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| Centre Number | Candidate Number | Name |
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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY

0620/05

Paper 5 Practical Test

May/June 2005

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

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



- 1 You are going to investigate a mixture of calcium hydroxide and water.

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

Instructions

Shake the mixture of calcium hydroxide and water provided in the bottle.

After one minute of shaking, filter the mixture into a beaker.

Start Experiment 1 when enough solution has been collected. Continue to filter the mixture.

Experiment 1

By using a measuring cylinder, measure 25 cm^3 of the solution (filtrate) into the conical flask provided.

Carry out the titration as follows.

Fill the burette to the 0.0 cm^3 mark with the solution **M** of hydrochloric acid.

Add 3 or 4 drops of phenolphthalein to the flask.

Add solution **M** slowly to the flask until the colour just disappears. Record the burette readings in the table. Pour the solution away and rinse the conical flask.

Experiment 2

Empty the contents of the burette down the sink.

Rinse the burette with the solution **N** of hydrochloric acid.

Repeat Experiment 1 using the solution **N** of hydrochloric acid.

Record your results in the table.

Normally you would be required to carry out repeat titrations. However, owing to time considerations you are only required to carry out **one** titration for each experiment

Table of results

| burette readings/ cm^3 | Experiment 1 | Experiment 2 |
|---------------------------------|--------------|--------------|
| final reading | | |
| initial reading | | |
| difference | | |

[6]

- (a) Describe the appearance of the mixture of calcium hydroxide and water.

..... [1]

(b) How did the colour of the solution in the flask change?

from to [2]

(c) What type of chemical reaction occurs when hydrochloric acid reacts with calcium hydroxide?

..... [1]

(d) (i) In which experiment was the greater volume of hydrochloric acid used?

..... [1]

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

.....

..... [2]

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

.....

..... [2]

(e) Predict the volume of hydrochloric acid **M** which would be needed to react completely if Experiment 1 was repeated with 50 cm³ of calcium hydroxide solution and explain your answer.

volume of solution

explanation

..... [3]

(f) Suggest **one** change you could make to the **apparatus** used in the experiments to obtain more accurate results.

.....

..... [1]

(g) From the list below choose the correct word to complete the sentence.

not

slightly

very

Calcium hydroxide is soluble in water. [1]

2 You are provided with liquid **A**.

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

| tests | observations |
|--|--|
| <p>(a) Describe the appearance and smell of A.</p> | <p>..... [2]</p> |
| <p>(b) Test the pH of the solution using indicator paper.</p> | <p>colour</p> <p>pH [2]</p> |
| <p>(c) Divide the liquid into five test-tubes.</p> <p>(i) To the first portion, add the piece of magnesium ribbon provided. Note any observations and test the gas.</p> <p>(ii) To the second portion of liquid A, add slowly a spatula measure of anhydrous sodium carbonate. Test the gas with limewater.</p> <p>(iii) To the third portion of liquid A, add a spatula measure of solid B. Boil gently for 2 minutes. Note any observations.</p> <p>By using a teat pipette transfer the solution to another test tube. To this solution add excess aqueous ammonia.</p> | <p>..... [3]</p> <p>..... [2]</p> <p>..... [2]</p> |

| tests | observations |
|---|----------------------------|
| <p>(iv) To the fourth portion of the liquid add about 1 cm³ of ethanol. Ask your supervisor to add a few drops of concentrated sulphuric acid to the mixture. Boil the mixture gently. Pour the mixture into a beaker half full of water. Note your observations.</p> | <p>..... [2]</p> |
| <p>(v) To the fifth portion of liquid A add a few drops of dilute sulphuric acid and about 1 cm³ of potassium dichromate solution. Boil gently and note any observation.</p> | <p>..... [1]</p> |

(d) (i) Name the gas given off in test **(c)(i)**.

..... [1]

(ii) Name the gas given off in test **(c)(ii)**.

..... [1]

(e) Use your observations in test **(c)(iii)** to say what ion is present in solid **B**.

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

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

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

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NOTES FOR USE IN QUALITATIVE ANALYSIS

Test 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. |

Test 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., 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

| <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 |

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