Cambridge IGCSE

**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

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

*7059295991*

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

Paper 5 Practical Test **February/March 2018**

**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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, 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.
Notes for use in qualitative analysis are provided on pages 11 and 12.

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 | |

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **9** printed pages and **3** blank pages.


© UCLES 2018

CAMBRIDGE International Examinations

[Turn over

**1** You are going to investigate the reaction between dilute hydrochloric acid and an aqueous solution of sodium carbonate labelled solution **L**.

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

**Instructions**
You are going to do three experiments.

**(a)** *Experiment 1*

- Use the measuring cylinder to pour 25 $cm^3$ of solution **L** into the conical flask.
- Add ten drops of thymolphthalein indicator to the conical flask.
- Fill the burette up to the 0.0 $cm^3$ mark with the dilute hydrochloric acid.
- Add dilute hydrochloric acid from the burette to the conical flask, 1.0 $cm^3$ at a time, while swirling the conical flask, until the solution just changes to colourless.
- Record the burette readings in the table and complete the table.

**Keep your solution from Experiment 1 to use in Experiment 2.**

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

[2]

**(b)** *Experiment 2*

- Now add ten drops of methyl orange indicator to the solution in the conical flask from Experiment 1.
- Record the initial burette reading in the table.
- Add dilute hydrochloric acid from the burette to the conical flask, 1.0 $cm^3$ at a time, while swirling the conical flask, until the solution just changes colour.
- Record the final burette reading in the table and complete the table.

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

[2]

© UCLES 2018

**(c)** *Experiment 3*

- Empty the conical flask and rinse it with distilled water.
- Repeat Experiment 1, using methyl orange indicator instead of thymolphthalein indicator and adding dilute hydrochloric acid from the burette to the conical flask until the solution just changes colour.
- Record the burette readings in the table and complete the table.

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

[1]

**(d) (i)** What colour change was observed in the conical flask in Experiment 3?

from ..... to .....
[1]

**(ii)** Apart from the colour change, what was observed in the conical flask in Experiment 3?

..... [1]

**(e)** Complete the sentence.

Experiment ..... needed the largest volume of dilute hydrochloric acid to change the colour of the indicator. [1]

**(f)** Give the name of a more accurate piece of apparatus for measuring the volume of solution **L**.

..... [1]

**(g)** What would be the effect on the results if solution **L** were warmed before adding the dilute hydrochloric acid? Give a reason for your answer.

effect on the results .....

reason .....
[2]

© UCLES 2018

**[Turn over**

**(h) (i)** Determine the simplest whole number ratio of volumes of dilute hydrochloric acid used in Experiments 1 and 3.

..... [1]

**(ii)** Suggest why the volumes of dilute hydrochloric acid used in Experiments 1 and 3 are different.

..... [1]

**(i)** Suggest why Universal Indicator **cannot** be used in these experiments.

.....

..... [1]

**(j)** Suggest how the reliability of the results could be checked.

.....

..... [2]

[Total:16]

© UCLES 2018

**2** You are provided with two substances, solution **M** and solid **N**.
Do the following tests on the substances, recording all of your observations at each stage.

**tests on solution M**

Divide solution **M** into five approximately equal portions in five test-tubes.

**(a) (i)** Describe the appearance of solution **M**.

..... [1]

**(ii)** Test the pH of the first portion of solution **M**.

pH = ..... [1]

**(b)** Add a few drops of dilute nitric acid and about 1 $cm^3$ of aqueous silver nitrate to the second portion of solution **M**.
Record your observations.

..... [1]

**(c)** Add a few drops of dilute nitric acid and about 1 $cm^3$ of aqueous barium nitrate to the third portion of solution **M**.
Record your observations.

..... [1]

**(d)** Add an excess of aqueous sodium hydroxide to the fourth portion of solution **M**.
Record your observations.

..... [2]

**Keep the fifth portion of solution M for the test on solid N in (i).**

**(e)** Identify solution **M**.

..... [3]

© UCLES 2018

**[Turn over**

**tests on solid N**

Divide solid **N** into three approximately equal portions in one hard glass test-tube and two test-tubes.

**(f)** Describe the appearance of solid **N**.

..... [1]

**(g)** Heat the first portion of solid **N** in the hard glass test-tube. Heat gently and then more strongly.
Test the gas produced.
Record your observations.

.....

.....

.....

..... [4]

**(h)** Add about 1 $cm^3$ of dilute hydrochloric acid to the second portion of solid **N** in a test-tube.
Carry out a flame test on the mixture.
Record the colour of the flame.

..... [1]

**(i)** Add the fifth portion of solution **M** to the third portion of solid **N** in a test-tube. Leave the solution to stand for about 5 minutes.
Record your observations.

..... [1]

**(j)** What conclusions can you draw about solid **N**?

.....

..... [2]

[Total:18]

© UCLES 2018

**3** Magnesium reacts with dilute sulfuric acid at room temperature to form hydrogen gas.

Plan an experiment to find the rate of reaction between magnesium ribbon and dilute sulfuric acid.

In your answer:
- include a diagram
- indicate how you could use the results obtained to find the rate of reaction.

You are provided with common laboratory apparatus, magnesium ribbon and dilute sulfuric acid.

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

[Total: 6]

**BLANK PAGE**

**BLANK PAGE**

© UCLES 2018

**BLANK PAGE**

**Notes for use in qualitative analysis**
**Tests 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. |
| bromide ($Br^-$) [in solution] | acidify with dilute nitric acid, then add aqueous silver nitrate | cream 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, then add aqueous barium nitrate | white ppt. |
| sulfite ($SO_3^{2-}$) | add dilute hydrochloric acid, warm gently and test for the presence of sulfur dioxide | sulfur dioxide produced will turn acidified aqueous potassium manganate(VII) from purple to colourless |

**Tests 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. |
| chromium(III) ($Cr^{3+}$) | green ppt., soluble in excess | grey-green ppt., insoluble in excess |
| 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 |

© UCLES 2018

**Tests 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 |
| sulfur dioxide ($SO_2$) | turns acidified aqueous potassium manganate(VII) from purple to colourless |

**Flame tests for metal ions**

| metal ion | flame colour |
|---|---|
| lithium ($Li^+$) | red |
| sodium ($Na^+$) | yellow |
| potassium ($K^+$) | lilac |
| copper(II) ($Cu^{2+}$) | blue-green |

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.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

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.