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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	
1	
2	
TOTAL	

- 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 cm³ mark with the solution **A** of sodium thiosulphate.

By using a measuring cylinder, pour 10 cm³ of the solution **B** of potassium iodate into the conical flask provided.

Add 10 cm³ of dilute sulphuric acid to the flask followed by about 20 cm³ 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 cm³ 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 cm³ 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 ³	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 cm³ 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 cm³ 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>(a) By using a spatula place about half of the mixture of D and E in a test-tube. Heat the mixture gently then strongly.</p>	<p>.....[2]</p>
<p>(b) Add the rest of the mixture of D and E to 10 cm³ 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 residue[2]</p>
<i>tests on residue</i>	
<p>(c) (i) By using a spatula transfer the residue from the filter paper in to a test-tube. Carefully add about 3 cm³ of dilute sulphuric acid. Test the gas with limewater.</p>	<p>.....[3]</p>
<p>(ii) Pour about half of the liquid from the reaction in (c)(i) 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>.....[2][2]</p>

tests	observations
<p style="text-align: center;"><i>tests on the filtrate</i></p> <p>(d) Divide the filtrate from (b) into three approximately equal portions.</p> <p>(i) 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>(ii) To the second portion add excess aqueous ammonia, a little at a time.</p> <p>(iii) 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 (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
iodide (I^-) [in solution]	acidify with dilute nitric acid, then aqueous lead(II) nitrate	yellow ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulphate (SO_4^{2-}) [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 (Al^{3+})	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
ammonium (NH_4^+)	ammonia produced on warming	—
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt., or very slight white ppt.
copper (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (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 (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	“pops” with a lighted splint
oxygen (O_2)	relights a glowing splint