UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*5551322464*

**CHEMISTRY** **5070/03**

Paper 3 Practical Test **May/June 2008**

**1 hour 30 minutes**

Candidates answer on the Question Paper.

Additional Materials: As listed in the Instructions to Supervisors

**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 work.
Do **not** use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You should show the essential steps in any calculations and record experimental results in the spaces provided on the question paper.
Qualitative Analysis Notes are printed 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** **P** is a solution containing either hydrochloric acid (HC*l*) or sulphuric acid ($H_2SO_4$). You are to identify the acid and determine its concentration by titrating it against solution **Q**, which is 0.100 mol/$dm^3$ sodium hydroxide.

*For Examiner's Use*

**(a)** Identification of the acid in **P**

Carry out the following tests on solution **P** and record your observations in the table.

| test no. | test | observations |
|---|---|---|
| **1** | To a portion of **P**, add an equal volume of aqueous lead(II) nitrate. | |
| **2** | To a portion of **P**, add an equal volume of aqueous silver nitrate. | |
| **3** | To a portion of **P**, add an equal volume of aqueous barium nitrate. | |

The acid present in **P** is .....[4]

**(b)** Determination of the concentration of the acid in **P**

*For Examiner's Use*

Put **P** into the burette.
Pipette a 25.0 $cm^3$ (or 20.0 $cm^3$) portion of **Q** into a flask and titrate with **P**, using the indicator provided.

Record your results in the table, repeating the titration as many times as you consider necessary to achieve consistent results.

**Results**

*Burette readings*

| titration number | 1 | 2 | |
|---|---|---|---|
| final reading / $cm^3$ | | | |
| initial reading / $cm^3$ | | | |
| volume of **P** used / $cm^3$ | | | |
| best titration results (✓) | | | |

**Summary**

Tick (✓) the best titration results.

Using these results, the average volume of **P** required was .....$cm^3$.

Volume of solution **Q** used was .....$cm^3$.

[12]

**(c)** **Q** is 0.100 $mol/dm^3$ sodium hydroxide.
Using your results from **(b)**, calculate the concentration, in $mol/dm^3$, of the acid in **P**.

Concentration of acid in **P**..... $mol/dm^3$. [2]

[Total: 18]





**[Turn over**

**2** You are provided with three solutions **S**, **T** and **U**. Carry out the following tests and record your observations in the table.

*For Examiner's Use*

| test no. | test | observations with solution **S** |
|---|---|---|
| **1** | **(a)** To a portion of the solution, add aqueous sodium hydroxide until a change is seen.<br><br>**(b)** Add excess aqueous sodium hydroxide to the mixture from **(a)**. | |
| **2** | **(a)** To a portion of the solution, add aqueous ammonia until a change is seen.<br><br>**(b)** Add excess aqueous ammonia to the mixture from **(a)**. | |
| **3** | To a portion of the solution, add an equal volume of aqueous potassium iodide and allow the mixture to stand for a few minutes. | |
| **4** | To a portion of solution **S** and a portion of solution **T**, add an equal volume of aqueous barium nitrate and allow the mixture to stand for a few minutes. | |
| **5** | To a portion of solution **S** and a portion of solution **T**, add an equal volume of aqueous silver nitrate and allow the mixture to stand for a few minutes. | |

*For Examiner's Use*

| observations with solution **T** | observations with solution **U** | test no. |
|---|---|---|
| | | **1** |
| | | **2** |
| | | **3** |
| | | **4** |
| | | **5** |

[20]

**Conclusion**

Give the formulae of the compounds present in solutions **S** and **T**.

The formula of the compound present in solution **S** is .....

The formula of the compound present in solution **T** is .....

[2]

[Total: 22]

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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 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 add 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(II) ($Cu^{2+}$) | 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 result* |
|---|---|
| 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 |
| sulphur dioxide ($SO_2$) | turns aqueous potassium dichromate(VI) from orange to green |