soluble in water and **E** is insoluble.

Carry out the following tests on **D** and **E**, recording **all** of your observations in the table. Do **not** write any conclusions in the table.

| tests  | observations                                     |
|--|--|
| <p><b>(a)</b> By using a spatula place about half of the mixture of <b>D</b> and <b>E</b> in a test-tube. Heat the mixture gently then strongly.</p>   | <p>.....<br/>.....[2]</p>                        |
| <p><b>(b)</b> Add the rest of the mixture of <b>D</b> and <b>E</b> to 10 cm<sup>3</sup> of distilled water in a boiling tube. Stopper the tube and shake for 1 minute. Filter the mixture. Keep the filtrate and the residue.</p>  | <p>filtrate .....<br/>residue .....[2]</p>       |
| <i>tests on residue</i>  |  |
| <p><b>(c) (i)</b> By using a spatula transfer the residue from the filter paper in to a test-tube. Carefully add about 3 cm<sup>3</sup> of dilute sulphuric acid. Test the gas with limewater.</p>   | <p>.....<br/>.....<br/>.....[3]</p>              |
| <p><b>(ii)</b> Pour about half of the liquid from the reaction in <b>(c)(i)</b> into a clean test-tube. By using a teat pipette add drops of aqueous ammonia until a change occurs on shaking.</p> <p>Add excess aqueous ammonia to fill the test-tube. Shake the mixture.</p> | <p>.....<br/>.....[2]<br/>.....<br/>.....[2]</p> |



| tests   | observations  |
|---|---|
| <p style="text-align: center;"><i>tests on the filtrate</i></p> <p><b>(d)</b> Divide the filtrate from <b>(b)</b> into three approximately equal portions.</p> <p><b>(i)</b> To the first portion add drops of aqueous sodium hydroxide, a little at a time, with shaking.</p> <p style="padding-left: 40px;">Add excess aqueous sodium hydroxide.</p> <p><b>(ii)</b> To the second portion add excess aqueous ammonia, a little at a time.</p> <p><b>(iii)</b> To the third portion add a few drops of dilute hydrochloric acid and aqueous barium chloride.</p> | <p>.....</p> <p>.....[2]</p> <p>.....[1]</p> <p>.....</p> <p>.....</p> <p>.....[3]</p> <p>.....</p> <p>.....[1]</p> |

**(e)** What conclusions can you draw about the identity of solid **D**?

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

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

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





## NOTES FOR USE IN QUALITATIVE ANALYSIS

## Tests for anions

| <i>anion</i>                                     | <i>test</i>  | <i>test result</i>                     |
|--|--|--|
| carbonate ( $\text{CO}_3^{2-}$ )                 | add dilute acid  | effervescence, carbon dioxide produced |
| chloride ( $\text{Cl}^-$ )<br>[in solution]      | acidify with dilute nitric acid, then add aqueous silver nitrate | white ppt.                             |
| iodide ( $\text{I}^-$ )<br>[in solution]         | acidify with dilute nitric acid, then aqueous lead(II) nitrate   | yellow ppt.                            |
| nitrate ( $\text{NO}_3^-$ )<br>[in solution]     | add aqueous sodium hydroxide then aluminium foil; warm carefully | ammonia produced                       |
| sulphate ( $\text{SO}_4^{2-}$ )<br>[in solution] | acidify with dilute nitric acid, then aqueous barium nitrate     | white ppt.                             |

## Tests for aqueous cations

| <i>cation</i>                  | <i>effect of aqueous sodium hydroxide</i>                  | <i>effect of aqueous ammonia</i>                               |
|--------------------------------|--|--|
| aluminium ( $\text{Al}^{3+}$ ) | white ppt., soluble in excess giving a colourless solution | white ppt., insoluble in excess                                |
| ammonium ( $\text{NH}_4^+$ )   | ammonia produced on warming                                | —  |
| calcium ( $\text{Ca}^{2+}$ )   | white ppt., insoluble in excess                            | no ppt., or very slight white ppt.                             |
| copper ( $\text{Cu}^{2+}$ )    | light blue ppt., insoluble in excess                       | light blue ppt., soluble in excess giving a dark blue solution |
| iron(II) ( $\text{Fe}^{2+}$ )  | green ppt., insoluble in excess                            | green ppt., insoluble in excess                                |
| iron(III) ( $\text{Fe}^{3+}$ ) | red-brown ppt., insoluble in excess                        | red-brown ppt., insoluble in excess                            |
| zinc ( $\text{Zn}^{2+}$ )      | white ppt., soluble in excess giving a colourless solution | white ppt., soluble in excess giving a colourless solution     |

## Tests for gases

| <i>gas</i>                       | <i>test and test results</i>     |
|----------------------------------|----------------------------------|
| ammonia ( $\text{NH}_3$ )        | turns damp red litmus paper blue |
| carbon dioxide ( $\text{CO}_2$ ) | turns limewater milky            |
| chlorine ( $\text{Cl}_2$ )       | bleaches damp litmus paper       |
| hydrogen ( $\text{H}_2$ )        | “pops” with a lighted splint     |
| oxygen ( $\text{O}_2$ )          | relights a glowing splint        |