

P510/3

Physics

Paper 3

3  $\frac{1}{4}$  hours



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# Apex Examination Council

## MOCK EXAMINATIONS 2025

Uganda Advanced certificate of education

PHYSICS

Paper 3(PRACTICAL)

3 hours 15 minutes

### INSTRUCTIONS TO CANDIDATES:

*Answer question 1 and **one** other question.*

*Any additional question(s) answered will **not** be marked.*

*Candidates are **not** allowed to use the apparatus or write for the first fifteen minutes.*

*Graph papers are provided.*

*Mathematical tables and non – programmable silent electronic calculators may be used.*

*Candidates are expected to record on their scripts all their observations as they are made and to plan the presentation of the records so that it is **not** necessary to make a fair copy of them. The working of the answers is to be handed in.*

*Details on the question paper should **not** be repeated in the answer, nor is the theory of the experiment required unless specifically asked for.*

*Candidates should however record any special precautions that they have taken and any particular features of their method of going about the experiment.*

*Marks are given mainly for a clear record of the observations actually made, for their suitability and accuracy, and for the use made of them.*

1. In this experiment, you will determine the acceleration due to gravity,  $g$  by two methods.

### METHOD I

- (a) Tie the pendulum bob at the end of the long piece of thread provided.
- (b) Suspend the pendulum bob shown in figure 1 by clamping the end of the thread using two small pieces of wood blocks, such that length,  $x = 0.900m$ .

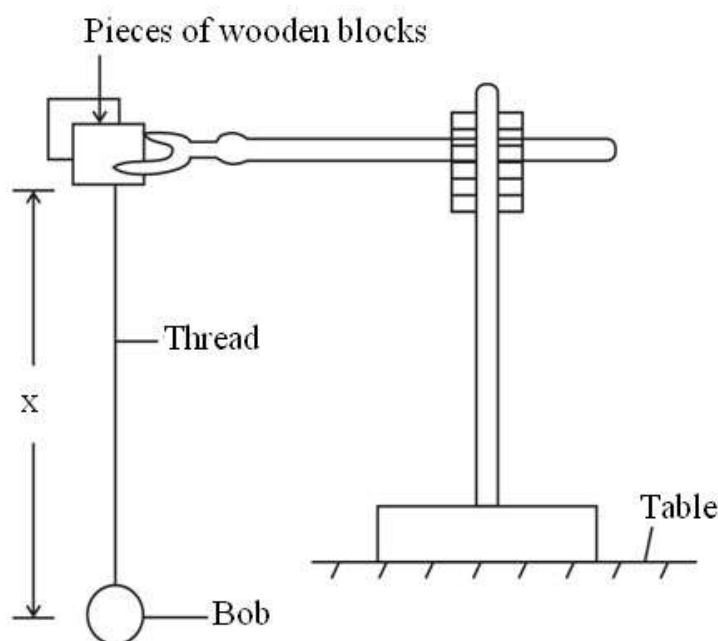


Fig. 1

- (c) Displace the bob slightly and release it to oscillate.
- (d) Measure and record the time,  $t$  for 20 oscillations.
- (e) Calculate period  $T$ .
- (f) Find the acceleration,  $g$  due to gravity from,  $g = \frac{4\pi^2 x}{T^2}$ .
- (g) Dismantle the apparatus.

## METHOD II

(a) Clamp the metre rule horizontally so that its scale faces you.

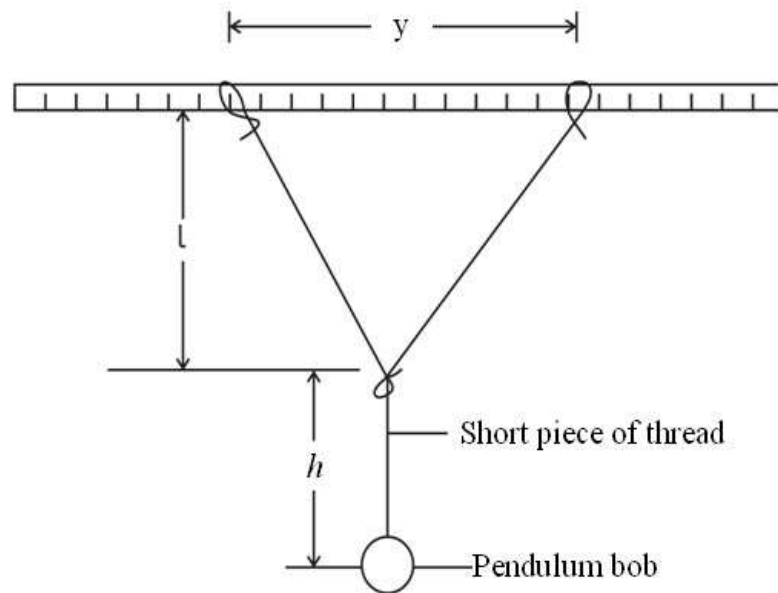


Fig. 2

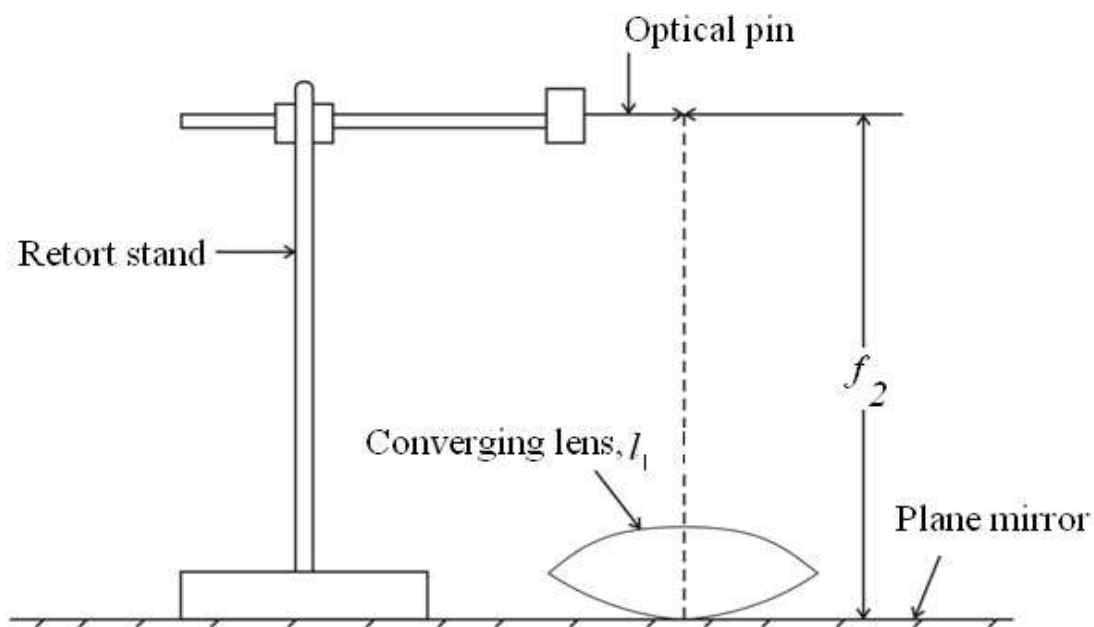
- (b) Make a lope at the end of the long piece of thread.
- (c) Slide the metre rule through the loop and tighten the loop.
- (d) Tie the free end of the thread on the metre rule such that the length of thread between the two loops is  $1.00\text{m}$ .
- (e) Tie the pendulum bob at the end of the short piece of thread.
- (f) Suspend the pendulum bob from the mid point of the looping thread such that the length,  $h$ , is  $0.200\text{m}$  as shown in figure 2..
- (g) Adjust the two loops to the  $0.400\text{m}$  and  $0.600\text{m}$  marks on the metre rule.
- (h) Read the distance,  $y$  between the two marks.
- (i) Measure and record the height,  $l$  in metres.
- (j) Displace the bob slightly towards you and release it to oscillate.

- (k) Measure and record the time,  $t$ , for 20 oscillations.
- (l) Determine the period,  $T$ .
- (m) Adjust the distance,  $y$  to  $0.300m$  by moving each loop towards the end of the metre rule.
- (n) Repeat procedure(s) (i) to (l).
- (o) Repeat procedures (i) to (l) for values of  $y = 0.400, 0.500, 0.600$  and  $0.700m$ .
- (p) Tabulate your results including values of  $T^2$ .
- (q) Plot a graph of  $T^2$  against  $l$ .
- (r) Find the slope,  $S$ , of the graph.
- (s) Calculate the acceleration due to gravity,  $g$  from  $g = \frac{4\pi^2}{S}$ .

2. In this experiment, you will determine the focal length,  $f$ , of the converging lens provided using two methods.

#### METHOD I

- (a) Mount the lens  $L$  provided in the holder.
- (b) Focus a distant object on to the screen.
- (c) Measure and record the distance,  $f_1$ , between the lens and the screen.
- (d) Remove the lens from the holder.
- (e) Place a plane mirror on the bench with the shiny surface facing up.
- (f) Place the lens on the plane mirror as shown in the figure 3.



**Fig. 3**

- (g) Clamp an optical pin on the retort stand such that its pointed end lies along the axis of the lens.
- (h) Adjust the height of the pin to locate the position at which the pin appears to coincide with its image while looking through the lens.
- (i) Measure distance  $f_2$  of the pin from the mirror.
- (j) Find the focal length  $f_1$  from  $f = \frac{f_1 + f_2}{2}$ .

## METHOD II

### PART I

- (a) Connect the dry cell, rheostat,  $P$ , switch,  $S$ , ammeter,  $A$  and a resistor of  $5\Omega$  in series as shown in figure 5.

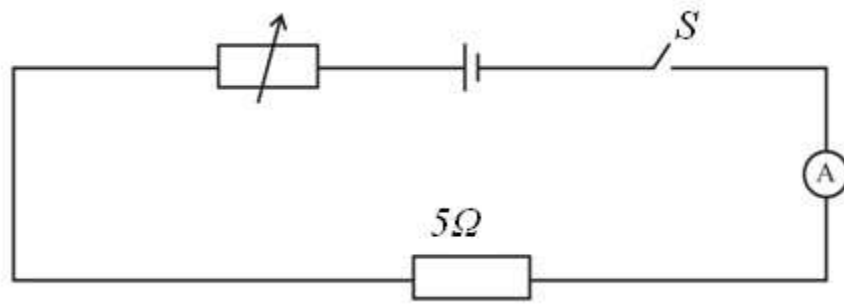


Fig. 5

- (b) Close switch  $S$ .
- (c) Adjust the rheostat until the ammeter registers a current,  $I = 0.08A$ .
- (d) Disconnect the circuit but keep the setting of the rheostat unaltered.
- (e) Connect the circuit as shown in figure 6.

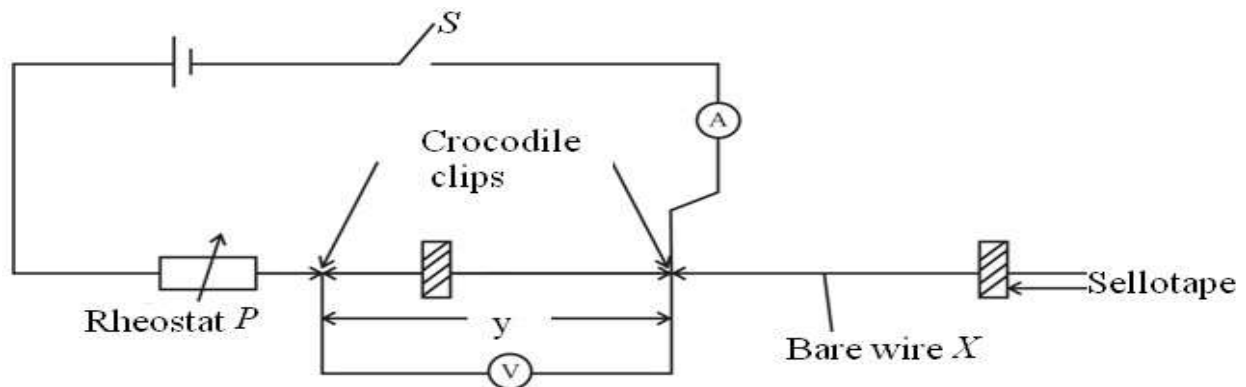


Fig. 6

- (f) Close switch,  $S$ .
- (g) Without altering the setting of the rheostat adjust the position of the crocodile clips until the reading of the ammeter,  $I = 0.08A$ .
- (h) Read and record the length,  $y_0$  of the bare wire,  $X$  between the two crocodile clips.
- (i) Open switch,  $S$ .
- (j) Calculate the resistance per metre length  $r_0$  from  $r_0 = \frac{5}{y_0}$ .

- (k) Close switch,  $S$ .
- (l) Adjust the length of the bare wire,  $X$  between the crocodile clips such that  $y = 0.200m$ .
- (m) Adjust the rheostat until the current registered by the ammeter reading,  $I = 0.08A$ .
- (n) Repeat and record the voltmeter reading,  $V$ .
- (o) Repeat procedures (l) to (n) for values of  $y = 0.300, 0.400, 0.500, 0.600$  and  $0.700m$ .
- (p) Disconnect the circuit.
- (q) Tabulate your results including values of  $\frac{I}{V}$  and  $\frac{1}{y}$ .
- (r) Plot a graph of  $\frac{1}{y}$  against  $\frac{I}{V}$ .
- (s) Determine the slope,  $r_1$  of the graph.

## PART II

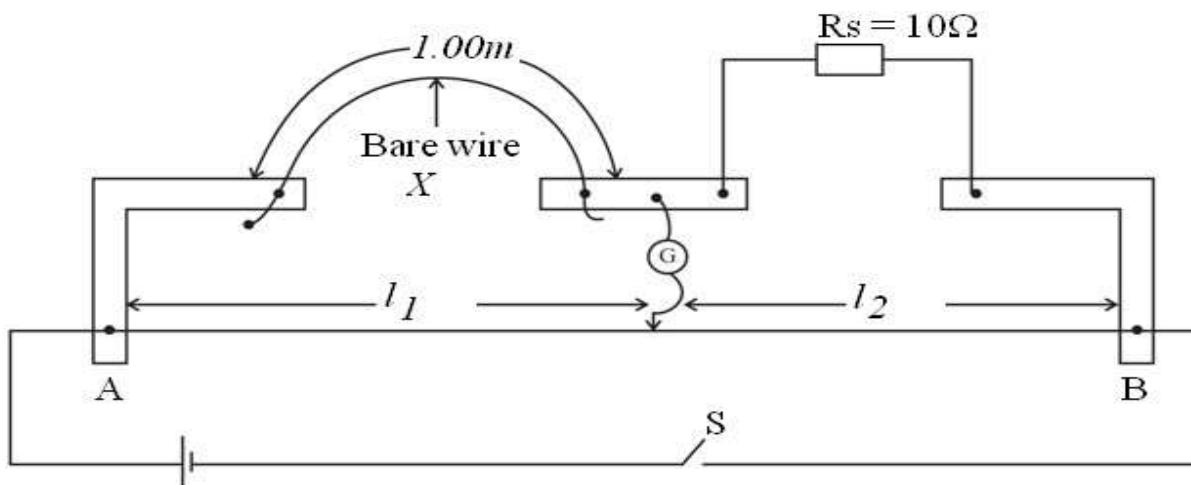


Fig. 7

- (a) Connect the circuit shown in figure 7 with  $1.00\text{m}$  length of the bare wire,  $X$  connected in the left hand gap of the metre bridge.
- (b) Connect the standard resistor,  $R_s = 10\Omega$  in the right hand gap of the metre bridge.
- (c) Close switch,  $S$ .
- (d) Move the sliding contact,  $Q$  along the metre bridge wire  $AB$  to locate a point for which the galvanometer,  $G$  shows no deflection.
- (e) Read and record the balance lengths  $l_1$  and  $l_2$ .
- (f) Open switch  $S$ .
- (g) Calculate the resistance per metre,  $r_2$ , of the bare wire,  $X$  from  $r_2 = R_s \frac{l_1}{l_2}$ .
- (h) Repeat procedures (b) to (f) with  $s = 5.0\Omega$ .
- (i) Calculate the resistance per metre length,  $r_3$  of bare wire,  $X$  from  $r_3 = R_s \frac{l_1}{l_2}$ .
- (j) Calculate the average of  $r_0, r_1, r_2$  and  $r_3$ .

**END**