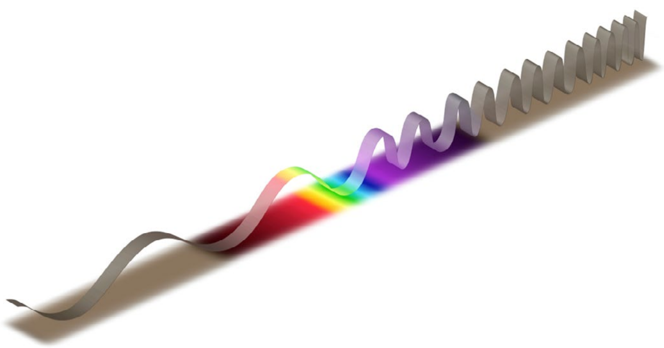
Cambridge Assessment International Education

Example Responses – Paper 6

Cambridge IGCSE™ / IGCSE (9–1) Physics 0625 / 0972

For examination from 2023



Cambridge Pathway

Contents

Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge IGCSE / IGCSE (9-1) Physics 0625 / 0972.

This booklet contains responses to all questions from June 2023 Paper 61, which have been written by a Cambridge examiner. Responses are accompanied by a brief commentary highlighting common errors and misconceptions where they are relevant.

The question papers and mark schemes are available to download from the School Support Hub

0625 / 0972 June 2023 Question Paper 61

0625 / 0972 June 2023 Mark Scheme 61

Past exam resources and other teaching and learning resources are available from the School Support Hub

Question 1

1 In this experiment, you will investigate the balancing of a metre ruler.

Carry out the following instructions, referring to Fig. 1.1.

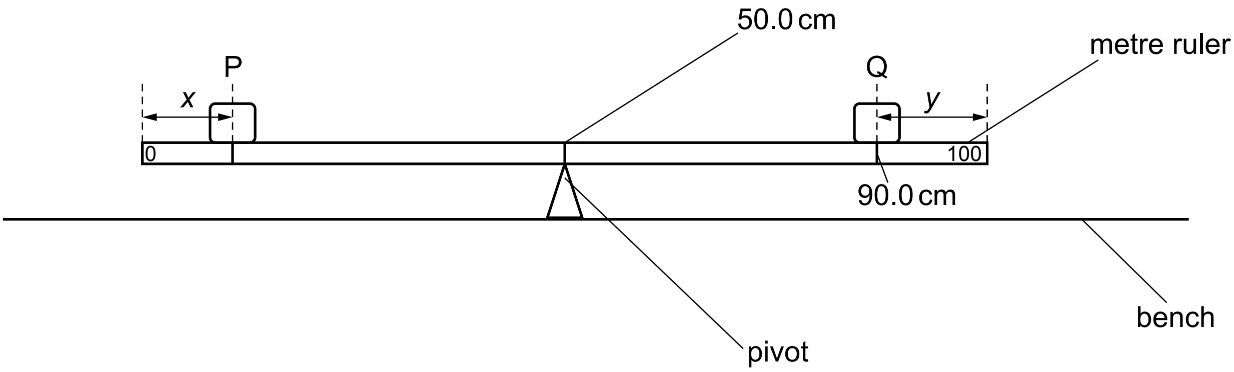


Fig. 1.1

(a)
- Place the metre ruler on the pivot at the 50.0 cm mark with its scale facing upwards.
- Place the object Q with its centre on the metre ruler at the 90.0 cm mark.

Record the distance *y* from the centre of Q to the 100.0 cm end of the ruler.

y = ...10.0.......... cm [1]

Examiner comment

A few candidates measured the distance on Fig. 1.1 instead of calculating the actual distance.

(b) The student places a load P of weight P = 2.0 N on the metre ruler.

He adjusts the position of the load so that the metre ruler is as near as possible to being balanced. He measures the distance x from the centre of P to the zero end of the ruler.

He repeats the procedure using loads of weight P = 3.0 N, 4.0 N, 5.0 N and 6.0 N. The values of P and x are shown in Table 1.1.

Table 1.1

P / N	x / cm
2.0	10.2
3.0	23.1
4.0	30.0
5.0	33.8
6.0	36.8

Describe the main difficulty that a student has when doing this experiment as accurately as possible.

obtaining an exact balance ....

....

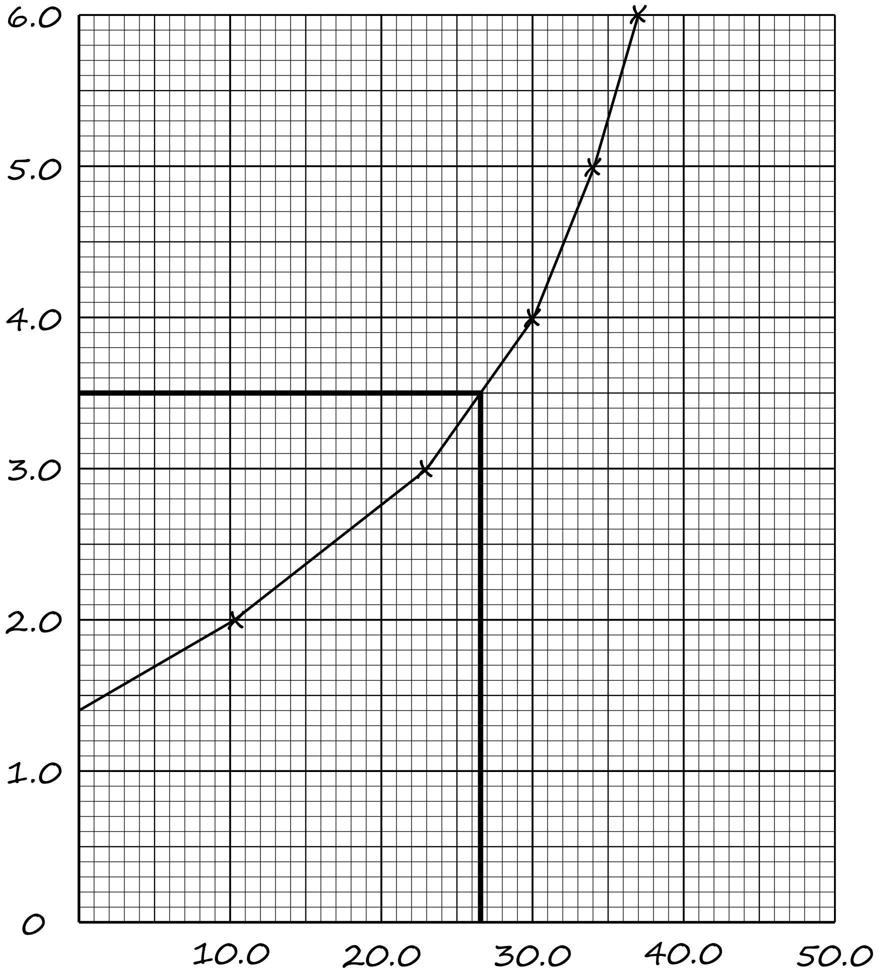
.... [1]

Examiner comment

Judging the position of the load and masses sliding along or off the ruler were alternative acceptable responses.

(c) Plot a graph of *P*/N (*y*-axis) against *x*/cm (*x*-axis).

Draw the best-fit line.



[4]

Examiner comment

Most candidates obtained readings that produced a clear curve when plotted. However, some candidates appeared to assume that a straight line graph was expected and so were not awarded the fourth graph mark.

(d) Use the graph to find the value of *x* required to balance the ruler when *P* = 3.5 N.

Show clearly on the graph how you determined the value of *x*.

x = ...26.5.......... cm [2]

Examiner comment

Most candidates were successful here, but some drew a triangle to work out the gradient of the line. This was not what the question demanded.

(e) Using apparatus from Fig. 1.1, explain briefly how you would determine the position of the centre of mass of the ruler.

balance the ruler on the pivot with no loads, the balance point shows

the centre of mass [2]

Examiner comment

- Many candidates did not realise that the loads must be removed.
- Candidates who successfully made the first point did not go on to explain how to read the position of the centre of mass.

Question 2

2 A student investigates the cooling of water under different conditions.

Fig. 2.1 shows the set-up.

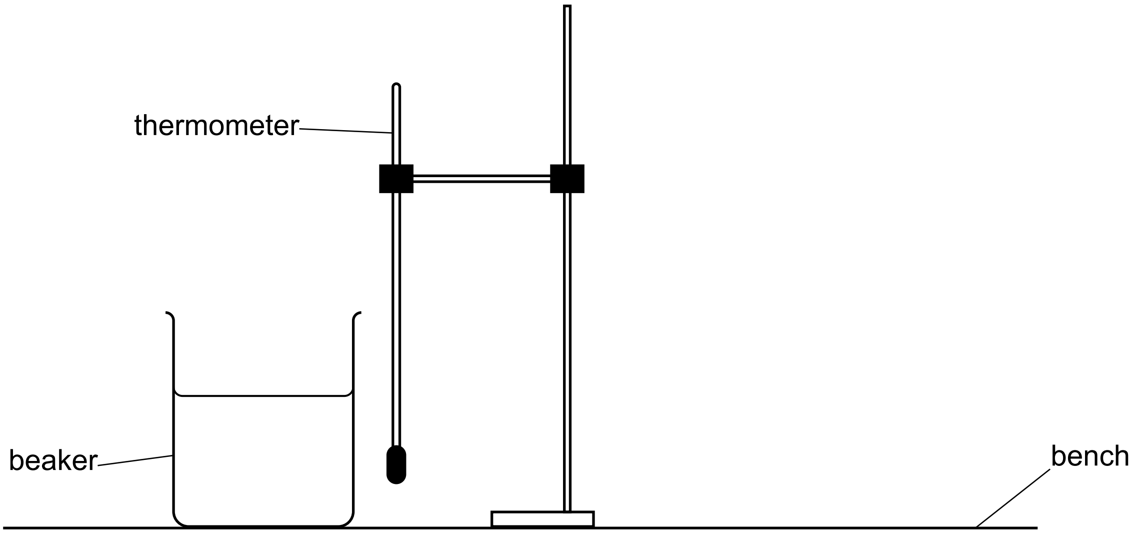


Fig. 2.1

(a) The thermometer in Fig. 2.2 shows the room temperature θ_R at the beginning of the experiment. Record θ_R.

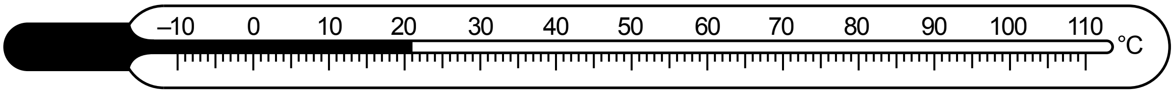


Fig. 2.2

θ_R = ...21 °C.......... [1]

Examiner comment

Some candidates recorded 20.1°C.

(b) **(i)** Pour 200 cm^3 of hot water into the beaker. Place the thermometer in the hot water in the beaker.

Record in Table 2.1 the temperature θ of the hot water at time $t = 0$. Immediately start the stop-watch.

Continue recording the temperature in Table 2.1 at 30 s intervals until you have seven sets of readings. [2]

(ii) Complete the column headings in Table 2.1.

Table 2.1

t / s	θ / °C
0	92
30	84
60	78
90	74
120	71
150	69
180	67

[1]

Examiner comment

- A few candidates gave a wrong unit for temperature (e.g. C°).
- A more common error was to miss the instruction to complete the column headings.

(c) **(i)** Calculate the decrease in temperature $\Delta\theta$ between $t = 0$ and $t = 180$ s.

$\Delta\theta$ = ...25 °C.......... [1]

(ii) Calculate the average rate of cooling R of the water using the equation $R = \frac{\Delta\theta}{\Delta t}$, where $\Delta t = 180$ s. Include the unit.

R = ...0.139 °C/s.......... [2]

(d) A student states that the average rate of cooling of the water decreases as the temperature comes nearer to room temperature.

(i) Suggest **one** change to the experiment that you could make to test the statement.

continue to take temperatures for a longer time..........

.... [1]

(ii) Suggest how to display the results to make it easier to see the trend in the rate of cooling.

plot a graph of temperature against time ....

....

.... [2]

Examiner comment

- Several approaches were possible here, all making the same basic point. For example, continuing to take temperatures until close to room temperature or using a higher or lower starting temperature.
- Some candidates correctly suggested plotting a graph but did not go on to specify the quantities to be plotted.

(e) Explain briefly why it is good practice to read the thermometer scale at right angles.

to avoid parallax error ....

.... [1]

Examiner comment

- Candidates did not need to use the word 'parallax' in their responses. A description of the effect, for example, the value looks different from other angle, or reference to avoidance of line-of-sight error, that showed that a candidate was familiar with good practice gained the mark.
- References to avoidance of inaccuracy or human error were too vague to attract the mark.

(f) The student uses a measuring cylinder to measure 200 cm^3 of hot water. She reads the scale at right angles.

Suggest another precaution to obtain an accurate reading of the volume of the water.

read the bottom of the meniscus ....

.... [1]

Examiner comment

Answers such as 'below the meniscus' were too vague.

Question 3

3 A student investigates the refraction of light using a semicircular transparent block.

Fig. 3.1 and Fig. 3.2 show his ray-trace sheet.

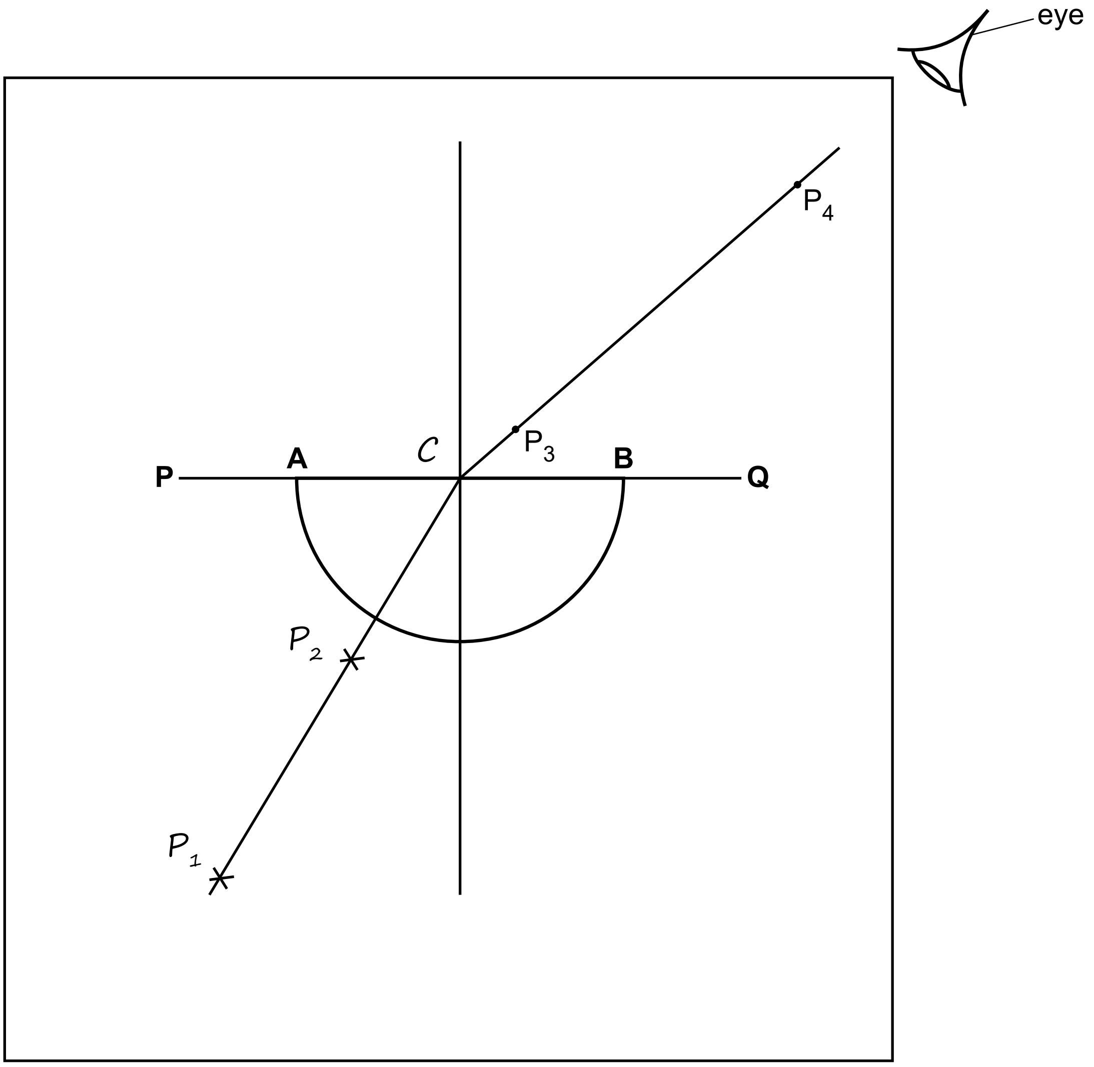


Fig. 3.1

(a)
- On Fig. 3.1, draw the normal **NL** through the centre of **AB**.
- Continue the normal so that it passes through the curved side of the block.
- Label the normal **NL**.
- Label the point **C** where the normal **NL** crosses **AB**.

[1]

(b) **(i)** Draw a line **DC**, below line **PC**, at an angle i = 30° to the normal and to the left of the normal. [1]

(ii)
- Mark with neat crosses (X) the positions for two pins on line **DC** at a suitable distance apart for this type of ray-trace experiment.
- Label the positions P_1 and P_2.

[1]

7

(b)
- Draw the line **DC** at an angle *i* = 30° to the normal, as shown in Fig. 3.1.
- Place the paper on the pin board.
- Place two pins, P_1 and P_2, on line **DC** at a suitable distance apart for this experiment.
- Replace the block and look from the position of the eye shown in Fig. 3.1 to observe the images of P_1 and P_2 through side **AB** of the block. Adjust your line of sight until the images of P_1 and P_2 appear one behind the other.
- Place two pins, P_3 and P_4, between your eye and the block so that P_3, P_4, and the images of P_1 and P_2 seen through the block, appear one behind the other.
- Label the positions of P_1, P_2, P_3 and P_4.
- Remove the block and the pins.
- Draw a line joining the positions of P_3 and P_4. Continue the line to **AB**.
- Label **E**, the end of the line furthest from **AB**.

[3]

(c) Measure the acute angle θ between the line **NL** and the line **CE**. (An acute angle is less than 90°.)

θ = ...48..........° [2]

Examiner comment

While most candidates constructed the diagram well, many placed the two pins P_1 and P_2 too close together. A minimum distance apart of 5.0 cm was required.

(d) State **one** precaution that you take to produce an accurate ray trace.

view the bases of the pins

.... [1]

Examiner comment

- Other acceptable responses included 'place pins as far apart as possible', 'use a sharp pencil / draw thin lines' or 'ensure pins are vertical'.
- Some candidates appeared to have learned answers from previous examination paper mark schemes and made suggestions appropriate for different experiments. For example 'use a darkened room' which would be appropriate for a lens experiment using an illuminated object.

(e) The student moves the transparent block to a new position on the ray-trace sheet, as shown in Fig. 3.2.

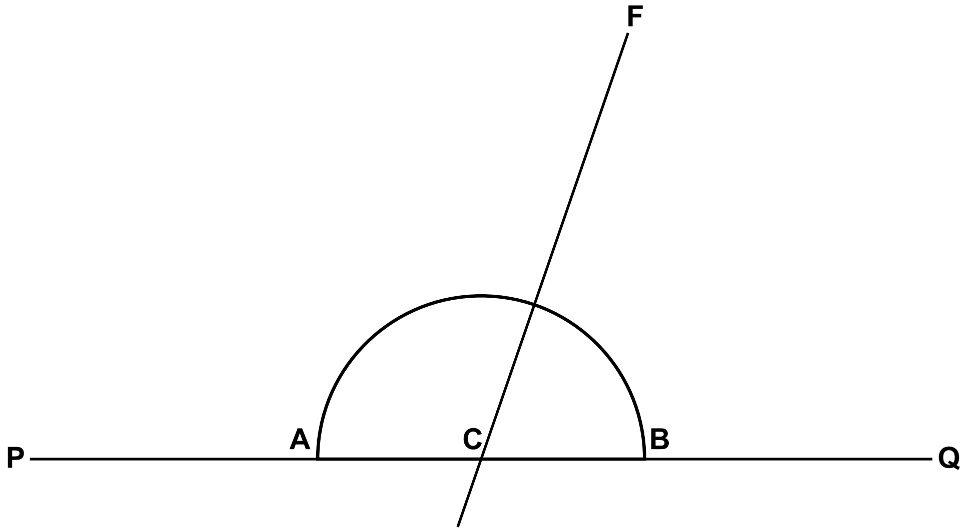


Fig. 3.2

He places pins P_1 and P_2 on line **DC** in the same positions used in **(b)(ii)**.
He observes the images of P_1 and P_2 through the curved side of the block.

He places pins P_5 and P_6 between his eye and the block so that P_5, P_6, and the images of P_1 and P_2 seen through the block, appear one behind the other.

He draws a line **CF** through the positions of P_5 and P_6.

(i) Measure the acute angle β between the line **AB** and the line **CF**. (An acute angle is less than 90°.)

β = ...72..........° [1]

(ii) Calculate the angle θ between line **CF** and the normal to line **AB**. Show your working.

90° – 72°

θ = ...18..........° [2]

(f) A student suggests that angle α should be equal to angle θ. State whether your results support the suggestion and justify your answer with reference to the results.

statement the results do not support the suggestion

justification the values of α and β are too different

....

.... [1]

Examiner comment

Some candidates wrote a statement that did not match their results. Alternative acceptable justifications include values are more than 10% different or the values are beyond the limits of experimental accuracy.

Question 4

4 A student investigates the change in resistance of a lamp filament when the current in the lamp is increased.

The following apparatus is available:

- a power supply
- a low-voltage filament lamp
- an ammeter
- a voltmeter
- connecting wires.

Other apparatus normally found in a school laboratory is also available.

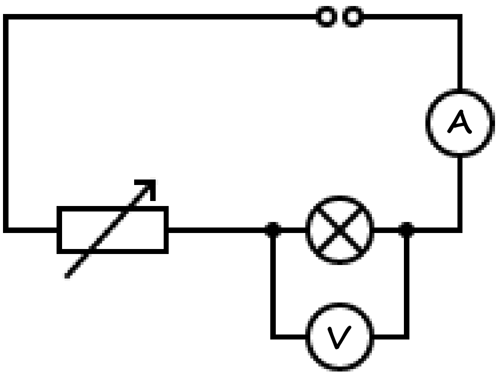
Plan an experiment to investigate the change in resistance of the lamp filament when the current in the lamp is increased.

Resistance *R* is given by the equation $R = \frac{V}{I}$, where *V* is the potential difference (p.d.) across the lamp and I is the current in the lamp.

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

You should:

- draw a diagram of the circuit used
- explain briefly how to do the investigation, including how to change the current
- draw a table, or tables, with column headings, to show how to display your readings (you are **not** required to enter any readings in the table)
- explain how to use your readings to reach a conclusion.



Method:

- *using the circuit shown, measure the current in the lamp and the potential difference across the lamp*
- *calculate the resistance*
- *repeat with five different values of current*
- *use a variable resistor to change the current*

Table:

- *write readings and results in a table as shown:*

I/A	V/V	R/Ω

Conclusion:

- *plot a graph of resistance against current*

[7]

Examiner comment

- Diagram: the main error with the circuit diagram was to place the voltmeter in series with the other components.
- Method: many candidates included unnecessary information in the method, often copying the list of apparatus from the question. Candidates often missed out one of the essential readings (current or potential difference), what to do with the readings (i.e. calculate the resistance) and a method for changing the current.
- Table: the most common error seen in the table was current / I, instead of I / A.
- Conclusion: a clear statement about comparing values of current and resistance as an alternative to the graph was acceptable. Instead of a conclusion, some candidates wrote a prediction which was not required and was not awarded a mark.

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