

URANGA PHYSICS EXAMINATION

Kenya Certificate of Secondary Education



232/3

FORM FOUR

PHYSICS PAPER 3

(Practicals)

4TH EDITION (JANUARY, 2022) – TIME $2\frac{1}{2}$ Hours

Name:..... School:

Class Adm No..... Index Number.....

Candidate's Signature..... Date:

INSTRUCTIONS TO CANDIDATES

- Write your **name** and **index number** in the spaces provided above
- Answer **ALL** the questions in the spaces provided.
- You are supposed to spend the first 15 minutes of the $2\frac{1}{2}$ 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, their suitability, accuracy and the use made of them.
- Candidates are advised to record their observations as soon as they are made.
- KNEC MATHEMATICAL TABLES AND NON PROGRAMMABLE SILENT CALCULATORS MAY BE USED.

For Examiners' Use Only

Question 1	Part A							Part B		Part C			TOTAL
	i	ii	iii	iv	v	vi	vii	ii	iv	ii	iii	(iv)	
Maximum score	1	1	1	1	1	1	3	1	5	1	2	2	20
Candidate's score													
Question 2	Part A				Part B								Total
	b	c			d	e	f	g	h	i			
Maximum score	3	2			1	5	5	1	1	2			20
Candidate's score													

Total score	Out of 40

QUESTION ONE

Part A

You are provided with the following apparatus:

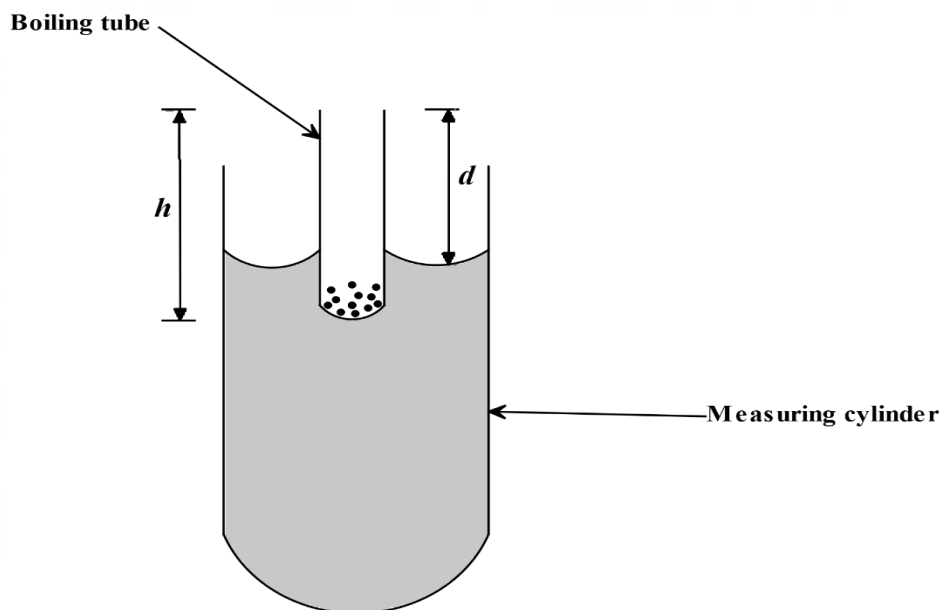
- A boiling tube
- Some dry sand
- Liquid in a measuring cylinder labelled L
- Half metre rule
- A Vernier caliper (to be shared)
- A weighing machine (one per form)
- Tissue paper
- A measuring cylinder

Proceed as follows

(i). Measure the length of the boiling tube using the half metre rule provided.

$h =$ _____ cm (1 mark)

(ii). Put a little amount of sand in the boiling tube and place it in the measuring cylinder which is almost filled with liquid L. Add sand, little by little until the tube floats upright as shown



Measure the length d of the boiling tube which is above the liquid

$d =$ _____ cm (1 mark)

(iii). Determine the length “ t ” of the boiling tube which is immersed in the liquid.

$t =$ _____ (1 mark)

(iv). Remove the boiling tube from the measuring cylinder, wipe it dry (on the outside) and measure its mass, m , including the sand inside

$m =$ _____ (1 mark)

(v). Measure the external diameter ‘ D ’ of the boiling tube using the vernier calliper (1 mark)

$D =$ _____

(vi). Determine the external radius R

$R =$ _____ (1 mark)

(vii). Using the formula $m = 12\mathcal{P}\pi R^2$

Determine $\mathcal{P}$ for the liquid (3 marks)

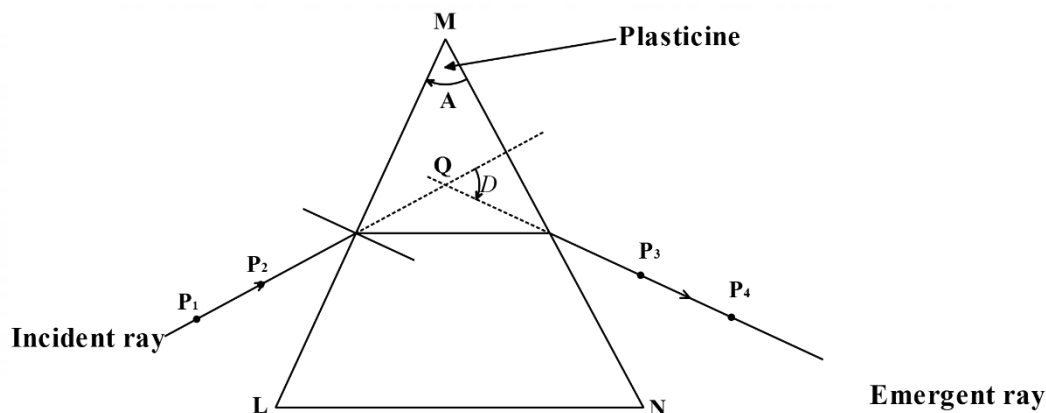
$\mathcal{P} =$ _____

Part B

You are provided with the following apparatus

- Prism
- 4 optical pins
- Plain paper
- Protractor
- Some plasticine
- Soft board

i. Set up the apparatus as shown below



ii. Measure angle A of the prism using a protractor

.....(1 mark)

(iii). Place the prism on a plain paper and trace its outline with a pencil. Attach some plasticine to the prism to indicate the prism angle, A. Construct a normal at point T along LM. Draw an incident ray to strike the prism at 40° . Replace the prism and stick pins P_1 and P_2 to define the incident ray. View pins P_1 and P_2 from the opposite face (MN). Insert pins P_3 and P_4 so that they appear to be in line with images of P_1 and P_2 . Remove the prism and join P_3 and P_4 to give emergent ray.

Extrapolate the emergent ray into the prism so as to meet the extrapolated incident ray at Q.

(iv). (a). Measure angle

D = _____ (1 mark)

(b). Calculate the value of $\eta = \cos \frac{\left(90^\circ - \frac{A+D}{2}\right)}{\sin \frac{A}{2}}$ (3 marks)

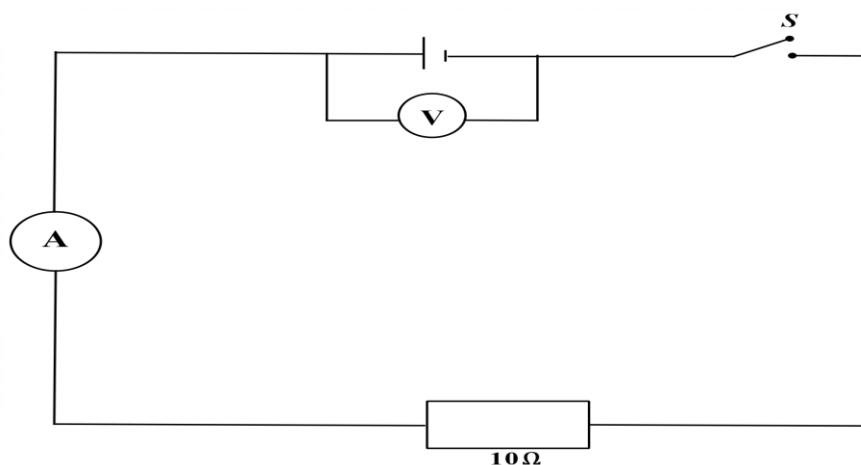
(c). What is the significance of η (1 mark)

Part C

You are provided with the following apparatus.

- A voltmeter (0-3V or 0-5V)
- An ammeter (0-1A)
- 10Ω resistor (fixed)
- A switch
- One dry cell and cell holder
- Six connecting wires at least three with crocodile clips.

(i). Connect the above apparatus as shown in the circuit diagram below with the switch S open.



(ii). With the switch s open record E, the voltmeter reading

E = (1 mark)

(iii). Close the switch and record V, the voltmeter reading and I, the ammeter reading

V = (1mark)

I = (1 mark)

(iv). Given that $E - V = Ir$

Find r for the dry cell

(2 marks)

.....

QUESTION TWO

This question has two parts A and B. Answer both parts.

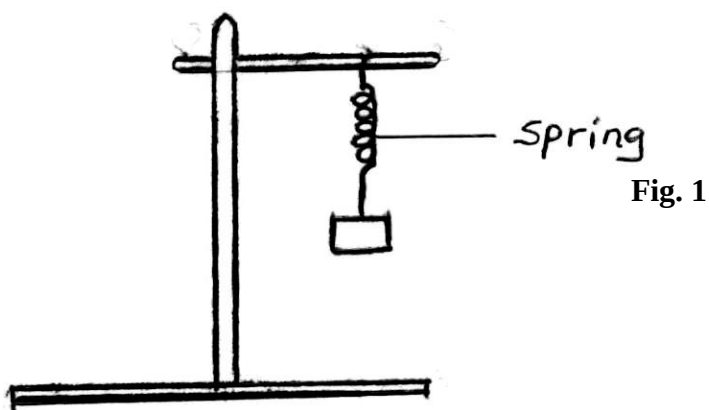
PART A

You are provided with the following:-

- A retort stand, clamp and boss.
- A spiral spring.
- A stop watch.
- Three 100g masses.

Proceed as follows:

- (a) Suspend a 100g mass at the end of the spring as shown in figure 1.



Now give the mass a small vertical displacement and release so that it performs vertical oscillations. Time ten oscillations and determine the period T . Enter your results in table 1.

- (b) Repeat the experiment for the other values of mass and complete the table.

Table 1

Mass m (g)	100	200	300
Time for 10 oscillations (s)			
Periodic time T (s)			

(3marks)

- (c) Given that $T = \pi \left(\sqrt{\frac{M}{k}} \right)$, where k is the spring constant, find the average value k for the spring. (2marks)

PART B

You are provided with the following:-

- A 250ml glass beaker
- A Bunsen burner
- A Thermometer
- A Stop watch
- A Tripod stand and a Wire gauze
- A measuring cylinder 100ml
- Water

Set the apparatus as shown in figure 2 below.

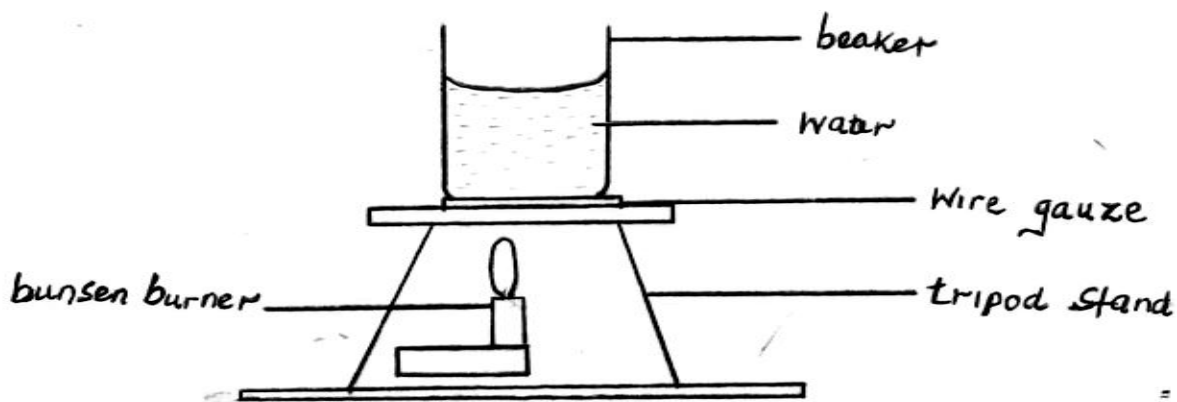


Fig. 2

- (d) Measure 100cm^3 of water and pour it into the beaker. Take the initial temperature of the water.
 $T_0 = \dots\dots\dots^\circ\text{C}$ (1mark)

- (e) Now heat the water to a temperature of 80°C . switch off the gas tap and place a thermometer into the beaker and start the stop watch when the temperature is 65°C . Take the temperature $T^{\circ}\text{C}$ of water ever two minutes. Record your results in the table 2 below. (5marks)

Table 2

Time, t(min)	2	4	6	8	10	12	14
Temperature (T) $^{\circ}\text{C}$							
(T - T_0)							
Log (T - T_0)							

- (f) Plot a graph of Log (T - T_0) against Time (t). (5marks)



(g) Find the value of P of $\log (T - T_0)$ when $t = 0$. (1mark)

(h) Determine N, where N is the antilog of P. (1mark)

(i) Calculate the temperature of the surrounding T_R using the expression $N = 65 - T_R$ (2marks)