Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

7661694815

CHEMISTRY **0971/61**

Paper 6 Alternative to Practical **May/June 2020**

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 **8** pages. Blank pages are indicated.

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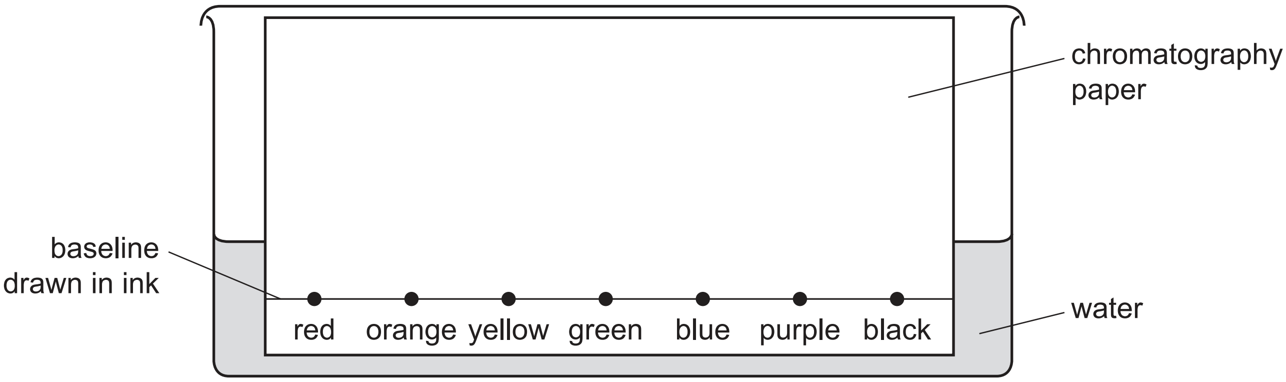
1 A student investigated the dyes contained in different coloured inks using chromatography. Water was the solvent. The diagram shows how the student set up the apparatus.



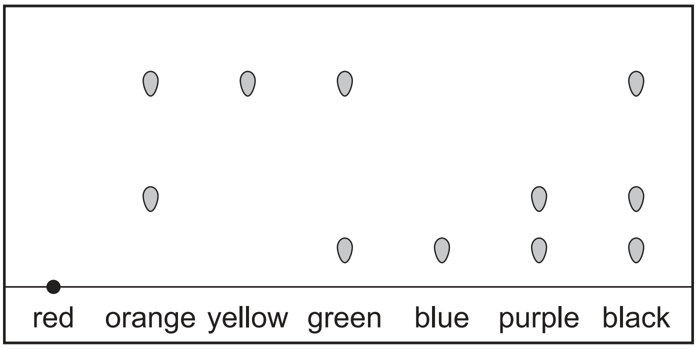
(a) Identify **two** errors in the way the student set up the apparatus.

1 ....

2 ....
[2]

(b) The student then carried out the chromatography correctly.

The diagram shows the results.



(i) Which ink contains the greatest number of soluble dyes?

.... [1]

(ii) Which **two** inks are made of a single soluble dye?

.... and ....
[1]

(iii) From the chromatogram it is **not** possible to tell if the red ink contains different dyes.

Suggest how the experiment could be changed to find out if the red ink contains different dyes.

.... [1]

[Total: 5]

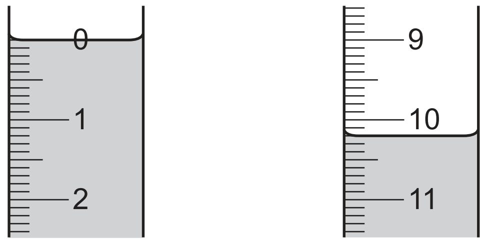
2 A student investigated the reaction between dilute hydrochloric acid and two different aqueous solutions of sodium carbonate, solution **E** and solution **F**.

Three experiments were done.

(a) *Experiment 1*

- A burette was filled up to the 0.0 cm^3 mark with dilute hydrochloric acid.
- Using a measuring cylinder, 25 cm^3 of solution **E** was poured into a conical flask.
- Five drops of thymolphthalein indicator were added to the conical flask.
- Dilute hydrochloric acid was slowly added 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.



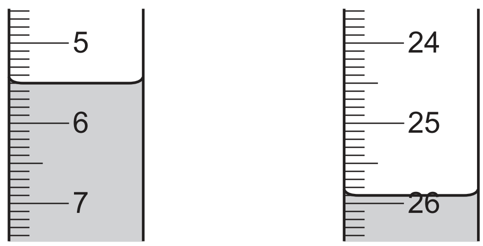
initial reading   final reading

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

Experiment 2

- The conical flask was emptied and rinsed with distilled water.
- The burette was refilled with dilute hydrochloric acid.
- Experiment 1 was repeated using five drops of methyl orange indicator instead of thymolphthalein indicator.

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



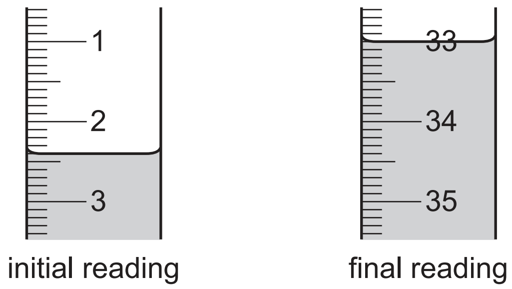
initial reading   final reading

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

Experiment 3

- The conical flask was emptied and rinsed with distilled water.
- The burette was refilled with dilute hydrochloric acid.
- Using a measuring cylinder, 25 cm^3 of solution **F** was poured into the conical flask.
- Five drops of methyl orange indicator were added to the conical flask.
- Dilute hydrochloric acid was slowly added 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 3.



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

[5]

(b) What colour change was observed in the conical flask in Experiment 2?

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

(c) Compare the volumes of dilute hydrochloric acid added in Experiment 2 and Experiment 3. Explain any difference.

....

.... [2]

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

ratio Experiment 1 : Experiment 2 = ... [1]

(e) What volume of dilute hydrochloric acid would be required if Experiment 3 was repeated using thymolphthalein indicator instead of methyl orange indicator?

volume = ... [2]

(f) The conical flask was rinsed with distilled water between each experiment.

(i) Why was the conical flask rinsed?

....

.... [1]

(ii) Why does it **not** matter if a little distilled water is left in the flask after it has been rinsed?

....

.... [1]

(g) State **two** sources of error in the experiments. For each error suggest an improvement that would reduce the error.

source of error 1 ....

improvement 1 ....

....

source of error 2 ....

improvement 2 ....

....
[4]

[Total: 18]

3 Two solids, solid **G** and solid **H**, were analysed. Solid **G** was copper(II) carbonate.
Tests were done on each solid.

tests on solid G

Complete the expected observations.

(a) Solid **G** was placed in a boiling tube. An excess of dilute sulfuric acid was added to the boiling tube. Any gas produced was tested.

observations ....

....

.... [3]

(b) Identify the gas produced in **(a)**.

.... [1]

(c) Aqueous ammonia was added slowly until in excess to the solution produced in **(a)**.

observations ....

....

....

.... [3]

tests on solid H

Tests were done and the following observations were made.

tests on solid **H**	observations
test 1 Flame test	yellow flame
test 2 Some of solid **H** was placed in a boiling tube. The boiling tube was heated strongly.	condensation appeared near the mouth of the boiling tube
Solid **H** was dissolved in distilled water. The solution was divided into two equal portions. **test 3** About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the first portion of the solution.	the solution remained colourless
test 4 About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate were added to the second portion of the solution.	white precipitate

(d) What conclusion can be made from the result of **test 3**?

....

.... [1]

(e) What conclusions can be made about solid **H** from the results of **test 1**, **test 2** and **test 4**?

....

....

.... [3]

[Total: 11]

4 Cobalt, manganese and nickel are metals. They react with dilute hydrochloric acid to form hydrogen gas.

Plan an investigation to find the order of reactivity of these three metals.

You are provided with:
- samples of each metal
- dilute hydrochloric acid
- common laboratory apparatus.

Your plan must make it clear how your investigation will be a fair test and how you will use your results to place the metals in order of reactivity.

....

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....

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....

....

.... [6]