URANGA PHYSICS JOINT EXAMINATION

Kenya Certificate of Secondary Education

232/3 **FORM 3 PHYSICS** **- Paper 3**

JUNE 2021 - $2\frac{1}{2}$Hours

NAME: …… ADM NO: ……..……

SCHOOL: ……..……

Candidate's Signature: ……. Date: …….

Instructions to candidates

1. *Write your Name, Admission number and Name of school in the spaces provided above.*
2. *Sign and write the date of Examination in the spaces provided above.*
3. *Answer all questions in the spaces provided.*
4. *You are supposed to spend the first 15 minutes of the hours allowed for this paper reading the whole paper carefully before commencing your work.*
5. *Marks will be given for clear records of observations actually made, their suitability, accuracy and the use made of them.*
6. *Students are advised to record their observations as soon as they are made.*
7. *All working must be clearly shown where necessary.*
8. *Mathematical tables and silent electronic calculators may be used.*
9. *Answer the questions in English.*
10. *This paper consists of 8 printed pages. Students are advised to check that all pages are printed as indicated and no questions are missing.*

For Examiners Use Only

QUESTIONS	MAXIMUM SCORE	STUDENT'S SCORE
1	20	
2	20	
TOTAL	40	

TURN OVER

QUESTION 1

You are provided with the following:

- Vernier calipers (to be shared)
- Rectangular glass prism
- White sheet of paper
- Soft board.
- Protractor.
- 30 cm transparent ruler.
- Four optical pins.
- A metre-rule
- A stop watch
- A marble
- A watch glass
- Some plasticine
- Micrometer screw gauge (to be shared)

PART A

Proceed as follows: -

(a) Draw the outline of the glass prism on the sheet of paper provided as shown in **figure 1**.

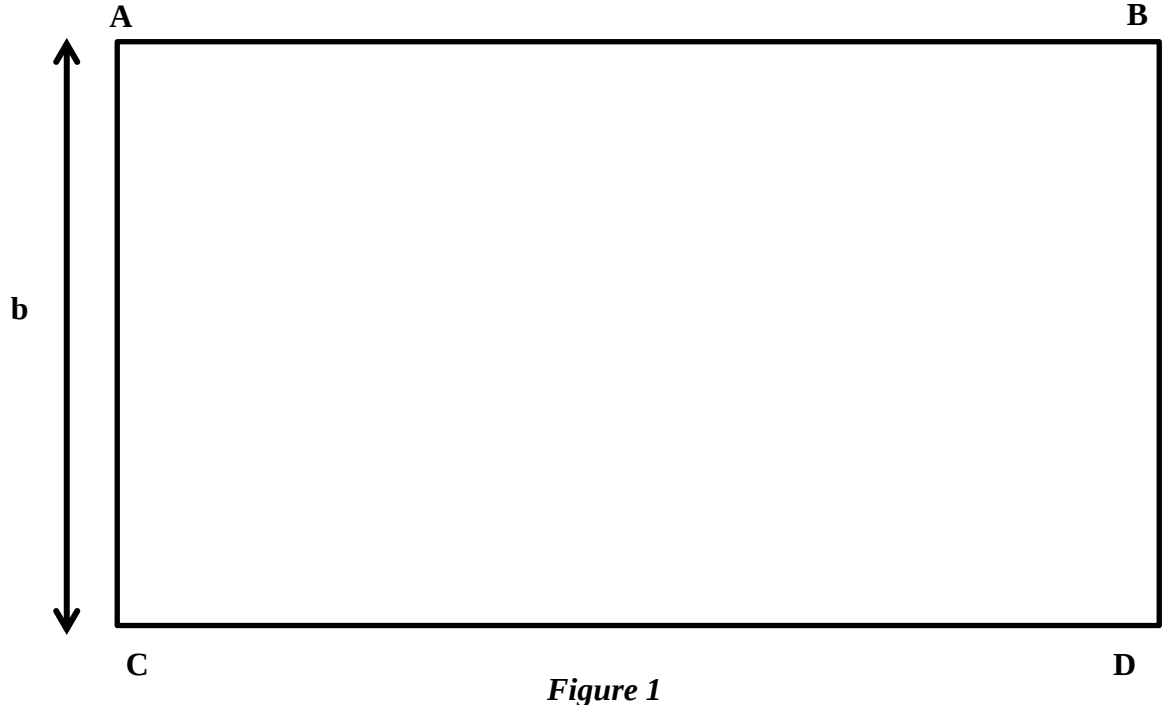


Figure 1

(b) Using the vernier calipers, measure the actual breadth, **b** of the glass prism. (1 mark)

b = ……cm

(c) Along the side **AB**, construct a normal **XY** about 3 cm from point **A** to cut line **AB** at point **O**. This is shown in **figure 2.**

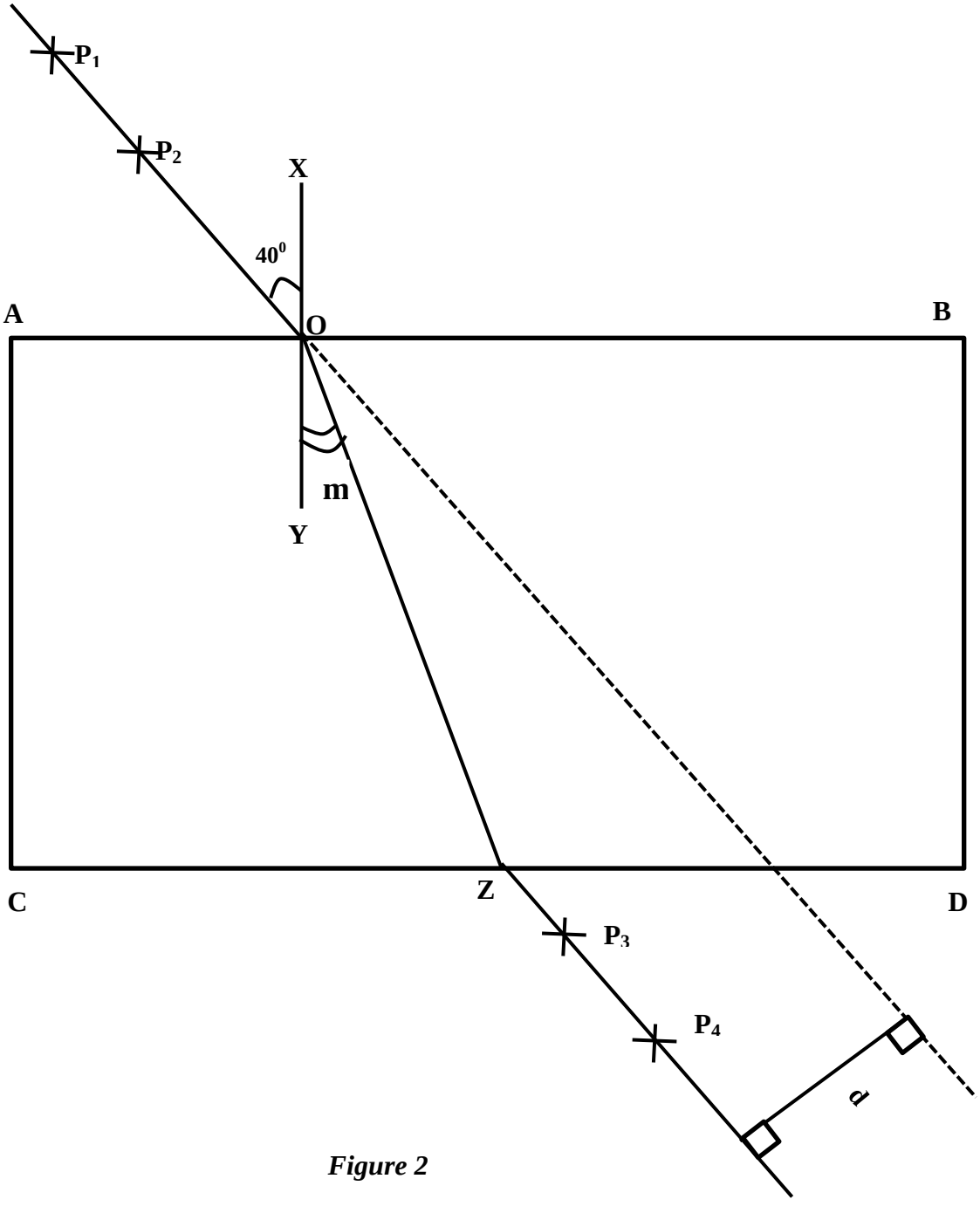


Figure 2

NB: Attach the piece of paper to your question paper for marking. (2 marks)

(d) At the normal, construct an angle of 40^0 being the angle of incidence (i) as shown in **figure 2.**

(e) Insert two pins $\mathbf{P_1}$ and $\mathbf{P_2}$ along the path drawn as indicated in **figure 2**.

(f) Produce $\mathbf{P_1P_2}$ with a dotted line to cut line **DC** and beyond.

(g) View through the glass prism from the side **DC** and insert pins $\mathbf{P_3}$ and $\mathbf{P_4}$ to be in a straight line with the images of pins $\mathbf{P_1}$ and $\mathbf{P_2}$.

(h) Join line $\mathbf{P_3}$ and $\mathbf{P_4}$ to meet line **DC** at **Z**.

(i) Join point **Z** to point **O** with a straight line.

(j) Measure angle **YOZ** which is the angle **m**.

m =…….. (1 mark)

(k) Given that; $\boldsymbol{n = \frac{\sin i}{\sin m}}$, determine the value of **n**. (2 marks)

(l) Measure **d**, the perpendicular distance between the line P_1P_2 and the line P_3P_4 produced.

d = ……**cm** (1 mark)

(m) Determine the value of **t**, given that; (3 marks)

$$\boldsymbol{d = \frac{t \sin(i-m)}{\cos m}}$$

PART B

Proceed as follows: -

(n) Arrange the apparatus as shown in **figure 3**:

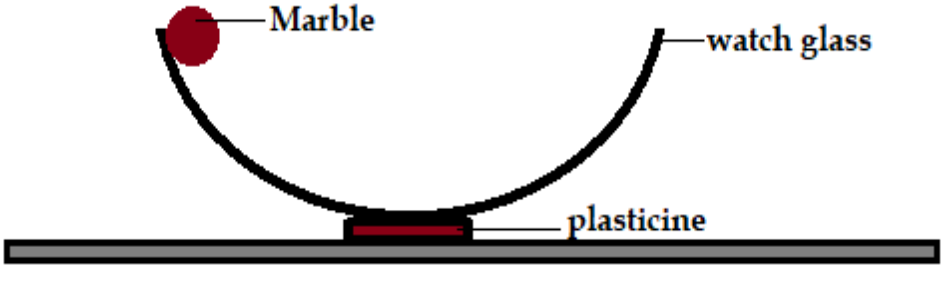


Figure 3

(o) Place the marble on one end of the watch glass and release it from the edge of the watch glass to oscillate freely. Record the time $\mathbf{t_1}$ taken by the marble to make 5 complete oscillations. Repeat this 2 times and calculate the average time for 5 oscillations. Complete **table 1** below.

Table 1 (3 marks)

$\mathbf{t_1(s)}$	$\mathbf{t_2(s)}$	$t_{AVR} = \frac{t_1 + t_2}{2}$ (s)

(p) Calculate the periodic time, **T(s).**

T = …….s (1 mark)

(q)

i. Measure the diameter, **D** of the marble using the micrometer screw-gauge.

D = ……m (1 mark)

ii. Determine the volume, **V** of the marble. (Take $\pi = 3.142$)

V = …….... (2 $marks$)

(r) The period, **T**, of oscillation of the marble is related by the equation:

$$\boldsymbol{T = 2\pi\sqrt{\frac{7(b-r)}{5g}}}$$

Where **r** is the radius of the marble; **g = 10 m/s^2** and **b** is a constant of the watch glass. Determine the value of **b**. (3 marks)

QUESTION 2

You are provided with the following:

- A resistance wire PQ mounted on millimeter scale.

- Two dry cells in a cell holder.
- An ammeter.
- A voltmeter.
- A switch.
- Six connecting wires (at least two with a crocodile clip at one end)

Proceed as follows: -

a. Set up the circuit as in **figure 4** and determine the total electromotive force, E, of the cells.

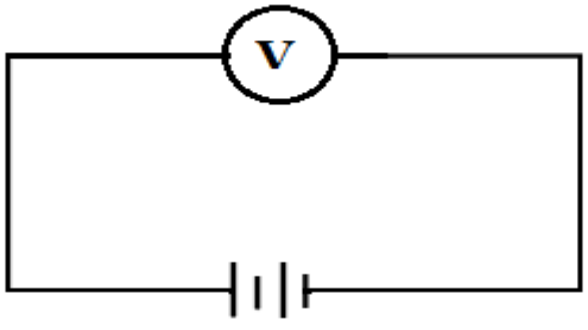


Figure 4

Electromotive force **E**, of the cells = ……. V (1 mark)

b. Set up the circuit as in shown in **figure 5**.

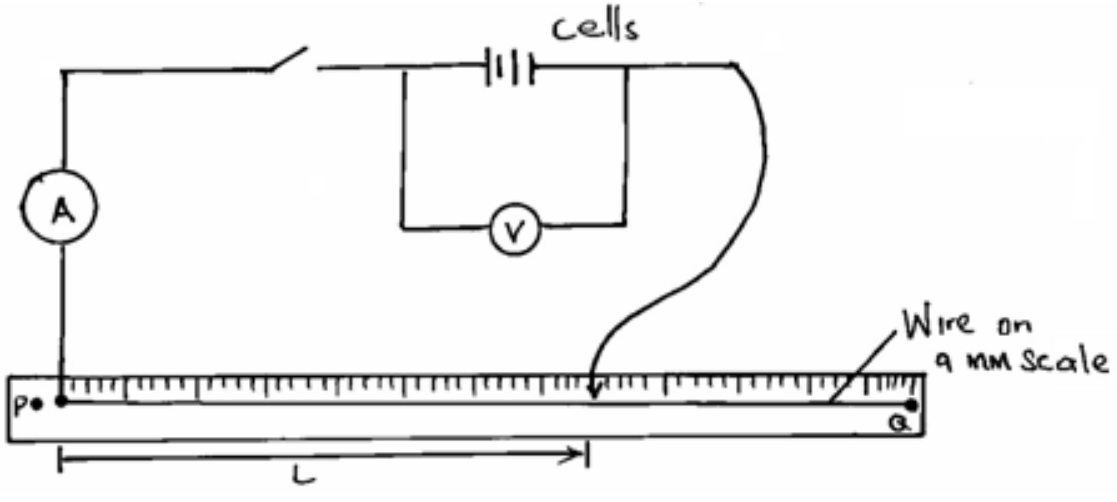


Figure 4

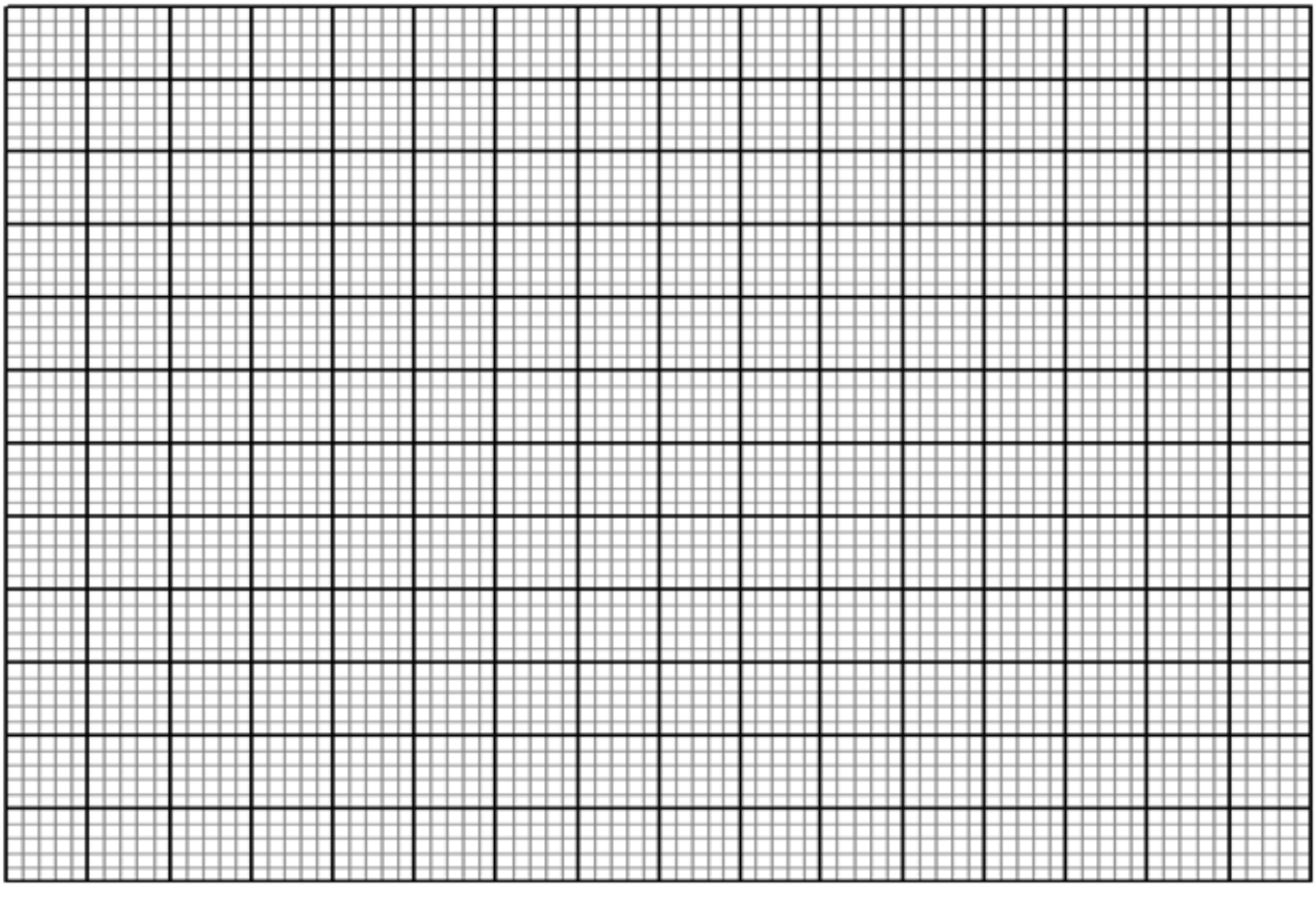
c. Connect the wire with clip on the mounted wire at a length, **L** = 70.0 cm from the end marked **P**. Read and record the readings of voltmeter and ammeter in **table 2** provided.

d. Repeat the procedure in (c) above for other values of L given in the **table 2** below. (5 marks)

Table 2

Length L(cm)	**70**	**50**	**40**	**30**	**20**	**10**
Current, I(A)						
P.d, V (volts)						

e. On the grid provided, plot a graph of p.d (y-axis) against I (A). . (5 marks)



f. Determine the slope of the graph. (3 marks)

g. Given that the graph is governed by the equation V = - Ir + E, determine:

(i) the e.m.f of the two cells in series. (2 marks)

(ii) the internal resistance of the two cells. (1 mark)

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