UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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

*1146292889*

**CHEMISTRY** **0620/51**

Paper 5 Practical Test **October/November 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.
Practical notes are provided on page 8.
You may lose marks if you do not show your working or if you do not use appropriate units.

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 **7** printed pages and **1** blank page.


© UCLES 2013

*For Examiner's Use*

**1** You are going to investigate what happens when aqueous sodium hydroxide reacts with acid **K**.

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

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

**(a)** *Experiment 1*

Use a measuring cylinder to pour 25 $cm^3$ of acid **K** into a conical flask. Add five drops of phenolphthalein to the flask.

Fill the burette with the aqueous sodium hydroxide to the 0.0 $cm^3$ mark.
Slowly add the aqueous sodium hydroxide to acid **K** in the flask and shake the mixture.
Continue to add aqueous sodium hydroxide to the flask until the solution shows a permanent colour change.
Measure and record the volume in the table. Complete the table.
Pour the solution away and rinse the conical flask.

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

[3]

**(b)** *Experiment 2*

Use a measuring cylinder to pour 50 $cm^3$ of acid **K** into a conical flask. Add the 0.3 g of powdered calcium carbonate to the flask and shake the flask until no further reaction is observed.
Add five drops of phenolphthalein to the mixture in the flask.

Fill the burette with aqueous sodium hydroxide and record the burette reading. Slowly add aqueous sodium hydroxide from the burette to the flask and shake the mixture. Continue to add aqueous sodium hydroxide to the flask until the solution shows a permanent colour change.
Measure and record the volume in the table. Complete the table.

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

[3]

© UCLES 2013

*For Examiner's Use*

**(c)** What colour change was observed after the sodium hydroxide solution was added to the flask?

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

**(d)** What type of chemical reaction occurs when acid **K** reacts with sodium hydroxide?

..... [1]

**(e)** If Experiment 1 was repeated using 50 $cm^3$ of acid **K**, what volume of sodium hydroxide would be required to change the colour of the indicator?

..... [2]

**(f)** **(i)** What is the effect of adding 0.3 g of powdered calcium carbonate to acid **K**?

.....

..... [2]

**(ii)** Use your answers from **(b)** and **(e)** to work out the difference in the volume of sodium hydroxide added when 0.3 g of calcium carbonate is mixed with 50 $cm^3$ of acid **K** in Experiment 2.

.....

..... [2]

**(iii)** Estimate the mass of calcium carbonate that would need to be added to 50 $cm^3$ of acid **K** to require 0.0 $cm^3$ of sodium hydroxide.

[1]

**(g)** What would be the effect on the results if the solutions of acid **K** were warmed before adding the sodium hydroxide? Give a reason for your answer.

effect on results .....

reason ..... [2]

© UCLES 2013



**[Turn over**

*For Examiner's Use*

**(h)** Suggest the advantage, if any, of

**(i)** using a pipette to measure the volume of acid **K**.

.....

..... [2]

**(ii)** using a polystyrene cup instead of a flask.

.....

..... [2]

[Total: 22]

© UCLES 2013

*For Examiner's Use*

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

| tests | observations |
|---|---|
| <u>tests on liquid **L**</u><br><br>**(a)** Describe the appearance of liquid **L**. | ..... [1] |
| Divide liquid **L** into five equal portions in separate test-tubes.<br><br>**(b) (i)** Add the first portion of liquid **L** to the test-tube containing the iodine crystal. Stopper the test-tube and shake the contents.<br><br>Now add an equal volume of liquid **M** to the test-tube, stopper and shake the contents. Leave to stand for five minutes and continue to part **(c)**.<br><br>**(ii)** After five minutes, remove most of the top layer using a teat pipette and add ethanol to the liquid which you have removed. Stopper the test-tube and shake the contents. Leave to stand for five minutes. | ..... [1]<br><br>.....<br><br>..... [2]<br><br>.....<br><br>..... [2] |
| **(c)** To the second portion of liquid **L**, add a few drops of dilute nitric acid and about 1 $cm^3$ of barium nitrate solution. | ..... [1] |
| **(d)** To the third portion of liquid **L**, add a few drops of dilute nitric acid and about 1 $cm^3$ of silver nitrate solution. | ..... [2] |
| **(e)** To the fourth portion of liquid **L**, add about 1 $cm^3$ of aqueous copper sulfate, shake and leave to stand for five minutes. | .....<br><br>..... [2] |
| **(f)** To the fifth portion of liquid **L**, add about 2 $cm^3$ of aqueous hydrogen peroxide.<br>Now add about 1 $cm^3$ of starch solution. | .....<br><br>..... [3] |

© UCLES 2013

**[Turn over**

*For Examiner's Use*

**(g)** Why does the colour of liquid **L** change in test **(b)(i)**?

.....

..... [1]

**(h)** What conclusions can you draw about liquid **M** from test **(b)(i)**?

.....

..... [2]

**(i)** What conclusions can you draw about liquid **L**?

.....

.....

..... [1]

[Total: 18]

© UCLES 2013

**BLANK PAGE**

© UCLES 2013

## 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 |

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2013