

SUKELLEMO

Kenya Certificate of Secondary Education FORM 4 JOINT EXAMINATIONS 2022

232/3

PHYSICS

TIME – 2½ Hours

Paper 3

Name: Adm No:

Class:Candidate's Signature:Date:/...../2022

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided.
- Answer ALL the questions in the spaces provided in the question paper
- You are supposed to spend the first 15 minutes of the 2½ hours allowed for this paper reading the whole paper carefully before commencing your work.
- Marks are given for a clear record of the observations actually made.
- Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

FOR EXAMINERS USE ONLY**QUESTION 1**

	a	e	f	Part B (e)	f	g	TOTAL
Maximum Score	1	7	2	1	4	5	20
Candidate's Score							

QUESTION 2

	b	c	d	e	f	g	h	i	TOTAL
Maximum score	1	1	5	5	1	2	2	3	20
Candidate's score									

TOTAL SCORE

Question 1

You are provided with the following:

- Triangular card marked PQR
- Plastic or glass beaker
- Straight piece of wire
- Two strips of cello tape
- Optical pin
- Millimeter scale
- Stop watch
- Complete mathematical set.

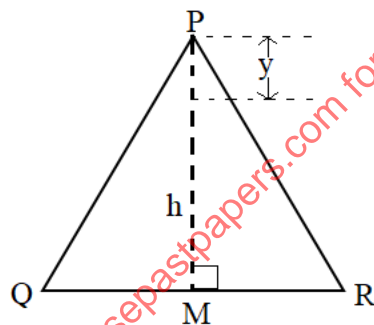
Proceed as follows:

PART A

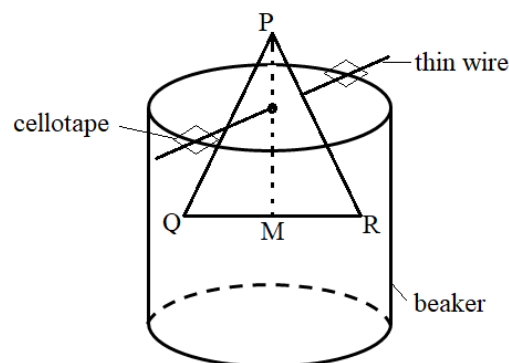
- (a) Draw the perpendicular line to the base QR and using a metre rule measure and record, the height PM of the triangle.

PM = h..... mm

(1 mark)



- (b) Using the optical pin provided make holes along the perpendicular line drawn such that the distance $y = 10$ mm, 20 mm and 30 mm from P.
- (c) By using a small piece of cello tape attach both ends of the thin length of wire to the circumference of the beaker with the wire passing through the hole $y = 10$ mm and the card hangs freely. Displace the card so that it oscillates about the wire on its axis.



- (d) Determine the time for 5 complete oscillations and then find the periodic time T . Record the values in the **table 1**.
- (e) Increase y to 20 mm and repeat the experiment so as to determine the new value of T . Repeat the procedure in (d) for other value of y and complete the table. (7 marks)

Table 1.

$y(\text{mm})$	10	20	30
Time for 5 oscillations			
Periodic time, T (seconds)			
$Z = T \sqrt{\frac{3(y-5)}{h}}$			

- (f) Determine the average value of Z (2 marks)

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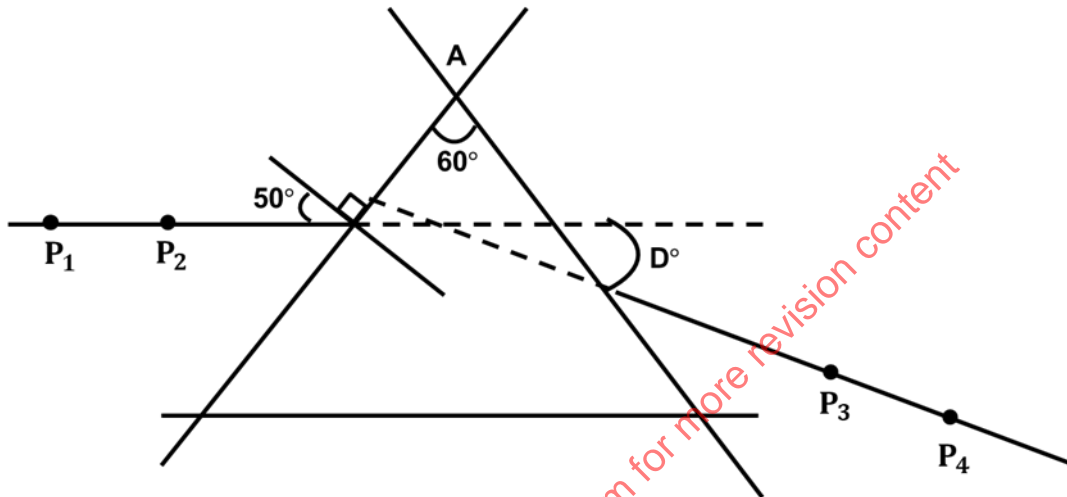
PART B

You are provided with the following apparatus:

- A triangular prism
- 4 optical pins
- Soft board
- Plain sheet of paper
- Protractor
- A piece of cellotape

Proceed as follows:

- a) Attach the plain sheet of paper on the soft board using the cellotape. Place the triangular prism at the middle of the sheet of paper as shown.
- b) Draw the outline of the prism. Remove the prism.
- c) At a point about a third way along one side of the outline from A, draw a normal.
- d) Draw a line at angle $i = 50^\circ$ to the normal. Stick two pins P_1 and P_2 vertically on this line.



Place the prism accurately on the outline. By viewing through the opposite side, stick two other pins P_3 and P_4 vertically such that they are in line with two images of P_1 and P_2

- e) Remove the prism and pins. Draw a line joining marks made by P_3 and P_4 . Extend the lines P_1P_2 and P_3P_4 to intersect. Hence measure the angle of deviation D .

$D = \dots\dots\dots$ (1 mark)

- f) For one other value of angle, i as shown in the table below locate and measure the corresponding angle of deviation. Complete the table . (4 marks)

Angle of incidence, i	50°	60°
Angle of deviation, D		
Angle of emergence, E		

Hint: Angle of emergence, E is the angle between the emergent ray and normal at the point of emergence.

g) (i) Determine the average value D_m of D (2 marks)

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(ii) Determine the constant k using the equation. (3 marks)

$$k = \frac{\sin\left(\frac{A + D_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

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Question 2

You are provided with the following:

- A micrometer screw gauge (to be shared)
- A voltmeter (0 – 5 V)
- An ammeter (0 – 1 A)
- Nichrome wire mounted on mm scale, **AB**
- A switch
- A jockey
- One new dry cell
- A cell holder
- 8 connecting wires with clips attached to one end.

Proceed as follows:

- (a) Set up the circuit as shown in **figure 3** below, ensure that when the switch is open, both meters read zero. Keep the switch open when readings are not being taken.

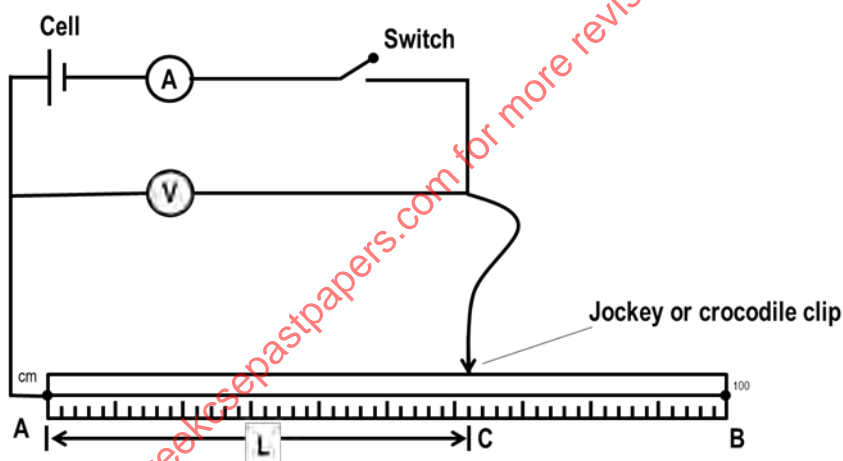


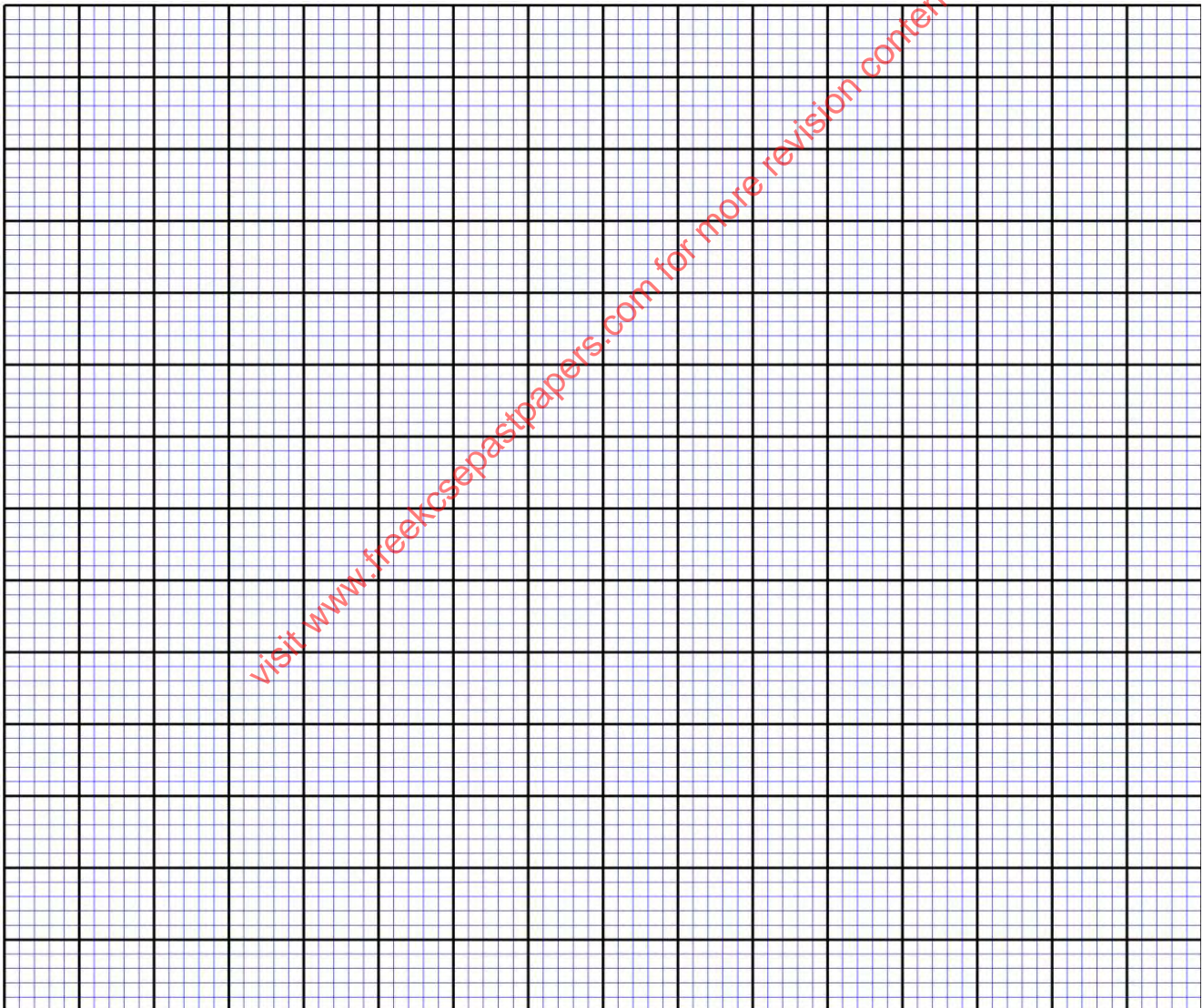
Figure 3

- (b) Measure and record the diameter **d** of the nichrome wire **AB** using the micrometer screw gauge.
d = (1 mark)
- (c) Disconnect the jockey from **AB** and close the switch. Record the value **E** of the voltmeter reading, **E** (1 mark)
- (d) Now, connect the jockey on **AB** at a distance **L** = 10 cm close the switch and record the voltmeter readings, **V** and current readings, **I** respectively in **table 2**. Repeat the procedure for the other values of **L** and complete the table. (5 marks)

Table 2

L (cm)	10	20	30	40	50	60
P.d V (volts)						
Current, I(A)						
VI (Watts)						

(e) Plot a graph of VI (vertical axis) against L. (5 marks)



(f) Using your graph, find the value L_0 where your graph cuts, the horizontal axis.
 $L_0 = \dots\dots\dots$ (1 mark)

(g) Now, place the jockey on wire **AB** such that length L is equal to the value of L_0 obtained in (f) above. Close the switch and record both the voltmeter reading V and ammeter reading I .

$V =$ (1 mark)

$I =$ (1 mark)

(h) Work out the value of r where: (2 marks)

$$r = \frac{E - V}{I}$$

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(i) Work out the value of e where: (3 marks)

$$e = \frac{\pi r d}{4L_0}$$

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