



Rewarding Learning

General Certificate of Secondary Education
2025

Centre Number

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Candidate Number

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Chemistry

Unit 3: Practical Skills

Practical Booklet B

Foundation Tier



[GCM32]

GCM32

FRIDAY 20 JUNE, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete questions in black ink and use a dark HB pencil for drawings and graphs.

Do not write with a gel pen.

Answer all **six** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You may use a scientific calculator.

Quality of written communication will be assessed in Question **3(d)(ii)**.

A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

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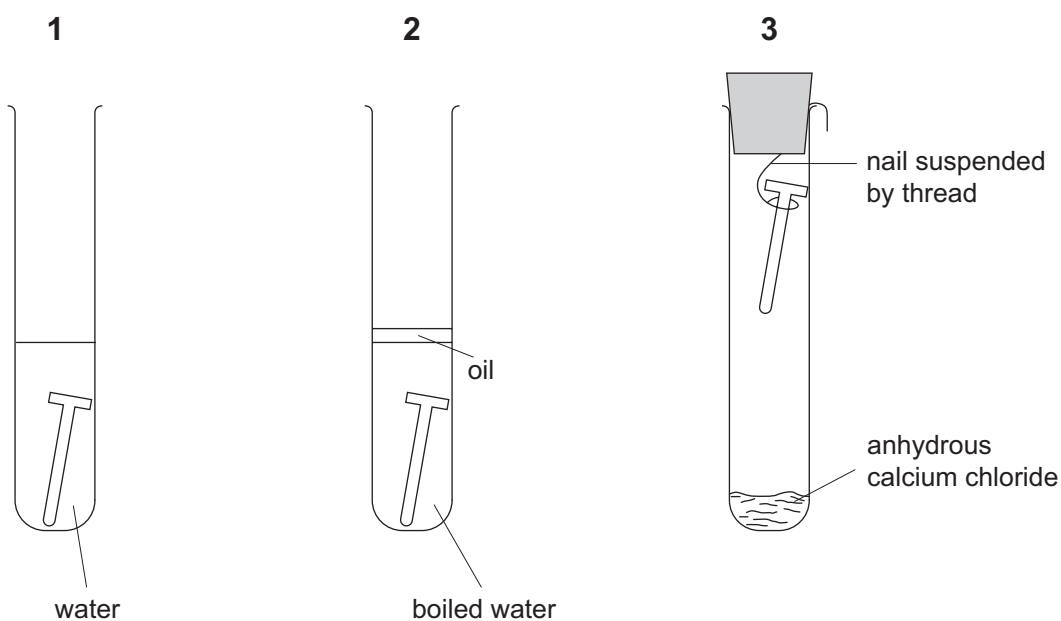
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20GCM3202

- 1 An experiment was set up to investigate what causes iron to rust. Iron nails were placed in three test tubes labelled **1**, **2** and **3** as shown below.



- (a) State the chemical name for rust.

_____ [2]

- (b) Explain why the nail in test tube **3** does not rust.

_____ [1]

- (c) What is the purpose of the oil in test tube **2**?

_____ [1]

- (d) What is the name given to the process of coating iron nails with zinc to prevent the iron nails from rusting?

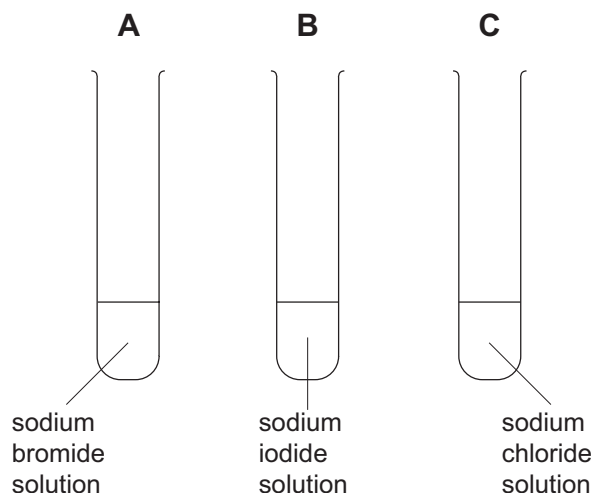
_____ [1]

[Turn over]



2 An experiment was carried out to compare the reactivity of the halogens.

2 cm³ of a sodium halide solution were added to the test tubes labelled **A**, **B** and **C** as shown below.



(a) (i) Chlorine water was added dropwise to each test tube until no further change occurred. Complete the table below.

Test tube	A	B	C
Observation on addition of chlorine water dropwise	Colourless solution changed to orange		No change

[1]

(ii) Write a word equation for the reaction occurring in test tube **A**.

_____ [2]

(iii) State the type of reaction occurring in test tube **A**.

_____ [1]

(iv) Name a suitable piece of apparatus used to measure 2 cm³ of the sodium halide solutions.

_____ [1]



The experiment was set up again as shown in the diagram using fresh samples of each sodium halide solution.

- (b) Bromine water was then added dropwise to each test tube. In which test tube (**A**, **B** or **C**), will a reaction occur? State the colour change observed.

Test tube _____

Colour change from _____ to _____ [2]

- (c) Silver nitrate solution was added dropwise to fresh samples of the sodium halide solutions in the test tubes labelled **A**, **B** and **C**.

- (i) Complete the table below.

Test tube	A	B	C
Observation on addition of silver nitrate solution		Yellow precipitate	

[2]

- (ii) What is a precipitate?

_____ [2]

- (iii) Write the formula for silver nitrate.

_____ [1]

- (iv) Write the name and the formula of the yellow precipitate formed in test tube **B**.

Name _____

Formula _____ [2]

[Turn over



- 3 A range of chemical tests may be used to identify the homologous series to which an organic compound belongs.

- (a) Several tests were carried out on two gaseous hydrocarbons, **X** and **Y**.
The results of one of the tests are shown in the table below.

Test	Hydrocarbon X	Hydrocarbon Y
Bubble the gas through bromine water	Bromine water remains orange	Orange bromine water changes to colourless

- (i) Name the homologous series to which hydrocarbon **X** belongs.

_____ [1]

- (ii) Name the homologous series to which hydrocarbon **Y** belongs.

_____ [1]

- (iii) Which hydrocarbon, **X** or **Y**, is unsaturated? Explain your answer giving evidence from the table.

_____ [1]



(b) The relative formula mass (M_r) of hydrocarbon **X** from (a) is found to be 16.

(i) Draw the structural formula of hydrocarbon **X**.

[1]

(ii) Name hydrocarbon **X**.

[1]

(c) Hydrocarbon **X** is burned in a limited supply of air. Name all the products formed when hydrocarbon **X** is burned in a limited supply of air.

[3]

[Turn over]



(d) Ethanoic acid is an organic compound and is commonly found in vinegar.

(i) Name the homologous series to which ethanoic acid belongs.

_____ [1]

(ii) Ethanoic acid reacts with metals and with metal carbonates. Both reactions release heat.

Describe the observations made when **excess** ethanoic acid reacts with magnesium metal and with copper(II) carbonate.

Your answer should include:

- the appearance of the reactants
- any observations made during the reaction
- the appearance of the products.

In this question you will be assessed on the quality of your written communication skills, including the use of specialist scientific terms.

reaction with magnesium metal

reaction with copper(II) carbonate

[6]



(iii) State one difference in the observations made between the reaction of ethanoic acid with magnesium and the reaction of sulfuric acid with magnesium.

[1]

[Turn over

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20GCM3209

- 4 AdBlue, an aqueous solution of urea, H_2NCONH_2 , is used in the exhaust system of diesel vehicles to remove oxides of nitrogen. At high temperatures, the urea in AdBlue undergoes thermal decomposition forming ammonia and carbon dioxide.

(a) Explain the meaning of the term thermal decomposition.

_____ [1]

(b) Calculate the percentage of nitrogen by mass in urea, H_2NCONH_2 .
Give your answer to 1 decimal place.

percentage of nitrogen = _____ % [2]

(c) Complete the sentences below to describe the test for ammonia gas.

Apply a _____ rod which has been dipped into
_____ hydrochloric acid.

_____ smoke forms if ammonia gas is present. [3]





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5 The following experiment was carried out to determine the concentration of sulfuric acid.

Step 1 Use a pipette and pipette filler to measure and add 25.0 cm^3 of sulfuric acid to a clean conical flask.

Step 2 Add three drops of an indicator to the conical flask and place the conical flask on a white tile.

Step 3 Fill a burette with sodium hydroxide solution. Record the initial burette reading.

Step 4 Add the sodium hydroxide solution from the burette to the conical flask with swirling.

Step 5 Stop adding the sodium hydroxide solution when the end point is reached. Record the final burette reading and calculate the rough titre.

Step 6 Repeat Steps 1 to 5 adding sodium hydroxide solution slowly from the burette near the end point until two accurate titres within 0.2 cm^3 of each other are obtained.

(a) State the name of this experimental method used to determine the concentration of the sulfuric acid.

_____ [1]

(b) State the name of a suitable indicator that may be used in this experiment and the colour change observed at the end point.

Indicator _____

Colour change from _____ to _____ [3]

(c) Suggest why the conical flask is placed on a white tile.

_____ [1]



(d) Explain why the conical flask is swirled when adding the sodium hydroxide solution.

[1]

(e) Draw a suitable results table with headings to record the results of this experiment.

[4]

(f) Suggest why Steps 1 to 5 are repeated until two accurate titres are obtained.

[1]

(g) Name the products of the reaction between sulfuric acid and sodium hydroxide.

[2]

[Turn over]



6 A student followed the procedure below to investigate the solubility of potassium bromide.

Step 1 Weigh out 2.6 g of potassium bromide crystals and place in a boiling tube.

Step 2 Add 10 cm³ of water to the boiling tube.

Step 3 Place the boiling tube in a beaker of water and heat gently using a Bunsen burner. Stir the contents of the boiling tube with a thermometer.

Step 4 When all the solid has dissolved, remove the boiling tube from the water bath and place in a beaker of cold water.

Step 5 Stir the solution with the thermometer and record the temperature at which crystals first appear.

(a) Draw a **labelled** diagram of the assembled apparatus used to heat the boiling tube containing potassium bromide and water.

[4]



(b) What is meant by the term solubility?

[3]

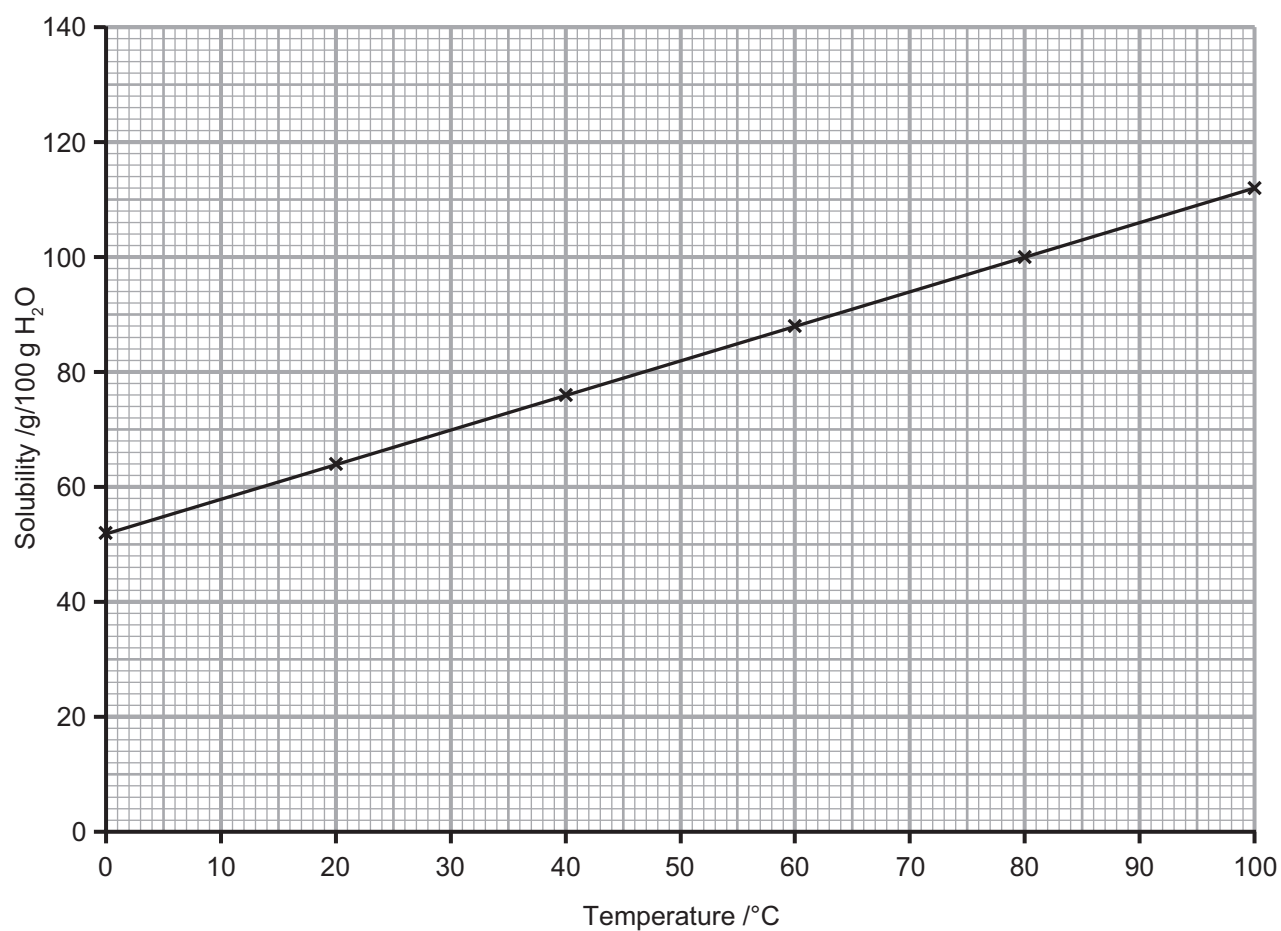
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(c) The graph below shows how the solubility of potassium bromide changes with temperature.



(i) What is the solubility of potassium bromide at 70°C?

_____ [1]

(ii) At what temperature is the solubility of potassium bromide 70 g/100 g water?

_____ [1]



- (d) The solubility values of lead(II) nitrate at various temperatures are shown in the table below.

Temperature /°C	0	20	40	60	80	100
Solubility of lead(II) nitrate /g/100 g H ₂ O	36	52	69	88	108	127

- (i) Plot these results on the axes in (c) and draw a best fit line through the points. [3]

- (ii) State the trend in the solubility of lead(II) nitrate as temperature increases. [1]
- _____

- (iii) Which solid, potassium bromide or lead(II) nitrate, is more soluble at 30°C? [1]
- _____

- (e) Complete the following statement about the solubility of gases in water.

As temperature increases, the solubility of gases in water [1]

_____ .

- (f) Name one insoluble metal sulfate. You may use your Data Leaflet to help you answer this question. [1]
- _____



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Question Number	Marks
1	
2	
3	
4	
5	
6	

Total Marks	
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Examiner Number

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