Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

7202226926

CO-ORDINATED SCIENCES **0654/52**

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

2 hours

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 for this paper are printed on page 16.

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	
4	
5	
6	
Total	

This document consists of **15** printed pages and **1** blank page.

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Cambridge Assessment International Education

[Turn over

1 You are going to investigate the nutrient content of yogurt and rice water.

You are provided with Benedict's solution, biuret solution and iodine solution.

Procedure

1. Add about 1 cm depth of yogurt to each of three test-tubes.
2. Add about 1 cm depth of Benedict's solution to one test-tube and place in a hot water bath for at least 3 minutes.
   You may carry out step 3 and step 4 while you are waiting.
3. Add about 1 cm depth of biuret solution into the second test-tube.
4. Add a few drops of iodine solution to the final test-tube.
5. Using clean test-tubes repeat steps 1 – 4 with rice water instead of yogurt.

(a) Record in Table 1.1 your observations of the **final colour** observed in each test-tube.

Table 1.1

food sample	observation with Benedict's solution	observation with biuret solution	observation with iodine solution
yogurt			
rice water			

[4]

(b) State the nutrients present in each food sample. Use your observations in Table 1.1.

yogurt contains ....

rice water contains ....
[3]

(c) State and explain a safety precaution you used when carrying out the tests.

safety precaution ....

explanation ....
[1]

(d) A student wants to compare concentrations of the nutrient tested for with Benedict's solution.

State **one** variable that would need to be kept the same.

.... [1]

(e) A student carries out this investigation but also tests samples of protein, reducing sugar and starch with the three test solutions.

Explain how this improves the investigation.

....

.... [1]

(f) **(i)** A student tests a liquid for the presence of fats by adding two substances. He gets a positive result.

Name the two substances added in the test.

.... and ....

State his observation.

....
[2]

(ii) Explain why the test in **(f)(i)** is not suitable for testing for the presence of fat in milk.

....

.... [1]

[Total: 13]

2 You are provided with half a tomato.

(a) In the box, make an enlarged detailed pencil drawing of the cut surface of the tomato.

[4]

(b) (i) Measure the actual width of the cut surface of the tomato.

Record this actual width in millimetres to the nearest millimetre.

actual width .... mm [1]

(ii) Draw a line to show this width on your drawing.

Measure and record the length of this line in millimetres to the nearest millimetre.

width on drawing .... mm [1]

(iii) Use your measurements in **(b)(i)** and **(b)(ii)** to calculate the magnification *m* of your drawing. Use the equation shown.

$$m = \frac{\text{width on drawing}}{\text{actual width}}$$

m = ... [1]

[Total: 7]

3 You are going to investigate the reaction between zinc powder and copper sulfate solution.

(a) Record the colours of the zinc powder and the copper sulfate solution.

colour of zinc powder ....

colour of copper sulfate solution .... [1]

(b) **(i)** Measure the temperature of the copper sulfate solution.

Record in Table 3.1 this value to the nearest 0.5 °C for time = 0.

Table 3.1

time / s	temperature / °C
0	
30	
60	
90	
120	
150	
180	
210	
240	
270	
300	

[1]

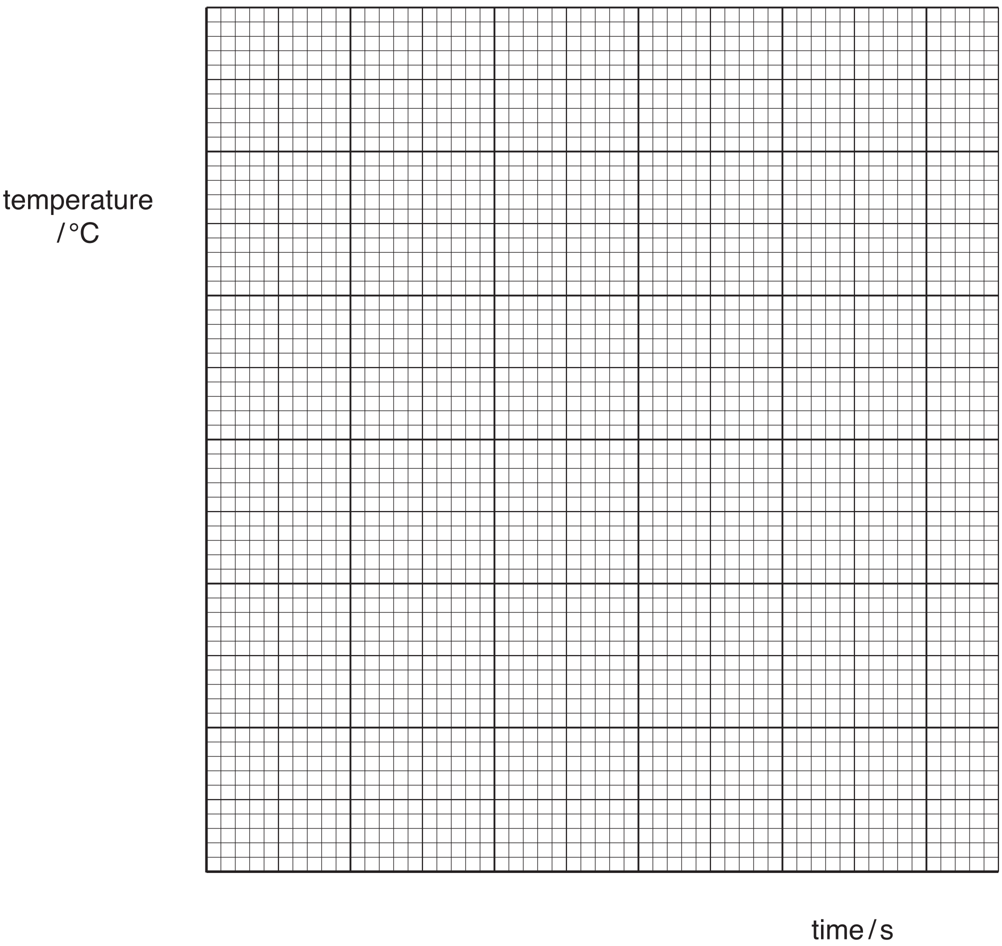
(ii) **Procedure**

- Place all of the zinc powder in the plastic cup.
- Use the measuring cylinder to add 20 cm^3 copper sulfate solution to the zinc powder in the plastic cup.
- Start the stopclock.
- Stir the mixture continuously.
- Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes).
- Record in Table 3.1 the values to the nearest 0.5 °C.
- Pour some of the mixture into a test-tube and keep for use in **(c)(iv)**.

[2]

(c) **(i)** Use your results in Table 3.1 to plot a graph of temperature against time.

You do **not** need to start the temperature axis at zero.



[2]

(ii) Draw the best-fit smooth curve. [1]

(iii) Use the graph to find the maximum temperature reached during the experiment.

Mark this temperature on your graph.

maximum temperature .... °C [2]

(iv) Record the colours of the solid and the liquid in the mixture from **(b)(ii)**.

solid ....

liquid ....
[1]

(v) Use your observations in **(a)** and **(c)(iv)** to suggest the name of **one** of the products of this reaction.

.... [1]

(d) Suggest why the maximum temperature in the experiment should be more accurate when read from the graph than from the results in Table 3.1.

....

.... [1]

[Total: 12]

4 Notes for use in Qualitative Analysis for this question are printed on page 16.

You are going to find out which one of the four solutions **H**, **J**, **K** or **L** is sodium hydroxide solution.

The other three are solutions of the same acid but each has a different concentration.

You will identify the acid and place them in order of concentration.

Note that solutions **H**, **J**, **K** and **L** will be required for **(a)**, **(b)** and **(c)**.

(a) You are supplied with the listed chemicals and you may **not** use any other chemical or testing materials.

barium nitrate solution
copper sulfate solution
silver nitrate solution

Using these chemicals, carry out tests on samples of solutions **H**, **J**, **K** and **L** to determine which is sodium hydroxide solution.

(i) State which **one** of these chemicals gives a positive result that identifies which solution **H**, **J**, **K** or **L** is sodium hydroxide solution.

Record your observation for this test.

chemical ....

observation ....

....

.... [1]

(ii) State which solution **H**, **J**, **K** or **L** is sodium hydroxide solution.

solution .... is sodium hydroxide solution [1]

(b) **(i)** The other three solutions not identified in **(a)(i)** are different concentrations of the same acid.

Use the marble chips supplied and your knowledge of rates of reaction to carry out a controlled test to place the three solutions in order of concentration.

State **one** variable that you have controlled.

Record the observations that will allow you to put the acids in order of concentration.

controlled variable ....

solution .... observation ....

solution .... observation ....

solution .... observation ....
[2]

(ii) Use the observations in **(b)(i)** to state the order of concentration of the three solutions of acid.

Explain how you use the observations to find the order of the concentrations.

most concentrated acid is ....

....

least concentrated acid is ....

explanation ....

....
[2]

(c) Carry out tests to identify the acid in the three solutions used in **(b)**.

You may only select from the chemicals listed in **(a)**.

State the chemical and observation which allows you to identify the acid.

Name the acid.

chemical ....

observation ....

acid ....
[2]

[Total: 8]

5 You are going to determine an approximate value for the specific heat capacity of glass.

The specific heat capacity c of glass is the amount of thermal energy required to raise the temperature of 1 g of glass by 1 °C.

You are provided with hot water and cold water. The cold water is at room temperature.

(a) **(i)** Use the balance provided to find the mass m of beaker **P** to the nearest gram.

m = ... g [1]

(ii) **Procedure**

- Pour 100 cm^3 of cold water into beaker **P**.
- Measure and record the temperature θ_1 of the cold water to the nearest 0.5 °C.
- Keep the water in beaker **P** to use in **(b)(ii)**.

θ_1 = ...°C [1]

(b) **(i)**
- Pour hot water into beaker **Q** up to the line marked on the side of the beaker.
- Place the thermometer into the hot water.
- Wait until the reading on the thermometer stops rising.
- Measure and record the temperature θ_2 of the hot water.
- Keep the water in beaker **Q** to use in **(b)(ii)**.

θ_2 = ...°C [1]

(ii)
- As soon as you have recorded the temperature of the hot water in **(b)(i)**, pour the hot water from beaker **Q** into the water in beaker **P**.
- Stir the mixture.
- Measure and record the temperature θ_3 of the mixture.

θ_3 = ...°C [1]

(c) Explain why stirring the mixture leads to a more accurate measurement of the water temperature in **(b)(ii)**.

....

.... [1]

(d) **(i)** Calculate the rise in temperature $(\theta_3 - \theta_1)$ of the cold water.

$(\theta_3 - \theta_1)$ = ...°C [1]

(ii) Calculate the fall in temperature $(\theta_2 - \theta_3)$ of the hot water.

$(\theta_2 - \theta_3)$ = ...°C [1]

(e) **(i)** Calculate the gain in thermal energy E_c of the cold water. Use the equation shown.

$$E_c = 420 \times (\theta_3 - \theta_1)$$

E_c = ... J [1]

(ii) Calculate the loss in thermal energy E_h of the hot water. Use the equation shown.

$$E_h = 420 \times (\theta_2 - \theta_3)$$

E_h = ... J [1]

(f) The difference between E_h and E_c is approximately equal to the thermal energy E_g gained by the glass beaker **P**.

(i) Use your answers to **(e)(i)** and **(e)(ii)** to calculate the thermal energy gained by the glass. Use the equation shown.

$$E_g = E_h - E_c$$

E_g = ... J [1]

(ii) Use your answers to **(a)(i)**, **(d)(i)** and **(f)(i)** to calculate the specific heat capacity c of glass. Use the equation shown.

$$E_g = m \times c \times (\theta_3 - \theta_1)$$

c = ... J/g°C [2]

(g) Suggest **one** practical reason why your value for the specific heat capacity of glass is not accurate.

....

.... [1]

[Total: 13]

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6 A student investigates how the resistance of a wire depends upon its length.

To calculate resistance he uses the equation shown.

$$R = \frac{V}{I}$$

The apparatus available is listed.

- power supply
- ammeter
- voltmeter
- switch
- several metres of resistance wires of different materials and thicknesses
- metre rule
- wire cutters
- connecting leads
- crocodile clips
- beaker of cold water

Plan an experiment to investigate how the resistance of the wire depends upon its length.

You **must** select apparatus for your experiment from the list above. You may **not** use any other apparatus.

You are **not** required to carry out this investigation.

Include in your answer:

- a diagram of the circuit you would use
- how you would carry out the experiment
- the key variables you would control
- a table with column headings to show how you would present your results (you are not required to enter any readings in the table)
- how you would use your readings to come to a conclusion.

....

....

....

....

....

....

....

....

....

.... [7]

[Total: 7]

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.
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.

Tests for aqueous cations

cation	*effect of aqueous sodium hydroxide*	*effect of aqueous ammonia*
ammonium (NH_4^+)	ammonia produced on warming	–
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt., or very slight white ppt.
copper (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

Flame tests for metal ions

metal ion	*flame colour*
lithium (Li^+)	red
sodium (Na^+)	yellow
potassium (K^+)	lilac
copper(II) (Cu^{2+})	blue-green