UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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

*7326112403*

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

Paper 5 Practical Test **May/June 2013**

**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.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
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 | |
|---|---|
| Total | |

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

**1** You are going to investigate the reaction between solution **A**, aqueous pot
manganate(VII), and two different solutions, **B** and **C**, of an acidic solution of a sodium

**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 solution **A** of potassium manganate(VII) to the 0.0 $cm^3$ mark.

Using a measuring cylinder, pour 25 $cm^3$ of solution **B** into the conical flask.
Place the flask on a tripod and gauze and heat the mixture in the flask to about 80 °C.

Remove the flask from the tripod and place it on the white tile under the burette. Slowly add 1 $cm^3$ of the solution **A** to the flask, with shaking. Continue to add solution **A** to the flask until the mixture just turns permanently pink. Record the burette reading in the table and complete the table.
Pour away the contents of the conical flask and rinse the flask with distilled water.

| | |
|---|---|
| final burette reading / $cm^3$ | |
| initial burette reading / $cm^3$ | |
| difference / $cm^3$ | |

[3]

**(b)** *Experiment 2*

Refill the burette with the solution **A** of potassium manganate(VII).

Using a measuring cylinder, pour 25 $cm^3$ of solution **C** into the conical flask. Heat the mixture in the flask to about 80 °C.

Remove the flask from the tripod and place it on the white tile under the burette. Slowly add 1 $cm^3$ of the solution **A** to the flask, with shaking. Continue to add solution **A** to the flask until the mixture just turns permanently pink. Record the burette readings in the table and complete the table.

| | |
|---|---|
| final burette reading / $cm^3$ | |
| initial burette reading / $cm^3$ | |
| difference / $cm^3$ | |

[3]

**(c) (i)** Suggest why the mixture in the flask is heated before adding the pot manganate(VII) solution.

..... [1]

**(ii)** What colour change was observed when potassium manganate(VII) solution was added to the flask in Experiment 1?

from ..... to ..... [2]

**(iii)** Why is an indicator not added to the flask?

..... [1]

**(d) (i)** In which experiment was the greater volume of potassium manganate(VII) solution used?

..... [1]

**(ii)** Compare the volumes of potassium manganate(VII) used in Experiments 1 and 2.

..... [1]

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

.....

.....

..... [2]

**(e)** If Experiment 2 was repeated using 12.5 $cm^3$ of solution **C**, what volume of potassium manganate(VII) solution would be used? Explain your answer.

.....

..... [3]

**(f)** A redox reaction occurs when potassium manganate(VII) reacts with solutions **B** and **C**. Explain the term *redox reaction*.

.....

..... [2]

**(g)** Give **one** advantage and **one** disadvantage of using a measuring cylinder for solution **C**.

advantage .....

disadvantage ..... [2]

[Total: 21]

**2** You are provided with a mixture of two solids, **R** and **S**.
Solid **R** is water-soluble and solid **S** is insoluble.
Carry out the following tests on the mixture, recording all of your observations in the table.
Conclusions must not be written in the table.

| tests | observations |
|---|---|
| Add about 15 $cm^3$ of distilled water to the mixture in a boiling tube.<br>Shake the boiling tube for one minute.<br><br>Filter the contents of the boiling tube, keeping the filtrate and residue for the following tests.<br>Divide the filtrate into five test-tubes. | ..... [1] |
| <u>tests on the filtrate</u><br><br>**(a)** Use pH indicator paper to measure the pH of the first portion of the filtrate. | ..... [1] |
| **(b) (i)** Add several drops of aqueous sodium hydroxide to the second portion of the solution and shake the test-tube. Now add a large excess of aqueous sodium hydroxide.<br><br>**(ii)** Using the third portion of solution, repeat test **(b)(i)** using aqueous ammonia instead of aqueous sodium hydroxide. | .....<br>..... [2]<br><br>.....<br>..... [2] |
| **(c)** Add about 1 $cm^3$ of dilute nitric acid to the fourth portion of the solution followed by aqueous silver nitrate. | ..... [1] |
| **(d)** To the fifth portion of the solution add about 1 $cm^3$ of dilute nitric acid followed by aqueous barium nitrate. | ..... [2] |

| tests | observations |
|---|---|
| <u>tests on the residue</u><br><br>Use a spatula to transfer some of the residue into the bottom of a test-tube.<br><br>**(e)** To the residue, add about 2 $cm^3$ of dilute hydrochloric acid.<br><br>Test the gas given off.<br><br>Now add a large excess of aqueous sodium hydroxide to the mixture. | .....<br><br>.....<br><br>..... [3]<br><br>..... [2] |

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

.....

..... [2]

**(g)** Name the gas given off in test **(e)**.

..... [1]

**(h)** Identify solid **S**.

..... [2]

[Total: 19]

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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 |