Cambridge Assessment International Education

# Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 7 1 2 4 9 8 4 1 7 5 *

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

Paper 5 Practical Test **October/November 2020**

**1 hour 15 minutes**

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

**INSTRUCTIONS**

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

**INFORMATION**

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].
- Notes for use in qualitative analysis are provided in the question paper.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| Total | |

This document has **12** pages. Blank pages are indicated.

IB20 11_0620_53/2RP

1 You are going to investigate the reaction between dilute ethanoic acid and two different solutions of sodium hydroxide labelled solution **A** and solution **B**.

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

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

**(a)** *Experiment 1*

- Rinse the burette with solution **A**.
- Fill the burette with solution **A**. Run some of solution **A** out of the burette so that the level of solution **A** is on the burette scale.
- Use the measuring cylinder to pour 25 $cm^3$ of dilute ethanoic acid into the conical flask.
- Add five drops of thymolphthalein indicator to the conical flask.
- Record the initial burette reading in the table.
- Slowly add solution **A** from the burette to the conical flask, while swirling the flask, until the solution just changes colour.
- Record the final burette reading in the table and complete the table.

| | Experiment 1 |
|---|---|
| final burette reading / $cm^3$ | |
| initial burette reading / $cm^3$ | |
| volume of solution **A** added / $cm^3$ | |

*Experiment 2*

- Empty the conical flask and rinse it with distilled water.
- Empty the burette and rinse it with distilled water.
- Rinse the burette with solution **B**.
- Fill the burette with solution **B**. Run some of solution **B** out of the burette so that the level of solution **B** is on the burette scale.
- Use the measuring cylinder to pour 25 $cm^3$ of dilute ethanoic acid into the conical flask.
- Add five drops of thymolphthalein indicator to the conical flask.
- Record the initial burette reading in the table.
- Slowly add solution **B** from the burette to the conical flask, while swirling the 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 / $cm^3$ | |
| volume of solution **B** added / $cm^3$ | |

[4]

**(b)** State the colour change observed in the conical flask in Experiment 2.

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

**(c)** Explain why universal indicator is **not** a suitable indicator to use in this titration.

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**(d)** **(i)** State which solution of sodium hydroxide, solution **A** or solution **B**, is the more concentrated. Explain your answer.

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**(ii)** State how many times more concentrated this solution of sodium hydroxide is compared to the other solution of sodium hydroxide.

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**(e)** Determine the volume of solution **B** that would be required if Experiment 2 was repeated with 10 $cm^3$ of dilute ethanoic acid.

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

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**(g)** A 25 $cm^3$ pipette can be used to measure the volume of a solution.

**(i)** Describe an advantage of using a 25 $cm^3$ pipette to measure the volume of the dilute ethanoic acid.

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**(ii)** Explain why a 25 $cm^3$ pipette could **not** be used to measure the volume of solution **A**.

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**(h)** **(i)** Explain why the burette was rinsed with distilled water in Experiment 2.

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**(ii)** Explain why the burette was then rinsed with solution **B**.

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**(iii)** State the effect that **not** rinsing the burette with solution **B** would have on the final burette reading.
Explain your answer.

effect .............................................................................................................................

explanation ....................................................................................................................

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[2]

[Total: 17]

**2** You are provided with two solids, solid **C** and solid **D**.
Do the following tests on solid **C** and solid **D**, recording all of your observations at each stage.

**tests on solid C**

**(a)** Describe the appearance of solid **C**.

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**(b)** Place about half of solid **C** in a hard-glass test-tube. Heat the solid gently and then strongly.
Record your observations.

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**(c)** Place the remaining half of solid **C** in a boiling tube. Add about 10 $cm^3$ of distilled water to the boiling tube. Stopper the boiling tube and shake it to dissolve solid **C** to form solution **C**.

Divide solution **C** into two approximately equal portions in two test-tubes.

**(i)** Add a few drops of universal indicator solution to the first portion of solution **C**.
Record your observations.

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**(ii)** Add a spatula measure of solid sodium hydrogencarbonate to the second portion of solution **C**.
Test any gas formed.
Record your observations.

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**(d)** What conclusions can you make about solid **C**?

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**tests on solid D**

Add solid **D** to about 10 $cm^3$ of distilled water in a boiling tube. Stopper the boiling tube and shake it to dissolve solid **D** to form solution **D**.
Divide solution **D** into four approximately equal portions in four test-tubes.

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

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

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**(f)** Add excess aqueous ammonia to the second portion of solution **D**.
Record your observations.

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**(g)** Add about 1 cm depth of dilute nitric acid and a few drops of aqueous silver nitrate to the third portion of solution **D**.
Record your observations.

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**(h)** Add about 1 cm depth of dilute nitric acid and a few drops of aqueous barium nitrate to the fourth portion of solution **D**.
Record your observations.

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**(i)** Identify solid **D**.

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[Total: 17]

**3** A toothpaste contains:

- sodium fluoride
- calcium carbonate
- silica
- mint flavouring.

Sodium fluoride and the mint flavouring are soluble in water.
Calcium carbonate and silica are insoluble in water.
Calcium carbonate reacts with dilute hydrochloric acid to form the soluble salt calcium chloride.

Plan an investigation to find the percentage by mass of silica in the toothpaste.

In your answer you should include how you will calculate the percentage by mass of silica in the toothpaste.

You have access to normal laboratory apparatus.

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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 |

**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 |