

Candidate Marks Report

Series : 6 2026

This candidate's script has been assessed using On-Screen Marking. The marks are therefore not shown on the script itself, but are summarised in the table below.

Centre No :	PK470	Assessment Code :	5054
Candidate No :	58	Component Code :	42
Candidate Name :	HUZAIFA UMER,		

In the table below 'Total Mark' records the mark scored by this candidate.
'Max Mark' records the Maximum Mark available for the question.

Paper:	5054/42	
Paper	35 / 40	
Total:		
Question	Total / Max Mark Mark	
1ai	1 / 1	
1aai	1 / 1	
1bi	1 / 1	
1bii	1 / 1	
1c	1 / 1	
1di	1 / 1	
1dii	1 / 1	
1e	2 / 2	
1f	1 / 1	
2ai	1 / 1	
2aai	1 / 1	
2bi	1 / 1	
2bii	2 / 2	
2biii	1 / 1	
2c	2 / 2	
2d	1 / 1	
2e	1 / 1	
3ai	1 / 1	
3aai	1 / 1	
3bi	1 / 1	
3bii	0 / 1	
3c	4 / 4	
3d	2 / 3	
3e	0 / 1	
3f	1 / 1	
3g	0 / 1	
4	5 / 6	



Cambridge O Level

 CANDIDATE
NAME

Hnzai fa Umer

 CENTRE
NUMBER

P K 4 7 0

 CANDIDATE
NUMBER

0 0 5 8

PHYSICS

5054/42

Paper 4 Alternative to Practical

May/June 2026

1 hour

You must answer on the question paper.

No additional materials are needed.

Casio FOL-991ES PLUS

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. Do **not** use correction fluid or tape.
- 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 [].

0905

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



- 1 A student investigates the oscillations of a pendulum and determines two values for the acceleration due to gravity.

The student arranges the pendulum in a clamp as shown in Figure 1.1.

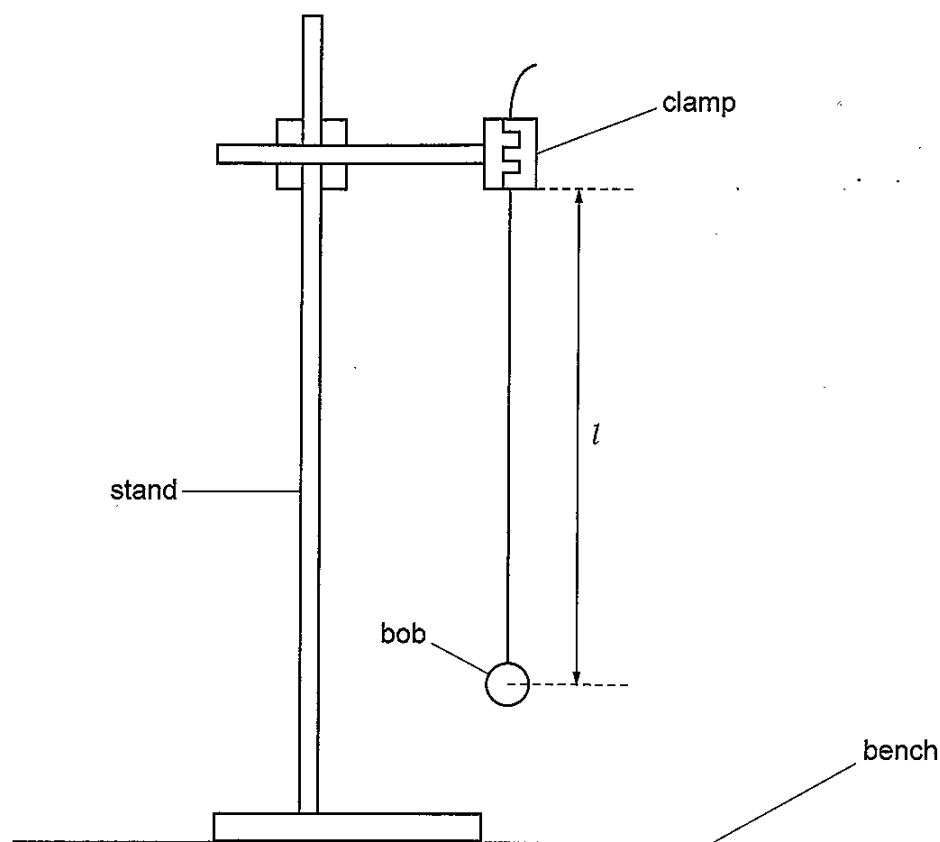


Figure 1.1

The length l of the pendulum is the distance from the bottom of the clamp to the centre of the pendulum bob.

- (a) (i) Measure the length l of the pendulum in Figure 1.1.

Record your measurement in centimetres to the nearest 0.1 cm.

$l = 7.0$ cm [1]

- (ii) Figure 1.1 has been drawn to a scale of one-fifth full size.

Calculate the actual length L of the pendulum **in metres**.

Record your answer in the first column of Table 1.1.

$$7 \times 5 = 35 \text{ cm} \\ = 0.35 \text{ m}$$

[1]



Table 1.1

L/m	t/s ✓	T/s
0.35 ✓	23.8	1.19 ✓
0.700	34.0	1.70

(b) procedure

The student:

- gives the bob a small sideways displacement and releases it so that it oscillates
- measures the time t for 20 oscillations of the pendulum.

The stopwatch reading is shown in Figure 1.2.

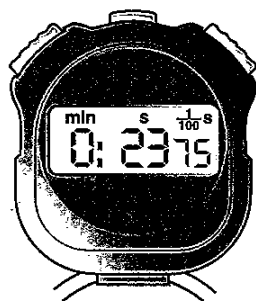


Figure 1.2

- Record t to 3 significant figures in the second column of Table 1.1. [1]
- Calculate the period T of the pendulum. The period is the time for 1 oscillation of the pendulum.

Record, in Table 1.1, your answer to 3 significant figures. [1]

(c) The student:

- adjusts the length of the string until the length L of the pendulum is 0.700 m
- repeats the procedure in 1(b).

The student records the results in Table 1.1.

Using data from Table 1.1, show that T is **not** proportional to L .

$$\frac{0.35}{0.70} = \frac{1.19}{x} \quad \boxed{x = 2.38}$$

If T was proportional to L it would have doubled when L was 0.700. But it only increased. Hence it is **not** proportional. [1]



- (d) The acceleration due to gravity in m/s^2 can be calculated using the equation shown.

$$g = \frac{39L}{T^2}$$

- (i) Calculate a first value g_1 for the acceleration due to gravity, using your value of L from **1(a)(ii)** and your value of T from **1(b)(ii)**.

Show your working and give your answer to 2 significant figures.

$$g_1 = \frac{39(0.35)}{1.14^2}$$

$$g_1 = 9.63 \approx 9.6$$

$$g_1 = \dots\dots\dots 9.6 \dots\dots\dots \text{m/s}^2 [1]$$

- (ii) Calculate a second value g_2 for the acceleration due to gravity, using the data for $L = 0.700 \text{ m}$ from Table 1.1.

$$g_2 = \frac{39(0.7)}{1.70^2}$$

$$g_2 = 9.44 \approx 9.4$$

$$g_2 = \dots\dots\dots 9.4 \dots\dots\dots \text{m/s}^2 [1]$$

- (e) Two quantities can be considered to be the same within the limits of experimental accuracy if their values are within 10% of each other.

Compare your value of g_1 from **1(d)(i)** with your value of g_2 from **1(d)(ii)**.

State if your two values can be considered to be the same.

Support your statement with a calculation.

calculation

$$\frac{9.4}{9.6} \times 100 = 97.9\% \text{ similar}$$

only 2.1% different.

statement Yes, they can be considered same as they lie within the limits of accuracy and are ~~not~~ only 2.1% different. [2]

- (f) State **one** technique that the student uses when doing the experiment to ensure that the results are accurate.

He repeats the experiment several times and takes ~~it~~ average value. Making his answer more precise and accurate. [1]

[Total: 10]





SEEN

Turn over



- 2 A student compares two methods of reducing the rate of temperature decrease in a beaker of hot water.

The student uses two identical beakers, P and Q.

Beaker P is wrapped with a layer of insulation but has no lid. Beaker Q has a lid but no layer of insulation.

The beakers are shown in Figure 2.1.

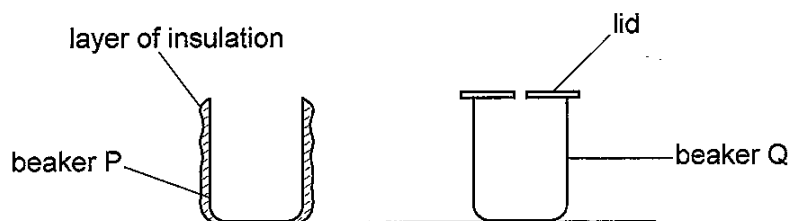


Figure 2.1

(a) **procedure**

The student:

- ✓. pours 200 cm³ of hot water into beaker P
- ✓. places a thermometer into the water
- ✓. waits until the thermometer reading has stopped increasing
- ✓. records the temperature θ of the hot water
- ✓. immediately starts a stopwatch
- ✓. allows the hot water to cool for 240 s
- ✓. measures the temperature θ of the water in the beaker, and records it in Table 2.1 at time $t = 240$ s.

The maximum thermometer reading is shown in Figure 2.2.

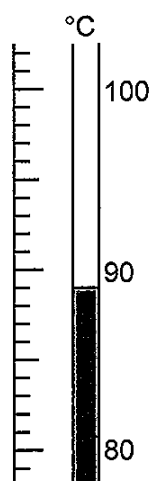


Figure 2.2

- (i) Read the temperature θ of the hot water in beaker P at time $t = 0$. Record your reading in the second column of Table 2.1. [1]

Table 2.1

	beaker P	beaker Q
$t / \dots \text{s} \dots$	$\theta / \dots ^\circ\text{C} \dots$	$\theta / \dots ^\circ\text{C} \dots$
0	89	90
240	77	82

- (ii) The student repeats the procedure for beaker Q.

The thermometer readings are shown in Table 2.1.

Add units to the column headings in Table 2.1.

[1]

- (b) (i) Use the temperature readings in Table 2.1 to calculate the temperature decrease of the hot water in beaker P and in beaker Q after cooling for 240 s.

$$P = 89 - 77 = 12 \quad Q = 90 - 82 = 8$$

temperature decrease in beaker P = 12 $^\circ\text{C}$

temperature decrease in beaker Q = 8.0 $^\circ\text{C}$

[1]

- (ii) Calculate the rate of temperature decrease of the water in each beaker using the equation shown.

$$\text{rate of temperature decrease} = \frac{\text{temperature decrease}}{\text{time}}$$

Give your answers to 2 significant figures.

$$P = \frac{12}{4} = 3.0 \quad Q = \frac{8}{4} = 2.0$$

rate of temperature decrease from the water in beaker P = 3.0 $^\circ\text{C}/\text{min}$

rate of temperature decrease from the water in beaker Q = 2.0 $^\circ\text{C}/\text{min}$

[2]

- (iii) State which beaker P or Q has the more effective method of reducing the rate of temperature decrease.

Explain how you reached your conclusion.

Putting a lid on the beaker is a more effective method, because rate of temperature decrease in beaker Q is lower than beaker P. [1]



- (c) State **two** factors that must be controlled to make a valid comparison between the rates of temperature decrease of beaker P and beaker Q.

1 ~~Volume of water used.~~ Temperature of the lab/room ✓
2 Material ✓ from which the beaker is made.

[2]

- (d) This experiment compares the effect of a layer of insulation with the effect of a lid on the rate of decrease of temperature.

A student wants to find how the rate of decrease of temperature of the water in a beaker surrounded by a layer of insulation compares with the rate of decrease of temperature of the water in a beaker with no insulation.

Suggest **one** change to the apparatus that will enable this new comparison to be made.

Remove the lid from beaker Q. ✓

[1]

- (e) Handling a beaker containing hot water is dangerous.

State **one** safety precaution that the student takes when doing the experiment.

Wear safety gloves ✓ and use forceps to transport beakers.

[1]

[Total: 10]



- 3 A student investigates the potential difference across resistors in a circuit.

The student assembles the circuit shown in Figure 3.1.

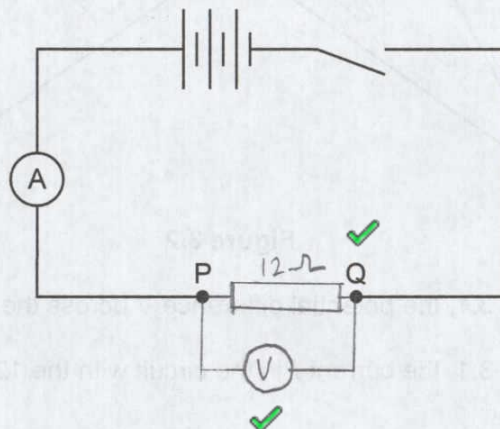


Figure 3.1

procedure

The student:

- connects a 12Ω resistor into the gap between terminals P and Q in the circuit
- connects a voltmeter to measure the potential difference across the resistor
- closes the switch
- measures and records the potential difference V across the resistor and the current I in the circuit
- opens the switch
- removes the 12Ω resistor.

- (a) (i) On Figure 3.1, using the correct circuit symbol, draw a resistor connected between terminals P and Q. [1]
- (ii) On Figure 3.1, using the correct circuit symbol, draw a voltmeter connected to measure the potential difference across the resistor. [1]

(b) The voltmeter and ammeter readings are shown in Figure 3.2.

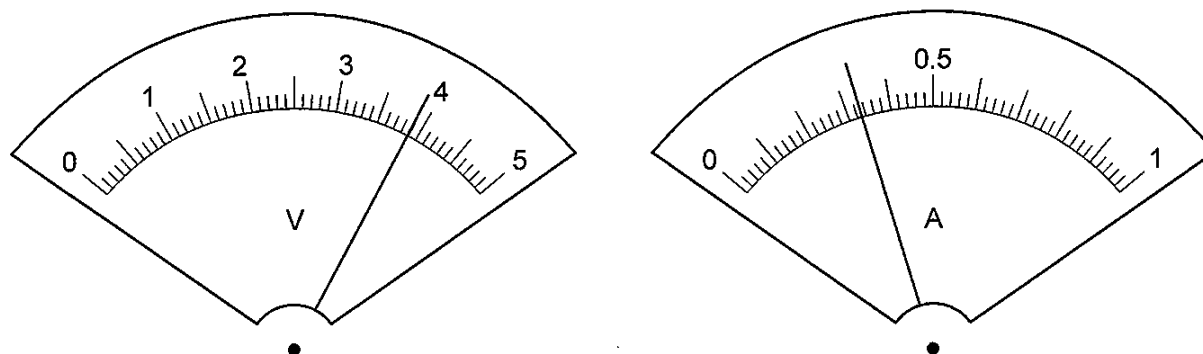


Figure 3.2

- (i) Record, in Table 3.1, the potential difference V across the 12Ω resistor. [1]
- (ii) Record, in Table 3.1, the current I in the circuit with the 12Ω resistor. [1]
- (c) The student repeats the procedure for resistors of value 15Ω , 18Ω , 22Ω and 33Ω .

The student's results are shown in Table 3.1.

Table 3.1

resistance R/Ω	potential difference V/V	current I/A
12	3.9 ✓	0.32 ✗ ✓
15	4.0	0.27 ✓
18	4.1	0.23 ✓
22	4.2	0.19 ✓
33	4.3	0.13

On the grid provided in Figure 3.3, plot a graph of V on the y -axis against I on the x -axis.

Start the x -axis from $I = 0A$.

Do not start the y -axis from $V = 0V$.

Draw the straight line of best fit.

[4]

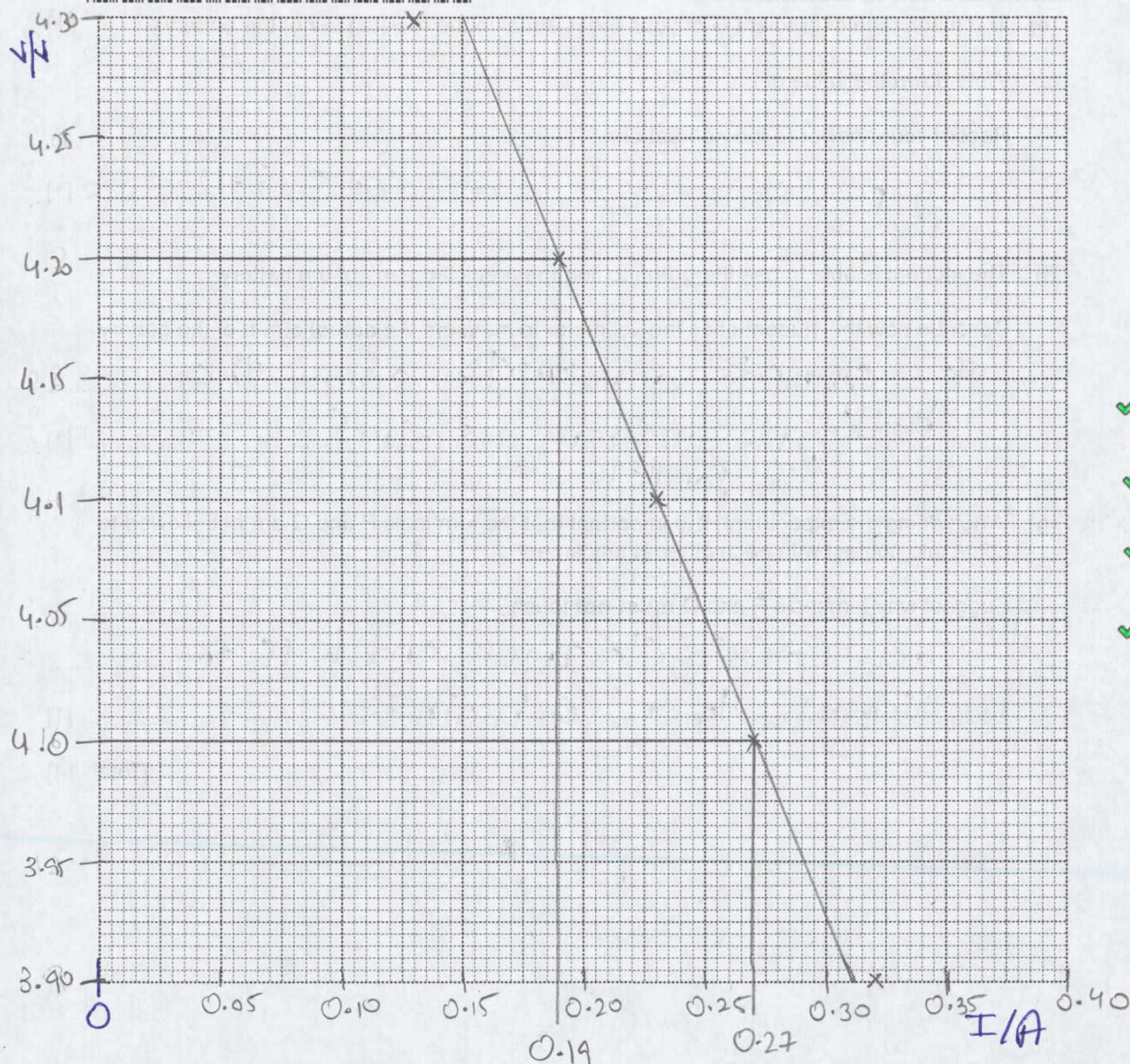


Figure 3.3

- (d) Determine the gradient G of your line. Show all working, and indicate on the graph the values you use.

$$(0.19, 4.20), (0.27, 4.0)$$

$$G = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4.20 - 4}{0.19 - 0.27} = -2.5$$

$$G = -2.5 \quad [3]$$



- (e) The magnitude of gradient G of your line is equal to the resistance r of the battery.

Write down the value of r .

Record your answer to the nearest ohm.

2.5 $\times$ 3

$r =$ ~~2.5~~ 3.0 Ω [1]

- (f) The student is able to use the graph to find the predicted e.m.f. of the battery.

Describe how the student uses the voltmeter to measure the **actual** e.m.f. of the battery.

He connects a voltmeter across the battery to measure its emf.
 in parallel [1]

- (g) When doing the experiment, it is important that the terminals P and Q are not allowed to come into contact with each other at any time.

Suggest why terminals P and Q **must not** touch.

Can cause electric shock if the terminals touch each other. [1]

[Total: 14]





SEEN

Turn over





- 4 When air moves over the surface of hot water in a beaker, it changes the rate of cooling of the hot water.

Plan an experiment to investigate the relationship between the speed of a fan producing the moving air and the rate of cooling of the hot water in the beaker.

The apparatus available includes:

a supply of hot water ✓
 a beaker ✓
 a thermometer ✓
 an electric fan with five speed settings. ✓

You may also use any apparatus commonly available in a school laboratory.

In your plan include:

- any other apparatus needed → stop watch, metre rule
- ✓ a brief description of the method, including what you will measure and how you make sure that your measurements are accurate
- the variables you will control (volume of water, initial Temp, beaker)
- ✓ a results table to record your measurements (you are not required to enter any readings in the table)
- ✓ how you will process your results to reach a conclusion.

★ 1 App's formule of ~~change~~ rate of
 Cooling as, $\frac{\text{change in Temp}}{\text{time taken}} = \frac{T_2 - T_1}{\text{time taken}}$

Additional apparatus:

1. stop watch

2. metre rule

~~Beaker~~ 3. Measuring cylinder



Procedure:

1. Place a beaker and with the help of a metre rule place the electric fan 10 cm away from it.
2. With the help of measuring cylinder pour 200cm^3 of water in the beaker.
- ✓ 3. Stir it and record the initial Temp^{erature} as T_1 .
4. Switch on the fan at the first speed level, as well as start the stop watch.
- ✓ 5. Make sure that fan's wind moves at the surface of the beaker rather than directly hitting the beaker.
6. Record Temperature after 60 seconds and measure the final Temperature after 5 minutes naming it T_2 .
- ✓ 7. Perform the exact same experiment with different wind speeds - settings. #1
- ✗ 8. Throughout the experiment make sure that volume of water used, material of beaker and the distance of fan, must remain constant. from the beaker
9. Repeat each experiment thrice and take its average value.
10. Tabulate data in this way.

Initial (T_1)	Final (T_2)	Rate of cooling Rate of cooling $^{\circ}\text{C/s}$	Wind speed setting.
Temp/ $^{\circ}\text{C}$	Temp/ $^{\circ}\text{C}$	Temp/ $^{\circ}\text{C}$	

[6]

11. To draw a conclusion, ~~plot~~ ^{draw} of ~~change in temp~~ ^{rate of cooling} against wind speed setting.



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