

Students Name:

School Name:..... Index Number



HES MOCK EXAMINATIONS 2025

UGANDA ADVANCED CERTIFICATE OF EDUCATION

PHYSICS

PRACTICAL

PAPER 3

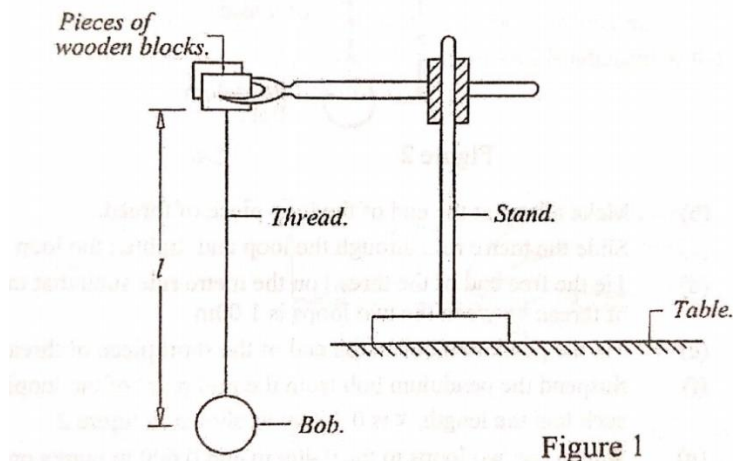
3 HOURS 15 MINUTES

INSTRUCTIONS

- Answer **Question 1** and **one** other question.
- 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.
- Write on one side of the paper only.
- Candidates are expected to record on their scripts all their observations as these observations 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.

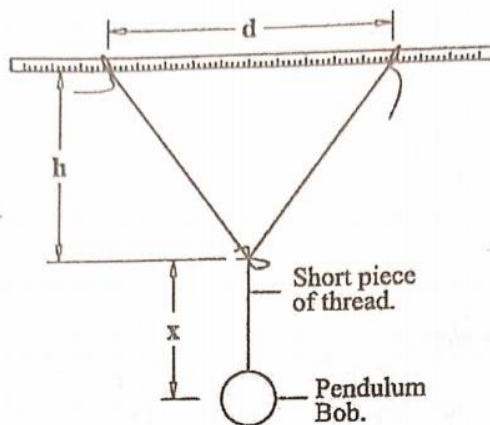
1. In this experiment, you will determine the acceleration due to gravity, g by two methods (34 marks)

METHOD I



- Tie the pendulum bob at the end of the long piece of thread provided.
- Suspend the pendulum bob as shown in figure I by clamping the end of the thread using two small pieces of wooden blocks, such that length $l = 0.900m$.
- Displace the bob slightly and release it to oscillate.
- Measure and record the time t for 20 oscillations.
- Calculate the period T .
- Find the acceleration, g due to gravity from, $g = \frac{4\pi^2 l}{T^2}$.
- Dismantle the apparatus.

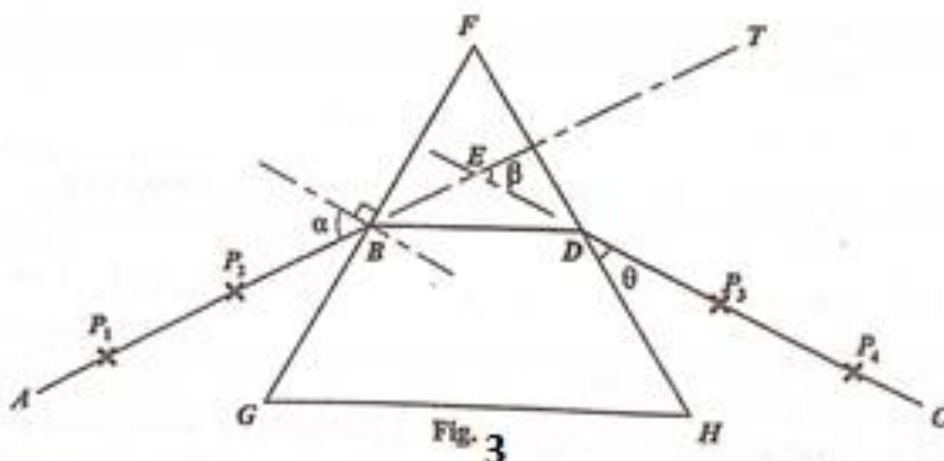
METHOD II



- a) Clamp the metre rule horizontally so that its scale faces you.
- b) Make a loop 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 the thread between the two loops is 1.00cm .
- e) Tie the pendulum bob at the of the short piece of thread.
- f) Suspend the pendulum bob from the mid-point of the looping thread such that the length, x is 0.200cm as shown in figure 2.
- g) Adjust the two loops to the 0.004m and 0.600m marks on the metre rule.
- h) Read the distance, d between the two marks.
- i) Measure and record the height, h in metres.
- j) Displace the bob slightly towards yourself and release it to oscillate.
- k) Measure and record the time, t , for 20 oscillations.
- l) Determine the period, T .
- m) Adjust the distance, d to 0.300m by moving each loop towards the end of the metre rule.
- n) Repeat procedures (i) to (l) for values of $d = 0.400, 0.500, 0.600, \text{ and } 0.700\text{m}$.
- o) Tabulate your results including values of T^2 .
- p) Plot a graph of T^2 against h .
- q) Find the slope, w of the graph.
- r) Calculate acceleration, g due to gravity from, $g = \frac{4\pi^2}{w}$.

DISMANTLE THE SET UP

2. In this experiment, you will determine the refractive index, of the material of the glass prism provided. (33 marks)



- Fix the white sheet of paper on the drawing boarding using thumb pins.
- Place the prism on the sheet of paper and trace its outline, FGH.
- Remove the prism and draw a normal at point, B midway between F and G.
- Draw a line ABT making an angle, $\alpha = 35^\circ$ with the normal drawn at point B as shown in figure 3.
- Place the prism back on its outline.
- Fix optical pins P_1 and P_2 along AB.
- Looking from side FH, fix pins P_3 and P_4 , such that they appear in line with the images of P_1 and P_2 .
- Remove the prism and draw a line CE through points P_3 and P_4 to meet line FH, at D.
- Measure and record angles $HDC = \theta$ and $CET = \beta$.
- Find $\phi = \beta + \theta - 90$.
- Repeat procedures (d) to (j) for $\alpha = 40^\circ, 45^\circ, 50^\circ, 55^\circ, 60^\circ$ and 65° .
- Record your results in a suitable table.
- Plot graphs of ϕ against α and β against α using the same axes.
- Read and record the intercept, c on the vertical axis for the graph of ϕ against α .
- Read and record the minimum value, β_o of β from the graph of β against α .
- Calculate the refractive index, k of the material of the prism from the expression

$$k = \frac{\sin \left[\left(\frac{\beta_o - c}{2} \right) \right]}{\sin \left(\frac{-c}{2} \right)}$$

HAND IN THE TRACINGS TOGETHER WITH YOUR WORK

3. In this experiment, you will determine the:

- i. Potential difference per metre, t , of the potentiometer wire.
- ii. Resistivity, l , of the wire W

(33 marks)

PART 1

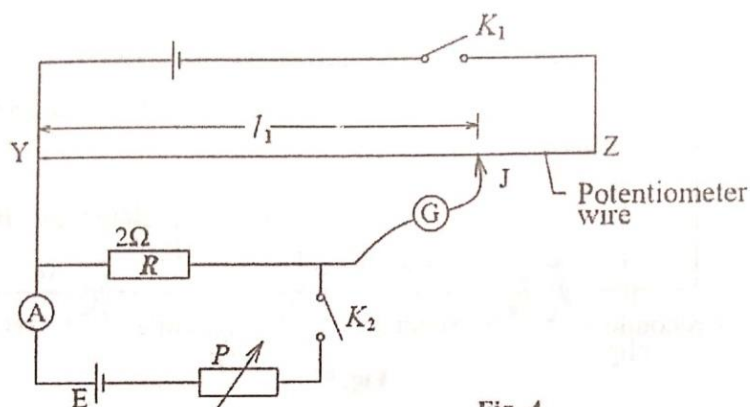


Fig. 4

- a) Connect the circuit as in figure 4.
- b) Close switch, K_2 .
- c) Adjust the rheostat, P , so that the ammeter indicates a current, $I_2 = 0.12A$.
- d) Close switch K_1 .
- e) Move the sliding contact, J , along the potentiometer wire YZ , to locate a point for which the galvanometer, G , show no deflection.
- f) Read and record the balance length, l , in meters.
- g) Open switch, K_1 .
- h) Repeat the procedure (c) to (e) for the ammeter reading $I_2 = 0.20A$.
- i) Read and record the balance length, l_2 , in meters.
- j) Open switches K_2 and K_1 .
- k) Find the potential difference per meter, t , across the potentiometer wire from the expression

$$t = \frac{R}{2} \left[\frac{I_1}{l_1} + \frac{I_2}{l_2} \right].$$

PART II

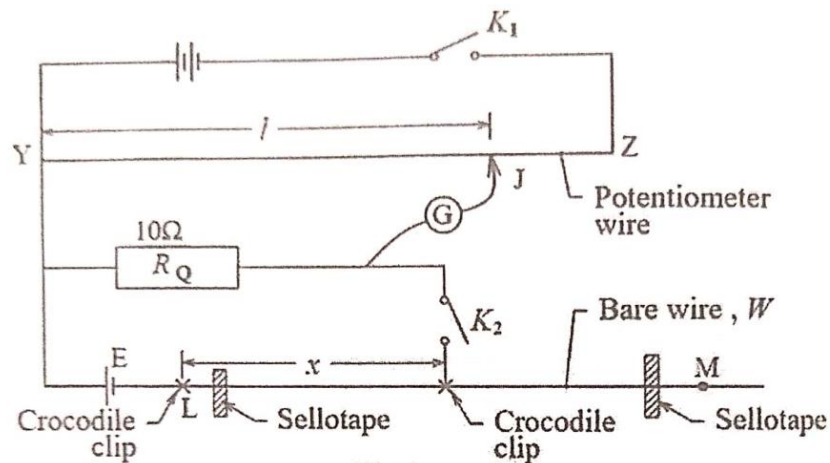


Fig. 5

- a) Measure and record the diameter, d , of the wire, W , in meters.
- b) Connect the circuit shown in figure 5 with length, $x = 0.200\text{m}$.
- c) Close the switches K_2 and K_1 .
- d) Move the sliding contact, J , along the potentiometer wire YZ , to locate a point for which the galvanometer, G , show no deflection.
- e) Read and record the balance length, l , in meters.
- f) Open the switches K_2 and K_1 .
- g) Repeat the procedures (b) to (f) for values of $x = 0.300, 0.400, 0.500, 0.600$ and 0.700m .
- h) Tabulate your result including values $\frac{1}{l}$.
- i) Plot a graph of $\frac{1}{l}$ against x .
- j) Find the slope, S , of the graph.
- k) Find the intercept, C , on the $\frac{1}{l}$ axis.
- l) Determine the resistivity, ℓ of the wire, W , from the expression;

$$\ell = \frac{\pi d^2 S R_Q}{4C}$$

END