Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME										
CENTRE NUMBER						CANDIDATE NUMBER				

9198095381

CO-ORDINATED SCIENCES **0654/51**

Paper 5 Practical Test **October/November 2021**

2 hours

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 60.
- 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	
4	
5	
6	
Total	

This document has **16** pages. Any blank pages are indicated.

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1 You are provided with a flower.

(a) Remove three petals from one side of the flower so that the internal structures of the flower are clearly visible. Keep these petals for part **(d)**.

(i) In the box, make a large, detailed pencil drawing of the flower.

Include the internal parts of the flower. [3]

(ii) On your drawing add labelled lines to identify:

- a petal
- an anther.

[2]

(b) **(i)** Draw a line on your drawing to show the width of one petal.

Measure the width of this petal.

Record this width in millimetres to the nearest millimetre.

width of petal on drawing = ... mm [1]

(ii) Measure the same width of the petal on the actual flower.

Record this width in millimetres to the nearest millimetre.

width of petal on actual flower = ... mm [1]

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

Use the equation shown.

$$M = \frac{\text{width of petal on drawing}}{\text{width of petal on actual flower}}$$

M = ... [1]

(c) Describe a difficulty in measuring the width of the actual petal.

....

.... [1]

(d) Calculate the average width in millimetres to the nearest millimetre of the three petals removed from the flower in **(a)**.

Show your working.

average width = ... mm [2]

[Total: 11]

2 You are going to investigate the nutrient content of samples of honey and milk. You are provided with three samples of honey and three samples of milk.

(a) Procedure

- Add about 1 cm depth of Benedict's solution to a sample of honey.
- Add about 1 cm depth of Benedict's solution to a sample of milk.
- Place these two test-tubes in the hot water-bath for at least 3 minutes.
- Continue with the procedure while you are waiting.
- Add about 1 cm depth biuret solution to a sample of honey and to a sample of milk.
- Add a few drops of iodine solution to the third samples of honey and milk.

(i) Complete Table 2.1 by recording the **final colours** observed in each of the test-tubes.

Table 2.1

	final colour observed with		
food sample	Benedict's solution	biuret solution	iodine solution
honey			
milk			

[4]

(ii) Use your observations in Table 2.1 to draw conclusions about the nutrients present in the honey and milk.

honey ....

milk ....
[2]

(b) (i) A student tests the honey for the presence of fat.

State the two reagents the student needs to use.

.... and ....

State the observation for a positive result.

....
[2]

(ii) The test in **(b)(i)** is **not** suitable for testing the presence of fat in milk.

Suggest a reason why.

.... [1]

[Total: 9]

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3 You are going to investigate the effect of dissolving salt on the boiling point temperature of water.

(a) Procedure

Step **1** Half-fill a boiling tube (large test-tube) with distilled water and add a few anti-bumping granules. Place a thermometer into the boiling tube.

Step **2** Clamp the boiling tube above a Bunsen burner.

Step **3** Heat the distilled water until it boils.

Step **4** Record the boiling point temperature in Table 3.1.

Step **5** Remove the Bunsen burner.

Step **6** Add one spatula of salt to the water.

Step **7** Heat the solution of salt until it boils and record the boiling point temperature in Table 3.1.

Repeat steps **5** to **7** until six spatulas of salt have been added.

Table 3.1

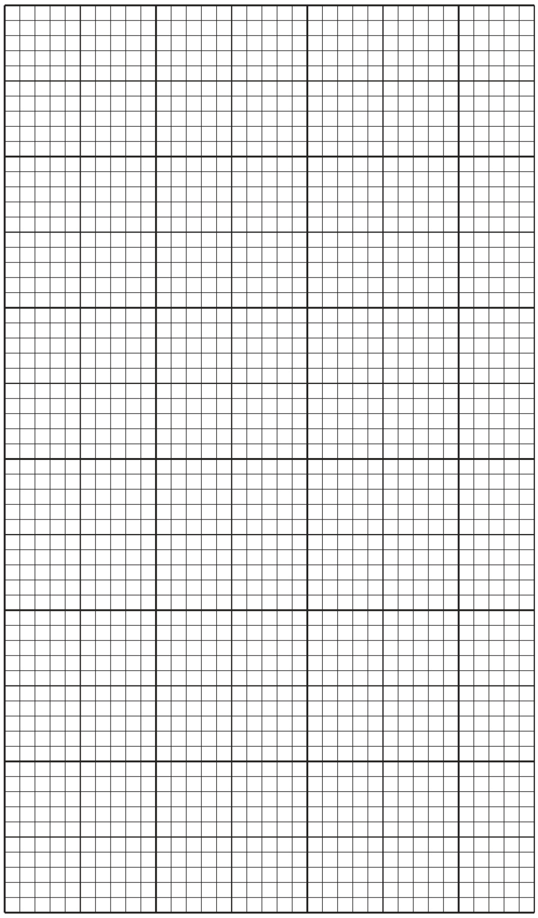
spatulas of salt added	boiling point temperature / °C
0	
1	
2	
3	
4	
5	
6	

[4]

(b) Suggest an improvement to the procedure that will make the results more reliable.

.... [1]

(c) **(i)** On the grid draw a graph of boiling point temperature (vertical axis) against number of spatulas of salt added. Do **not** start the y-axis at 0. [3]



(ii) Draw the line of best-fit. [1]

(iii) State the relationship between amount of salt added and boiling point temperature.

....

.... [2]

(iv) Use your graph to estimate the boiling point temperature of water when 2.5 spatulas of salt are added.

Show on your graph how you arrived at your answer.

boiling point temperature = ... °C [2]

(v) The student finds the boiling point temperature is the same when 7, 8 and 9 spatulas of salt are added.

Suggest why.

....

.... [1]

[Total: 14]

4 Methanol and water are both liquids and they have been mixed together.

The boiling point of methanol is 65 °C and the boiling point of water is 100 °C.

The methanol can be separated from the water by **distillation**.

Fig. 4.1 shows some apparatus.

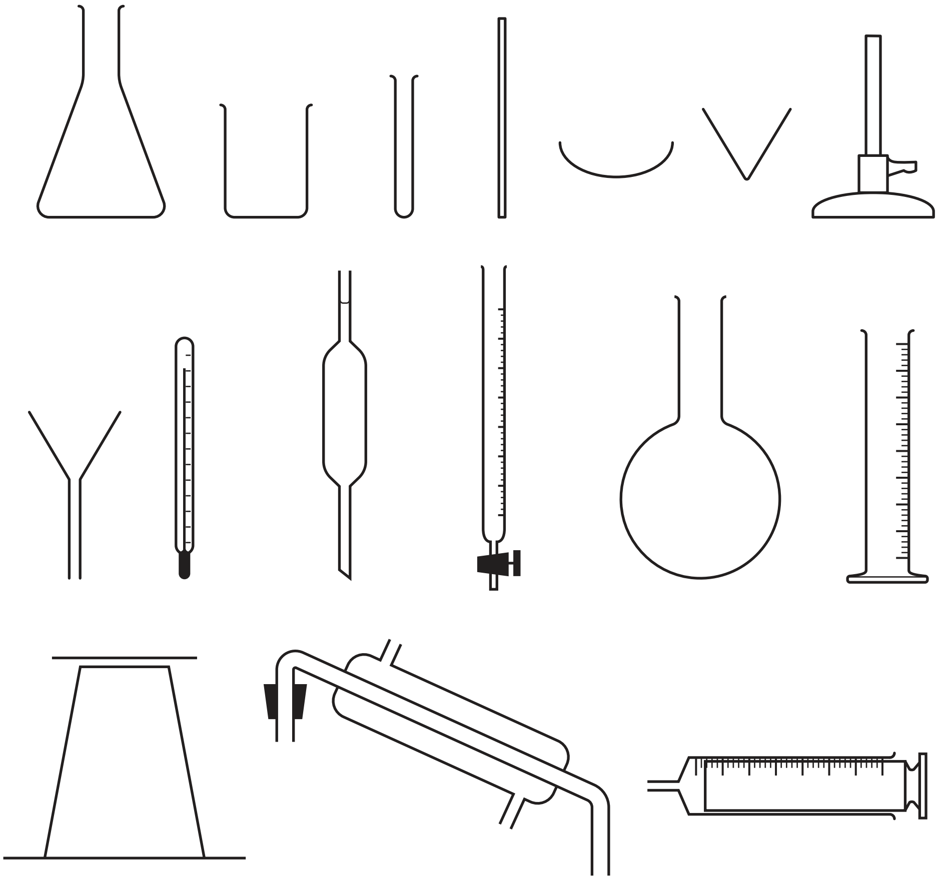


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Fig. 4.1

(a) **(i)** Draw a diagram of the assembled apparatus used for separating the methanol from the water by distillation.

The boiling temperature of the methanol needs to be measured.

Use the following apparatus from Fig. 4.1.

- a flask
- a thermometer
- heating apparatus
- a condenser
- a beaker
- any other pieces of apparatus necessary

[3]

(ii) On your diagram label:

- the thermometer
- the condenser.

[2]

(iii) On your diagram draw **two** arrows on the condenser to show where the water enters the condenser and where it leaves the condenser. [1]

[Total: 6]

5 You are going to determine the focal length of a convex lens.

Set up the apparatus as shown in Fig. 5.1.

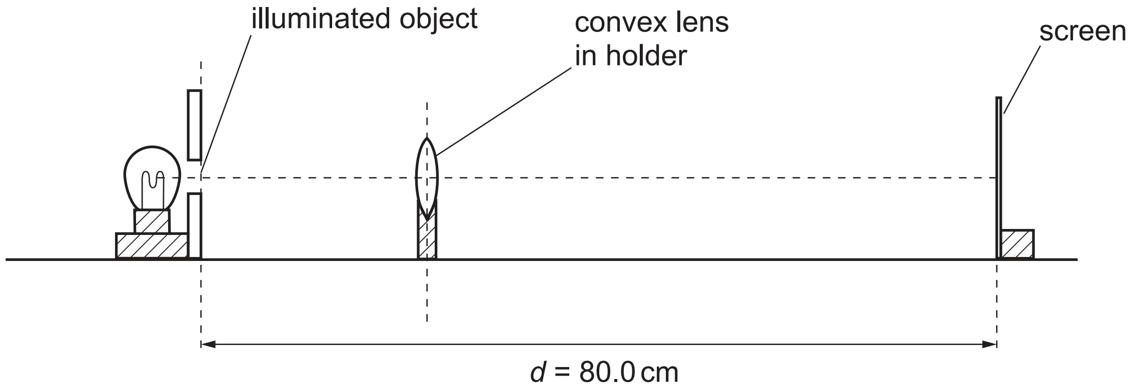

Fig. 5.1

(a) Procedure

- Switch on the lamp and place the screen a distance d = 80.0 cm from the illuminated object.

The distance between the illuminated object and the screen **must not change** during the experiment.

- Move the lens towards the illuminated object until it is as close as possible to the illuminated object.
- Slowly move the lens away from the illuminated object until a sharp triangular image of the illuminated object is formed on the screen.

(i) Measure, and record in centimetres to the nearest 0.1 cm, the distance u_1 from the illuminated object to the lens.

u_1 = ... cm [1]

(ii) Use a ruler to draw a double headed arrow ⟵⟶ on Fig. 5.1 to show the object distance u_1. [1]

(iii) Calculate the focal length f_A of the lens using the equation shown.

$$f_A = u_1 \times \frac{(80 - u_1)}{80}$$

f_A = ... cm [1]

(iv) Measure the vertical height h_1 of the image on the screen. Record this height in millimetres.

h_1 = ... mm [1]

(b) Procedure

(i) Make sure that the position of the screen remains unchanged.

- Continue to move the lens away from the illuminated object.
- Adjust the position of the lens until a second sharp triangular image of the illuminated object is formed on the screen.

Measure, and record in centimetres to the nearest 0.1 cm, the distance u_2 from the illuminated object to the lens.

u_2 = ... cm [1]

(ii) Calculate the focal length f_B of the lens. Use the equation shown.

$$f_B = u_2 \times \frac{(80 - u_2)}{80}$$

f_B = ... cm [1]

(iii) Measure the vertical height h_2 of the image on the screen. Record this height in millimetres.

h_2 = ... mm [1]

(c) Use your results from **(a)(iii)** and **(b)(ii)** to calculate the average value for the focal length f of the lens.

f = ... cm [1]

(d) Use your answers to **(a)(iv)** and **(b)(iii)** to calculate the ratio r of the two heights.

Use the equation shown.

$$r = \frac{h_1}{h_2}$$

r = ... [2]

(e) State one difference and one similarity between the images seen in **(a)(i)** and **(b)(i)**.

difference ....

similarity ....
[2]

(f) State **one** precaution that you take in this experiment to obtain accurate results.

....

.... [1]

[Total: 13]

6 Fig. 6.1 shows a pendulum.

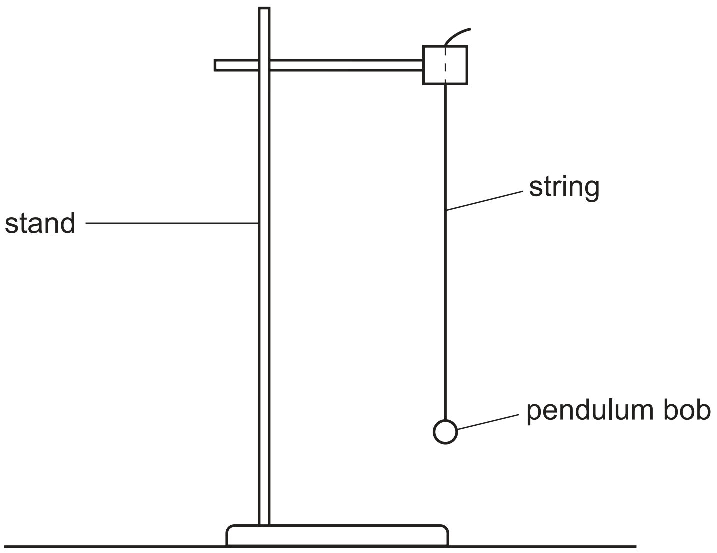

Fig. 6.1

The period of a pendulum is the time taken for one complete oscillation (swing) of the pendulum.

Fig. 6.2 shows one complete oscillation.

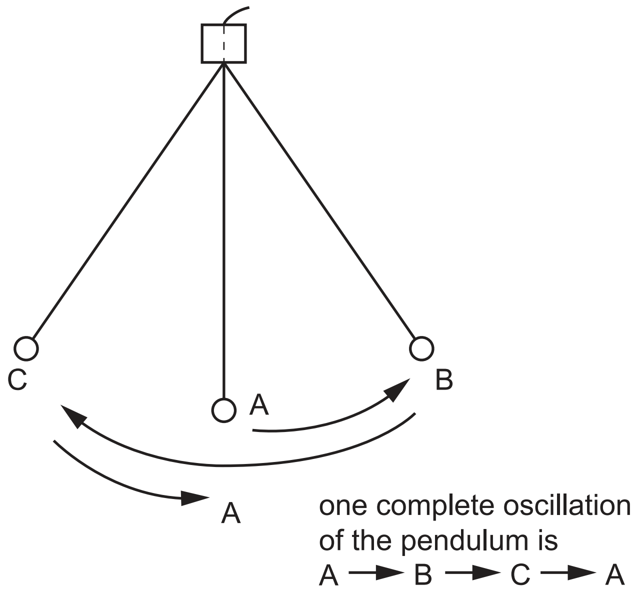

Fig. 6.2

Plan an experiment to investigate how the period of a pendulum depends upon the mass of its bob.

The apparatus available is listed.

- clamp, boss and stand
- pendulum bobs of different masses
- a ball of string
- a pair of scissors

You are **not** required to do this investigation.

Include in your answer:

- any other apparatus you will need
- a brief method, including how you will ensure your results are as accurate as possible
- the variables you will control
- a table with column headings to show how you will present your results (you are not required to enter any readings in the table)
- how you will process and use your results to reach a conclusion.

....

....

....

....

....

....

....

....

....

....

[Total: 7]

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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.
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