UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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|---|---|
| CANDIDATE NAME | |
| CENTRE NUMBER | |
| CANDIDATE NUMBER | |

*4238227109*

**CHEMISTRY** **0620/52**

Paper 5 Practical Test **October/November 2011**

**1 hour 15 minutes**

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Practical notes are provided on page 8.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| Total | |

This document consists of **6** printed pages and **2** blank pages.

**1** You are going to investigate what happens when iodine reacts with two different solutions of sodium thiosulfate, **F** and **G**.

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

**Instructions**
You are going to carry out two experiments.

**(a)** *Experiment 1*

Fill the burette with the aqueous sodium thiosulfate **F** provided to the 0.0 $cm^3$ mark.

Using a measuring cylinder, pour 20 $cm^3$ of the aqueous potassium iodate into a conical flask. Add 1 g of potassium iodide (an excess) and 5 $cm^3$ of the dilute sulfuric acid provided to the flask and shake the mixture. These chemicals react to form iodine.

Add the sodium thiosulfate from the burette 1 $cm^3$ at a time while shaking the flask. When the colour of the mixture is pale yellow add 2 $cm^3$ of starch solution to the flask. Continue to add sodium thiosulfate solution until the colour changes. Record, in the table, the volume of sodium thiosulfate solution added.

| | |
|---|---|
| final volume / $cm^3$ | |
| initial volume / $cm^3$ | |
| difference / $cm^3$ | |

[3]

**(b)** *Experiment 2*

Empty the burette and rinse with the solution **G** of sodium thiosulfate.
Fill the burette with the aqueous sodium thiosulfate **G** to the 0.0 $cm^3$ mark.
Empty the conical flask and rinse it with distilled water.

Repeat Experiment 1 using solution **G** instead of solution **F**.
Record, in the table, the volume of sodium thiosulfate solution added.

| | |
|---|---|
| final volume / $cm^3$ | |
| initial volume / $cm^3$ | |
| difference / $cm^3$ | |

[3]

**(c)** What was the colour of the mixture in the flask before the sodium thiosulfate solution was added?

..... [1]

**(d)** The final volume reading was taken when the colour of the mixture in the flask changed

from …… to ……..… [2]

**(e)** Suggest the purpose of the starch in the experiments.

..... [1]

**(f)** **(i)** In which Experiment was the greater volume of sodium thiosulfate solution used?

..... [1]

**(ii)** Compare the volumes of sodium thiosulfate solution used in Experiments 1 and 2.

..... [1]

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

.....

.....

..... [2]

**(g)** If Experiment 1 was repeated using 10 $cm^3$ of aqueous potassium iodate, what volume of solution **F** would be used? Explain your answer.

.....

..... [2]

**(h)** **(i)** State **two** sources of error in the Experiments.

1. .....

2. ..... [2]

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

1. .....

2. ..... [2]

[Total: 20]

**2** You are provided with two different liquids, **H** and **J**.
Carry out the following tests on each liquid, recording all of your observations in the table.
Conclusions must **not** be written in the table.

| tests | observations |
|---|---|
| **(a) (i)** Pour 1 $cm^3$ of liquid **H** into a test-tube. Describe the appearance and smell of liquid **H**. | ..... [1] |
| Test the pH of liquid **H**. | ..... [1] |
| **(ii)** Pour 1 $cm^3$ of liquid **J** into a test-tube. Describe the colour and smell of liquid **J**. | ..... [2] |
| Add 1 $cm^3$ of distilled water to the test-tube and shake the contents. Insert a piece of pH indicator paper so that it touches the bottom of the test-tube. | .....<br>..... [2] |
| **(b)** To about 1 $cm^3$ of liquid **H** add about 1 $cm^3$ of dilute hydrochloric acid and then aqueous barium chloride. | ..... [1] |
| **(c) (i)** To about 1 $cm^3$ of liquid **H**, add about 1 $cm^3$ of aqueous sodium hydroxide. | ..... [2] |
| Heat the mixture gently until no further change is observed. | ..... [1] |
| **(ii)** To about 1 $cm^3$ of liquid **H**, add about 1 $cm^3$ of aqueous ammonia solution. | ..... |
| Now add excess aqueous ammonia solution. | ..... [3] |
| **(d) (i)** Using a teat pipette, transfer a few drops of liquid **H** to a dry watch glass. Touch the liquid with a lighted splint. | ..... [1] |
| **(ii)** Repeat test **(d)(i)** using liquid **J**. | .....<br>..... [2] |

**(e)** What conclusions can you draw about liquid **H**?

.....

..... [2]

**(f)** What conclusions can you draw about liquid **J**?

.....

.....

..... [2]

[Total: 20]

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## NOTES FOR USE IN QUALITATIVE ANALYSIS

### Test for anions

| *anion* | *test* | *test result* |
|---|---|---|
| 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 add aqueous silver nitrate | yellow ppt. |
| nitrate ($NO_3^-$) [in solution] | add aqueous sodium hydroxide then aluminium foil; warm carefully | ammonia produced |
| sulfate ($SO_4^{2-}$) [in solution] | acidify with dilute nitric acid, then aqueous barium nitrate | white ppt. |

### Test for aqueous cations

| *cation* | *effect of aqueous sodium hydroxide* | *effect of aqueous ammonia* |
|---|---|---|
| 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 |

### Test for gases

| *gas* | *test and test results* |
|---|---|
| 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 |