Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3616379926

CHEMISTRY **0620/63**

Paper 6 Alternative to Practical **May/June 2022**

1 hour

You must answer on the question paper.

No additional materials are needed.

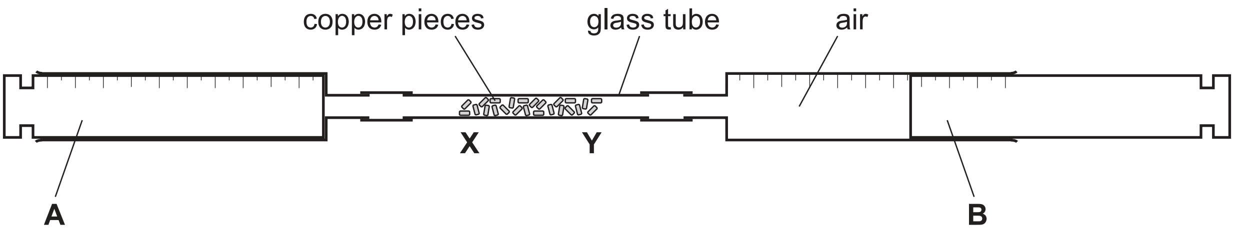
INSTRUCTIONS
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable 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 [ ].

This document has **12** pages. Any blank pages are indicated.

IB22 06_0620_63/3RP

1 The apparatus shown was used to determine the percentage of oxygen in a sample of air.



The glass tube was heated strongly at **X** while the sample of air was passed backwards and forwards over the copper pieces in the tube. The source of heat was gradually moved along the tube from **X** to **Y**.
During the experiment the copper pieces in the glass tube reacted with oxygen in the sample of air.

(a) Name the item of apparatus labelled **B**.

.... [1]

(b) Name the item of laboratory equipment that could be used to heat the glass tube strongly.

.... [1]

(c) The copper pieces at **Y** did not change colour when they were heated.

Suggest why the copper pieces at **Y** did **not** change colour.

....

.... [1]

(d) **(i)** The table shows the volume of air in each part of the apparatus at the start of the experiment.

part of apparatus	volume of air at start / cm^3
A	0
glass tube	8
B	94

Calculate the total volume of air in the apparatus at the start of the experiment.

total volume of air at start = ... cm^3 [1]

(ii) The table shows the volume of gas in each part of the apparatus at the end of the experiment.

part of apparatus	volume of gas at end / cm^3
A	0
glass tube	8
B	75

Calculate the percentage of oxygen in the sample of air.

percentage of oxygen = ... [1]

[Total: 5]

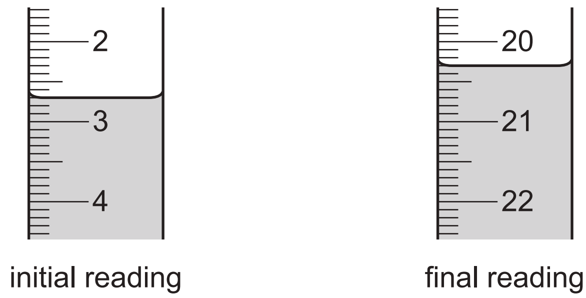
2 A student investigated the reaction between aqueous sodium hydroxide and two different solutions of dilute hydrochloric acid with different concentrations, labelled **Q** and **R**, using two different indicators.

Three experiments were done.

(a) *Experiment 1*

- A burette was filled with dilute hydrochloric acid **Q**. Some of the dilute hydrochloric acid was run out of the burette so that the level of the dilute hydrochloric acid was on the burette scale.
- Using a measuring cylinder, 25 cm^3 of aqueous sodium hydroxide was poured into a conical flask.
- Five drops of methyl orange indicator were added to the conical flask.
- The conical flask was placed on a white tile.
- Dilute hydrochloric acid was added slowly from the burette to the conical flask, while the flask was swirled, until the solution just changed colour.

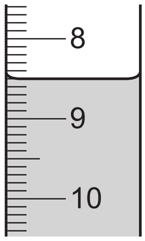
Use the burette diagrams to complete the table for Experiment 1.



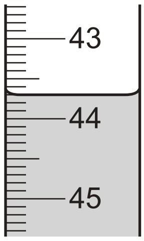
	Experiment 1
final burette reading / cm^3	
initial burette reading / cm^3	
volume of dilute hydrochloric acid **Q** added / cm^3	

Experiment 2
- The conical flask was emptied and rinsed with distilled water.
- The burette was rinsed with distilled water and then with dilute hydrochloric acid **R**.
- Experiment 1 was repeated using dilute hydrochloric acid **R** instead of dilute hydrochloric acid **Q**.

Use the burette diagrams to complete the table for Experiment 2.



initial reading

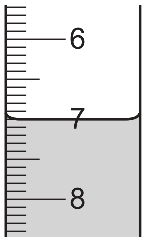


final reading

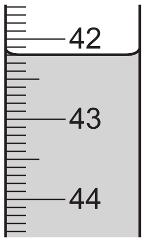
	Experiment 2
final burette reading / cm^3	
initial burette reading / cm^3	
volume of dilute hydrochloric acid **R** added / cm^3	

Experiment 3
- The conical flask was emptied and rinsed with distilled water.
- Experiment 2 was repeated using thymolphthalein indicator instead of methyl orange indicator.

Use the burette diagrams to complete the table for Experiment 3.



initial reading



final reading

	Experiment 3
final burette reading / cm^3	
initial burette reading / cm^3	
volume of dilute hydrochloric acid **R** added / cm^3	

[5]

(b) Determine the simplest whole number ratio of the volumes of dilute hydrochloric acid **R** used in Experiment 2 and Experiment 3.

.... [1]

(c) Deduce the volume of dilute hydrochloric acid **Q** needed when Experiment 1 is repeated using thymolphthalein indicator instead of methyl orange indicator.

volume of hydrochloric acid **Q** = ... [2]

(d) Compare the concentration of dilute hydrochloric acid **Q** used in Experiment 1 to the concentration of dilute hydrochloric acid **R** used in Experiment 2.
Explain your answer.

....

....

....

.... [3]

(e) State how the results change, if at all, if the aqueous sodium hydroxide is warmed before adding the dilute hydrochloric acid.
Give a reason for your answer.

effect on results ....

reason ....
[2]

(f) State the advantage of using a pipette instead of the measuring cylinder in these experiments.

.... [1]

(g) Explain why a white tile is used in these experiments.

.... [1]

(h) At the start of Experiment 2 the burette was rinsed with distilled water and then with dilute hydrochloric acid **R**.

(i) State what was removed from the burette when it was rinsed with distilled water.

.... [1]

(ii) State what was removed from the burette when it was rinsed with dilute hydrochloric acid **R**.

....

.... [1]

(iii) Explain why the burette does **not** need to be rinsed at the start of Experiment 3.

.... [1]

(i) After the burette was filled with dilute hydrochloric acid at the start of Experiment 1, some of the acid was run out of the burette.

One reason for running the acid out of the burette is to make sure the level of the hydrochloric acid is on the scale.

Give one **other** reason why it is important to run some acid out of the burette after it has been filled for the first time in an experiment.

....

.... [1]

[Total: 19]

3 Solid **S** and solution **Y** were analysed. Solid **S** was anhydrous copper(II) sulfate.
Tests were done on each substance.

tests on solid S

Complete the expected observations.

(a) A flame test was carried out on solid **S**.

observations .... [1]

The remaining solid **S** was dissolved in about 10 cm^3 of distilled water to form solution **T**. Solution **T** was divided into two approximately equal portions in two test-tubes.

(b) State the colour change that occurred when water was added to solid **S** to form solution **T**.

from solid **S** .... to solution **T** .... [1]

(c) To the first portion of solution **T**, about 1 cm depth of dilute nitric acid followed by a few drops of aqueous barium nitrate were added.

observations .... [1]

(d) To the second portion of solution **T**, aqueous ammonia was added dropwise and then in excess.

observations ....

....

.... [3]

tests on solution Y

tests	observations
test 1 A flame test was carried out on solution **Y**.	the flame became lilac
Solution **Y** was divided into three approximately equal portions in one boiling tube and two test-tubes. **test 2** Dilute hydrochloric acid was added to the portion of solution **Y** in a boiling tube. The mixture was warmed. A strip of filter paper soaked in acidified aqueous potassium manganate(VII) was held at the mouth of the boiling tube.	the acidified aqueous potassium manganate(VII) remained purple
test 3 About 1 cm depth of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the second portion of solution **Y**.	yellow precipitate
test 4 Aqueous ammonia was added dropwise and then in excess to the third portion of solution **Y**.	a white precipitate formed which dissolved in excess to give a colourless solution

(e) Name the gas tested for in **test 2**.

.... [1]

(f) Identify the **three** ions in solution **Y**.

....

.... [3]

[Total: 10]

4 When solution **A** and solution **B** are mixed they react slowly to form iodine.
Starch solution is added to the mixture to act as an indicator.
When a certain amount of iodine is made there is a sudden colour change to blue-black.

Plan an investigation to find the effect of temperature on the rate of the reaction between solution **A** and solution **B**.

You are provided with solution **A**, solution **B**, starch solution and common laboratory apparatus.

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.... [6]