Cambridge IGCSE

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

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*9075832942*

**CHEMISTRY** **0620/53**

Paper 5 Practical Test **October/November 2019**

**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 7 and 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 | |
| 3 | |
| Total | |

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

This document consists of **8** printed pages.


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Cambridge Assessment International Education

[Turn over

**1** You are going to investigate the reaction between dilute hydrochloric acid and three different concentrations of aqueous sodium hydroxide, labelled **R**, **S** and **T**.

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

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

*Experiment 1*

- Fill the burette up to the 0.0 $cm^3$ mark with dilute hydrochloric acid.
- Use the measuring cylinder to pour 20 $cm^3$ of solution **R** into the conical flask.
- Add six drops of methyl orange indicator to the conical flask.
- 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 burette readings in the table.
- Empty the conical flask and rinse it with distilled water.

*Experiment 2*

- Repeat Experiment 1 using solution **S** instead of solution **R**.
- Record the burette readings in the table.

*Experiment 3*

- Repeat Experiment 1 using solution **T** instead of solution **R**.
- Record the burette readings in the table.

**(a)** Complete the table.

| burette reading / $cm^3$ | Experiment 1 using solution **R** | Experiment 2 using solution **S** | Experiment 3 using solution **T** |
|---|---|---|---|
| final burette reading | | | |
| initial burette reading | | | |
| volume used | | | |

[4]

**(b)** What colour change is observed in the conical flask at the end-point?

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

**(c)** Suggest why Universal Indicator is **not** a suitable indicator to use in these experiments.

.....

..... [1]

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**(d) (i)** Complete the sentences.

Experiment ..... needed the smallest volume of dilute hydrochloric acid to change the colour of the methyl orange indicator.

Experiment ..... needed the largest volume of dilute hydrochloric acid to change the colour of the methyl orange indicator.

[1]

**(ii)** Determine the simplest whole number ratio of volumes of dilute hydrochloric acid used in Experiments 1 and 2.

Experiment 1 ..... **:** ..... Experiment 2 [1]

**(iii)** Deduce the order of concentrations of the solutions of aqueous sodium hydroxide, **R**, **S** and **T**.

most concentrated .....

.....

least concentrated .....

[1]

**(e)** What would be the effect on the results, if any, if the solutions of aqueous sodium hydroxide were warmed before adding the dilute hydrochloric acid? Give a reason for your answer.

effect on the results .....

reason .....

[2]

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

.....

..... [2]

**(g)** Suggest a different method, **not** involving an indicator, of finding the order of concentrations of the solutions of aqueous sodium hydroxide, **R**, **S** and **T**.

.....

.....

..... [3]

[Total: 17]

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**[Turn over**

**2** You are provided with solid **U** and liquid **V**.
Do the following tests on solid **U** and liquid **V**, recording all of your observations at each stage.

**tests on solid U**

**(a)** Do a flame test on a small sample of solid **U**.
Record your observations.

..... [1]

Add the rest of solid **U** to about 10 $cm^3$ of distilled water in a boiling tube. Stopper the boiling tube and shake the mixture to dissolve solid **U** and form solution **U**.

**(b)** Describe the colour of solution **U**.

..... [1]

Divide solution **U** into three approximately equal portions in three test-tubes.

**(c) (i)** Add a few drops of aqueous sodium hydroxide to the first portion of solution **U**.
Record your observations.

..... [1]

**(ii)** Now add an excess of aqueous sodium hydroxide to this mixture.
Record your observations.

..... [1]

**(d) (i)** Add a few drops of aqueous ammonia to the second portion of solution **U**.
Record your observations.

..... [2]

**(ii)** Now add an excess of aqueous ammonia to this mixture.
Record your observations.

..... [1]

**(e)** Add a few drops of dilute nitric acid and about 1 $cm^3$ of aqueous barium nitrate to the third portion of solution **U**. Leave to stand for 5 minutes.
Record your observations.

..... [2]

**(f)** Solid **U** contains three different ions.

What conclusions can you draw about the ions present in solid **U**?

.....

..... [3]

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**tests on liquid V**

**(g)** Describe the appearance of liquid **V**.
Record your observations.

..... [1]

**(h)** Use a teat pipette to place a few drops of liquid **V** onto a watch-glass. Put the stopper back into the test-tube of liquid **V**. Use a lighted splint to touch the surface of liquid **V** carefully.
Record your observations.

..... [1]

**(i)** Use a spatula to transfer a small crystal of iodine carefully into the rest of liquid **V** in the stoppered test-tube. Put the stopper back into the test-tube and shake the test-tube.
Record your observations.

.....

..... [2]

**(j)** Draw **one** conclusion about liquid **V**.

..... [1]

[Total: 17]

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**[Turn over**

**3** Potassium nitrate and ammonium chloride are two salts. The energy change when they each dissolve in water is endothermic.

Plan an experiment to show which of these two salts produces the larger endothermic energy change per gram.

Your answer should include:
- any measurements you would take and record
- how the results could be used to draw a conclusion.

You are provided with potassium nitrate and ammonium chloride, distilled water and common laboratory apparatus.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

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**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 |

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**Tests 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 |
| 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 |

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