MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education

PRE-MOCK EXAMINATIONS 2024

232/3 PHYSICS Paper 3

March/April 2024 – 2½ Hours

Name: …… Adm No: ……

Class: ……Candidate's Signature: ……Date: 26/3/2024.

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 2 ½ 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

	d	e	f	g	TOTAL
Maximum Score	7	5	6	2	20
Candidate's Score					

QUESTION 2

	c	d	e	TOTAL
Maximum score	7	5	8	20
Candidate's score				

TOTAL SCORE

Question 1

You are provided with the following apparatus:

- A bi convex lens
- A plane mirror
- Complete retort stand
- Some glycerine in a beaker
- Half meter rule
- Manilla card
- Two wooden blocks
- A dropper

Proceed as follows:

a) Estimate the focal length, f of the lens provided.

f = ……cm (1 mark)

b) With aid of a diagram, describe the method you used to estimate f in (a). (2 marks)

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c) Clamp the wooden blocks so that they hold the manilla card horizontally, with the calibrated side upwards.

d) Place the plane mirror on a horizontal surface directly below the object manilla card and place the lens at the centre of the mirror as shown in **figure 1.**

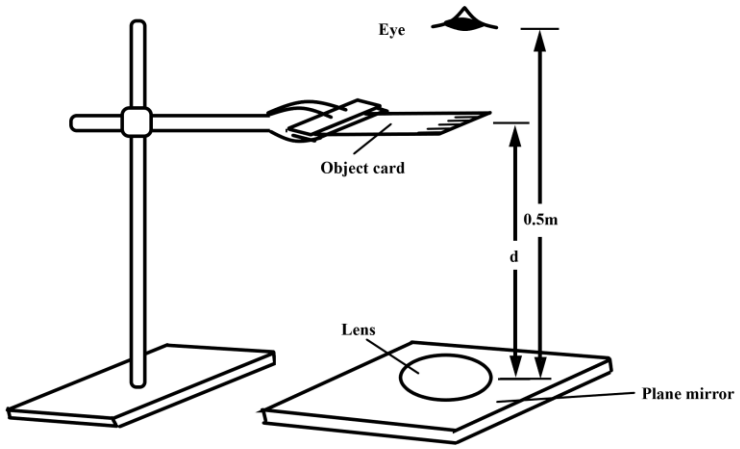


Figure 1

e) Measure a height *h*, where *h = 15 cm* measured from the surface of the mirror.

f) Keeping your eye about 0.50 m from the mirror, adjust the position of the mirror and lens so that you can see an image of the card in the central region of the lens.

g) By means of the millimeter scale on the top side of the object manilla card, determine the width of the image.

h) Repeat the experiment to obtain a series of corresponding values of h and b. Record the results in **table 1.**

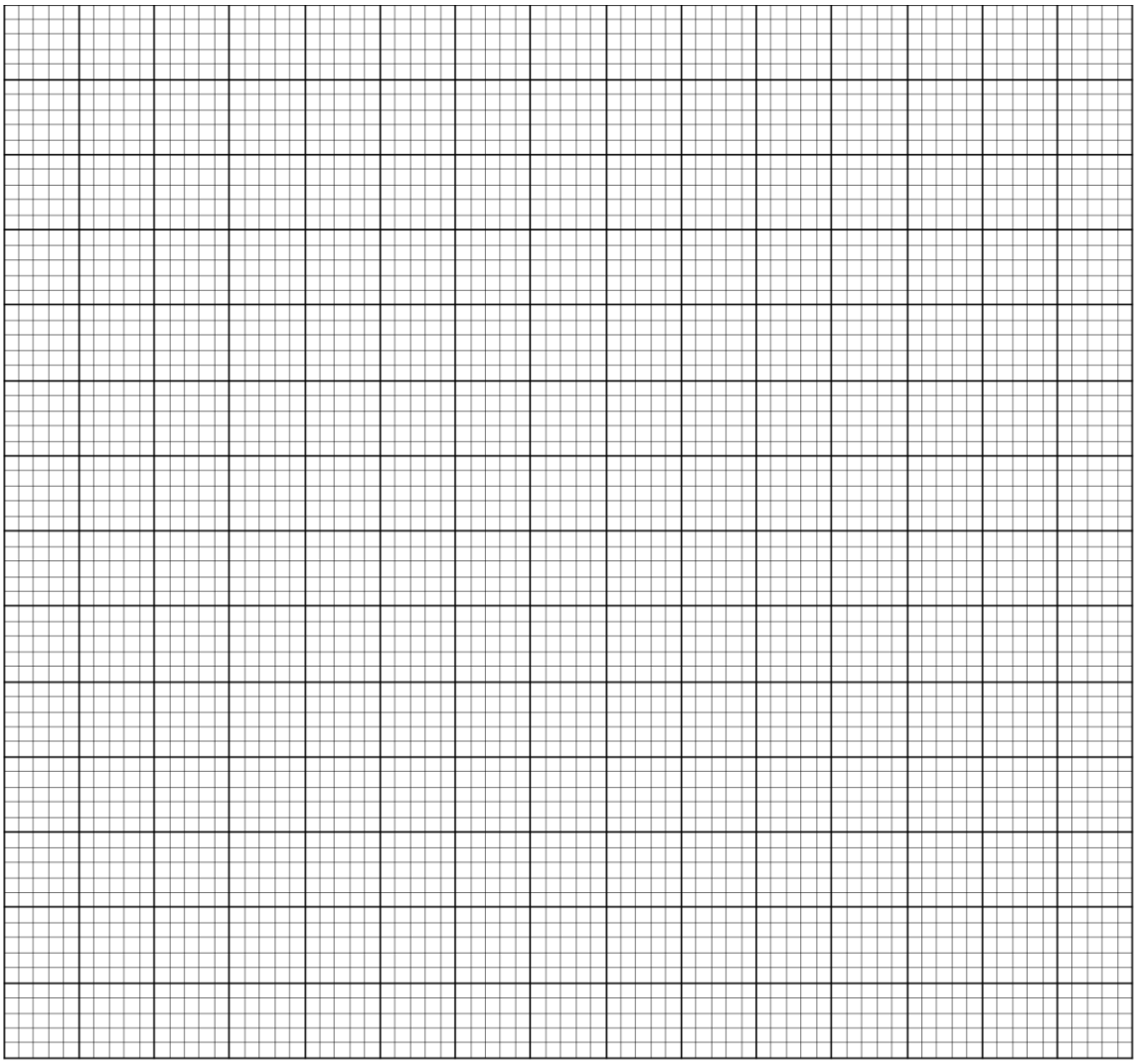
Note: invert the card for the images larger than the object so that the calibrated side faces the mirror

Determine the image width by relating to the object width.

Table 1 **(3 marks)**

Height *h* (cm)	15.0	17.5	20.0	22.5	25.0	27.5
Width *b* (mm)						

i) Plot a graph of width, b against height, h (3 marks)



j) Remove the lens and put a few drops of glycerine in the centre of the mirror. Replace the lens on top of the glycerine so that the glycerine fills the central region of the lens.

k) Repeat step (e) to obtain a series of corresponding values of *h* and new image width *b*. record the results in **table 2** **(3 marks)**

Table 2

Height h (cm)	15.0	17.5	20.0	22.5	25.0	27.5
Width b (mm)						

l) Using the same axes as in (g) plot a graph of width,*b* against height, *h* (2 marks)

m) From the graphs, determine:

(i) h_a the value of h when b = 10 mm (for air)

$h_a =$ ..... cm (1 mark)

(ii) h_g the value of h when b = 10 mm (for glycerine)

$h_g =$ ..... cm (1 mark)

n) Determine the constant *k* for glycerine from the expression $k = 2 - \frac{h_a}{h_g}$ (2 marks)

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o) Find the gradient of the graph for glycerine when the height h = 18cm (2 marks)

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Question 2

PART A

You are provided with the following apparatus:

- Metre rule
- Thread
- A complete retort stand
- Two masses, a 50g and 20g mass
- Water in a beaker
- Liquid X in a beaker

a) Suspend the metre rule so that it balances at its centre of gravity G. Read and record the value of G.

$G =$ ……..cm

b) Suspend the 50g mass at a distance $d = 10\,cm$, then suspend the 20g mass and adjust its position such that the metre rule is balanced as shown in the **figure 2**

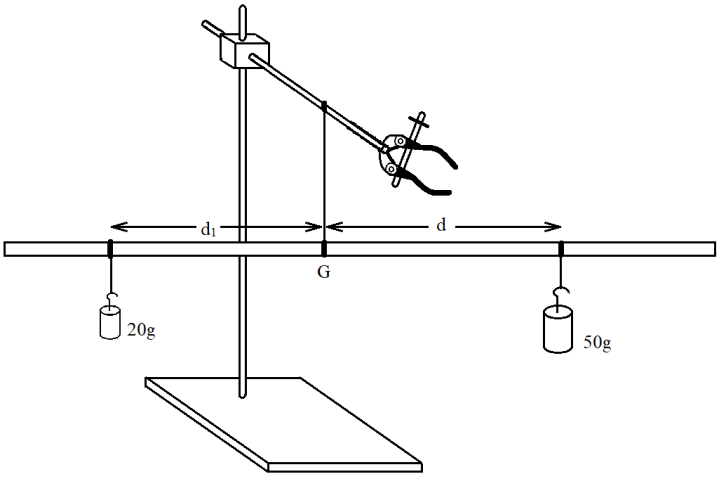
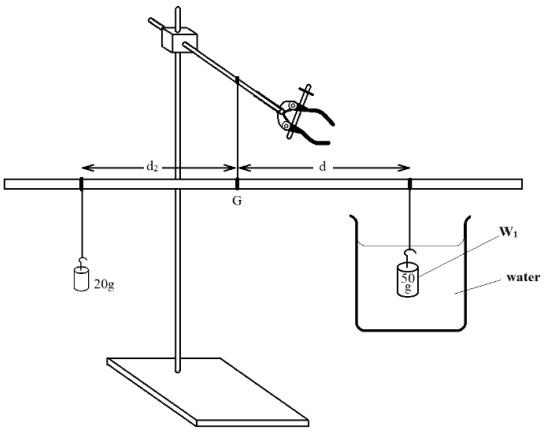


Figure 2

c) Record the distance distance d_1

$d_1 =$ …… cm (1 mark)

d) While maintaining the distance d, immerse the the 50g mass completely in water, as shown in the **figure 3**.



e) Adjust the position of the 20g mass to balance the metre rule again. Record the new distance d_2

d_2 = …….. cm (1 mark)

f) Using the results obtained above, calculate the value of W_1, weight of the 50g mass in water. (2 marks)

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g) Determine the upthrust U_1 on the 50g mass in water. (1 mark)

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h) Repeat steps (d), (e) and (f) but now the 50g is totally immersed in liquid X as shown in the **figure 4**

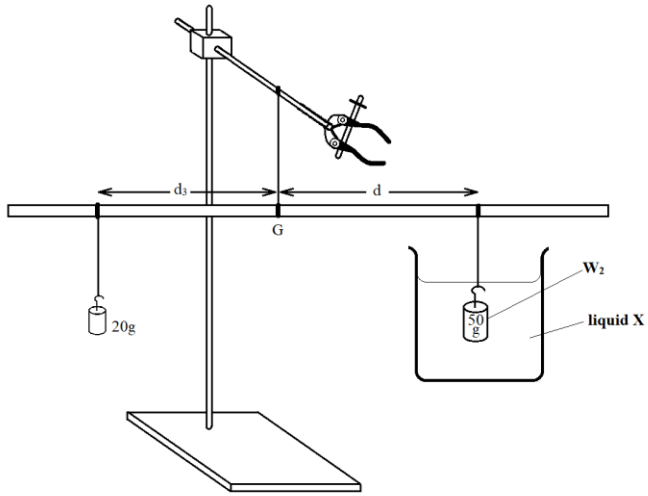

Figure 4

i) Using the results obtained above, calculate the value of W_2, weight of the 50g mass in liquid X.(1 mark)

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j) Determine the upthrust U_2 on the 50g mass in liquid X. (1 mark)

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k) Given that $\rho_L = \frac{U_2}{U_1} \times \rho_W$ where $\rho_W = 1000 kgm^{-3}$. Calculate ρ_L (1 mark)

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PART B

You are provided with the following:

- four 10 Ω resistors
- a resistance wire labelled Q mounted on a half metre rule
- a resistance wire AB mounted on a metre rule
- two dry cells and a cell holder
- a centre zero galvanometer G
- 8 connecting wires each with a crocodile clip at one end
- a jockey
- a micrometer screw gauge
- a switch

Proceed as follows:

a) Set up the circuit as in **figure 5** in which **R** is near A and Q is near B. (**R** is a 10 Ω resistor or an appropriate combination of 10-ohm resistors).

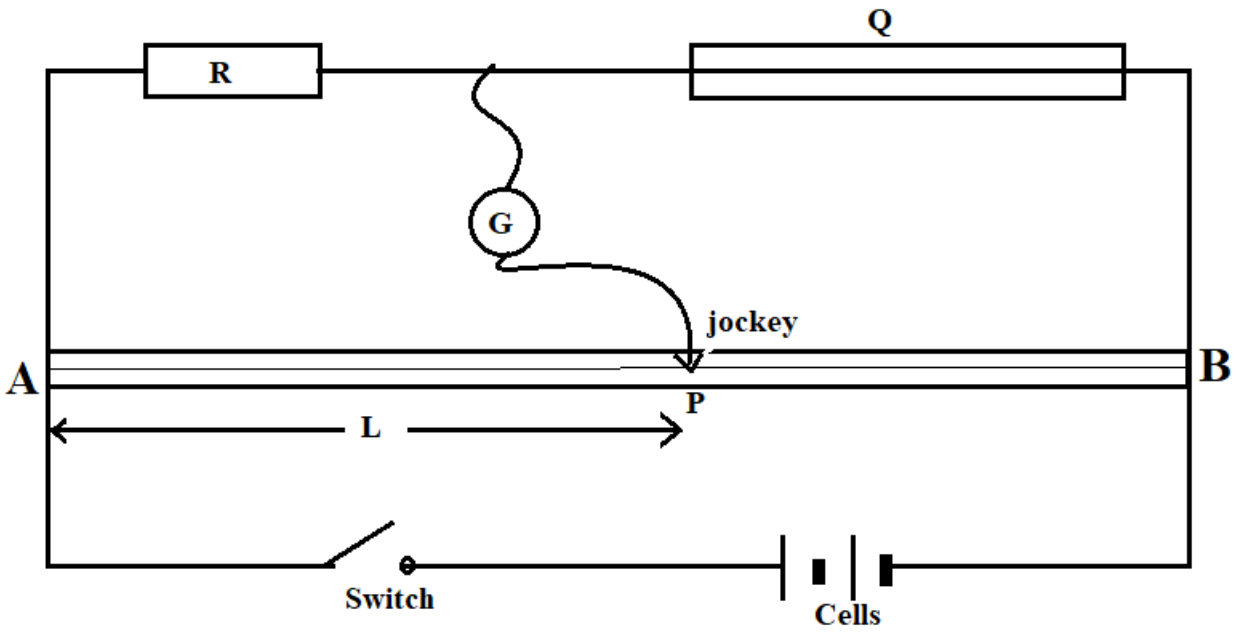

Figure 5

b) Starting with a single 10 Ω resistor as **R,** close the switch. Using the jockey tap wire AB briefly near end A and observe the deflection on the galvanometer. Now tap the wire near end B and again observe the deflection of the galvanometer. (*The two deflections should be in opposite directions*)

c) Still with the 10 Ω resistor as **R**, tap at various points along wire AB to obtain a point P at which the galvanometer shows zero deflection. Measure and record in **table 3** the length **L** between A and P.

d) Repeat part (c) to obtain L for other values of R shown in **table 3.** (3 marks)

R (Ω)	5	10	15	20	25	30
L (m)						
$X = \frac{1}{L}(m^{-1})$						
$Y = \frac{1}{R}(\Omega^{-1})$						
$Z = \frac{X}{Y}$						

e) Determine:

(i) $\frac{1}{L}$ for all values of L (1 mark)

(ii) $\frac{1}{R}$ for all values of R (1 mark)

(iii) $\frac{X}{Y}$ for all sets of values of X and Y (1 mark)

f) Calculate the average value of Z and state its unit (2 marks)

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g) (i) Using the micrometer screw gauge provided, measure and record the diameter **D** of wire Q in millimetres .

D = ... mm. (1 mark)

(ii) Record D in metres.

D = …… m. (1 mark)

h) Determine the value of constant **K** given that: $4\mathbf{K} = \pi D^2 Z$ (2 marks)

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