BUNAMFAN CLUSTER EXAMINATION – 2022

Kenya Certificate of Secondary Education

232/3 – PHYSICS – Paper 3

June 2022 - 2 ½ hours

Name……**Adm No**……

Class…… **Date**……

INSTRUCTIONS TO CANDIDATES

1. Write your **name, index number, class, date** and **signature** in the spaces provided above.
2. This paper consists of two questions **1** and **2.**
3. Answer all questions in the spaces provided.
4. Non-programmable calculators and mathematical tables may be used.
5. Show all your workings.

QUESTION 1	a	d	e	f	g	h	k	TOTAL
Maximum score	½	1½	1	3½	2	6½	5	20
Candidates score								

QUESTION 2	c	d	e	f	i	j	k	l	TOTAL
Maximum score	2	2	1	2	4	5	2	2	20
Candidates score									

This paper consists of 10 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing

QUESTION 1

PART A

You are provided with the following:

-A watch glass

-A piece of plasticine

-A marble

-A Stopwatch

-An electronic balance (*to be shared*)

- Vernier calipers (*to be shared*)

- Geometrical set

Proceed as follows:

(a) Measure the mass, **m** of the marble.

m = ……g ($^1/_2$mark)

b) Place the watch glass on the table. Cut the plasticine into two pieces and use them to hold the watch glass firmly on the table as shown in **Figure 1**.

c). Release the marble from one end of the watch glass and time 5 complete oscillation with the stopwatch. Repeat this one more time.

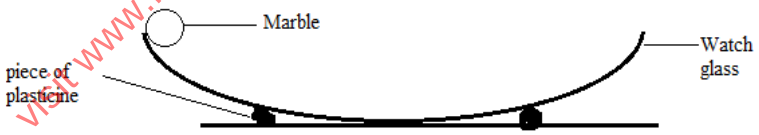

Figure 1

d) Record your values in the **Table 1** ($1^1/_2$ marks)

Attempt	Time for **5** oscillations (seconds)	Periodic time, **T**(s)
1st		
2nd		

Table 1

e) Find the average periodic time **T** (1mark)

f) (i)Measure the diameter of the marble with the Vernier calipers, hence find its radius

Diameter, **d** = …… (1mark)

Radius, **r** = ……m ($^1/_2$mark)

(ii)Determine the volume of the marble given that $V=\frac{4}{3}\pi r^3$ where $\pi=3.142$ (1mark)

(iii)Calculate the radius of the curvature of the watch glass R from the formula $R - r = \frac{5gT^2}{7(2\pi)^2}$

Where $g=10m/s^2$ and $\pi=3.142$ (1mark)

PART B

You are provided with the following:

- A glass prism
- A plain sheet of paper
- A soft board
- 4 optical pins
- 2 Thumb tacks

Proceed as follows:

g) (i)Firmly fix the plain sheet of paper on the soft board using the thumb tacks and place the prism at the centre of the paper. Trace the outline of the prism using a pencil.

(ii)Remove the prism from the outline and label the vertices of the outline L, M and N as shown in **Figure 2**

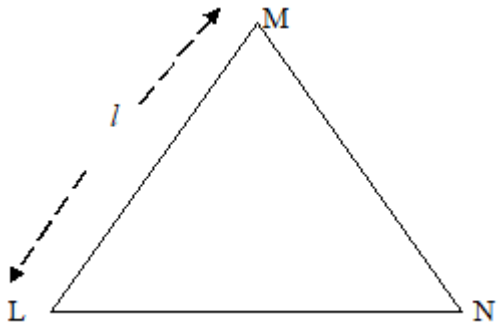

Figure 2

Measure Angle LMN and length, **l** using a ruler

Angle LMN = …… (1mark)

Length, l = …… (1mark)

iii) On the side ML mark a point and draw the normal at that point. Measure an angle T, 60° from the line LM and draw a line along this angle as shown in **Figure 3.**

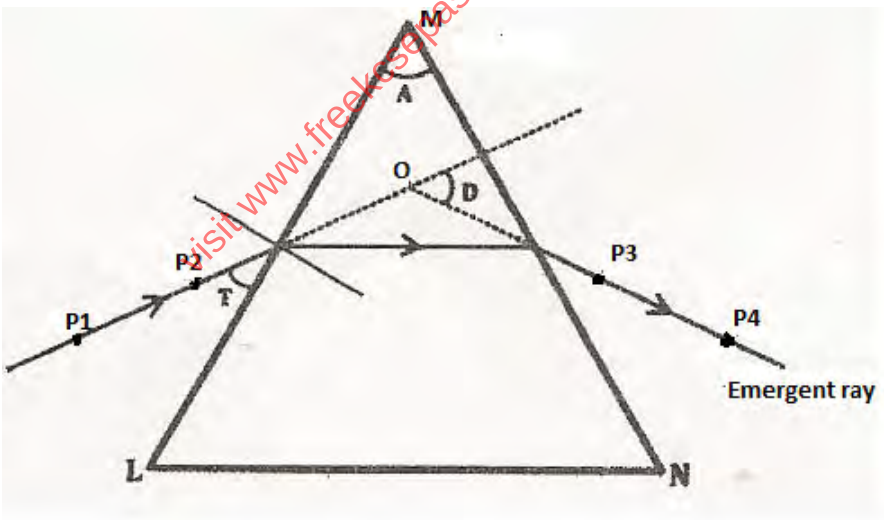

Figure 3

iv). Replace the prism on the outline and fix pins P_1 and P_2 on the 60° line at a distance of 3cm from each other. View the images of the pins P_1 and P_2 through side MN and fix P_3 and P_4 so that they appear to be on straight line with the images of P_1 and P_2.

v). Remove the prism and the pins and draw a line to pass through the holes made by pins P_3 and P_4. Extend the line into the outline as shown in figure 3 above. Also extend the 60° line so that the two lines cross each other at point O. Determine angle D and record it in the **Table 2**

h). (i)Repeat the procedure and complete the **Table 2** (2 $^1/_2$marks)

Angle T (°)	60°	50°	40°
Angle D(°)			
Angle I°(90° − *T*)			

Table 2

(ii) Determine the average value D_m of D (1mark)

iii) Determine the constant ***k*** for the glass prism from the formula (2marks)

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

iv) State the significance of ***k*** (1mark)

PART C

You are provided with the following:

- A lens holder
- Convex lens
- A candle
- A white screen
- A metre rule

Proceed as follows:

i) Set up the apparatus as shown in **Figure 4**

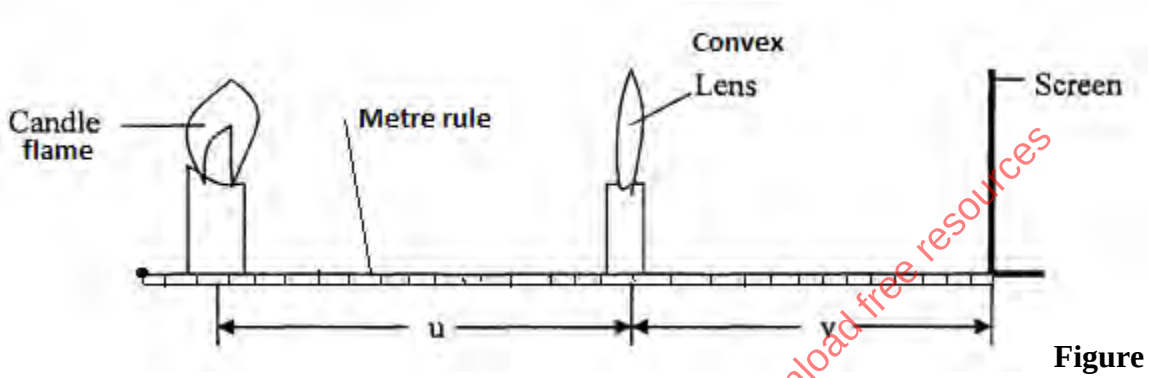

Figure 4

(j) Starting with u = 30 cm, adjust the position of the screen to obtain a sharp image of the candle flame. Record the value of v in **Table 3**.

(k)(i) Repeat the procedure in (i) for u = 30 cm. Complete **Table 3** (3marks)

u (cm)	v (cm)	m = $\frac{v}{u}$
30		
50		

Table 3

(ii) Given that the focal length f of the lens satisfies the equation f = $\frac{v}{m+1}$, determine the average value of the focal length, f. (2 marks)

QUESTION 2

You are provided with the following:

- An ammeter (**0 – 1 A**)
- A voltmeter (**0 – 3 V** or **0 – 5 V**)
- A variable resistor
- A **10Ω** carbon resistor
- A piece of resistance wire
- Two new dry cells
- A cell holder
- A switch
- Seven connecting wires

Proceed as follows:

a) Take the resistant wire and coil it around the biro pen to make a coil.

b) Set up the apparatus as shown **Figure 5** below such that the **10Ω** carbon resistor and the coil are in parallel connection.

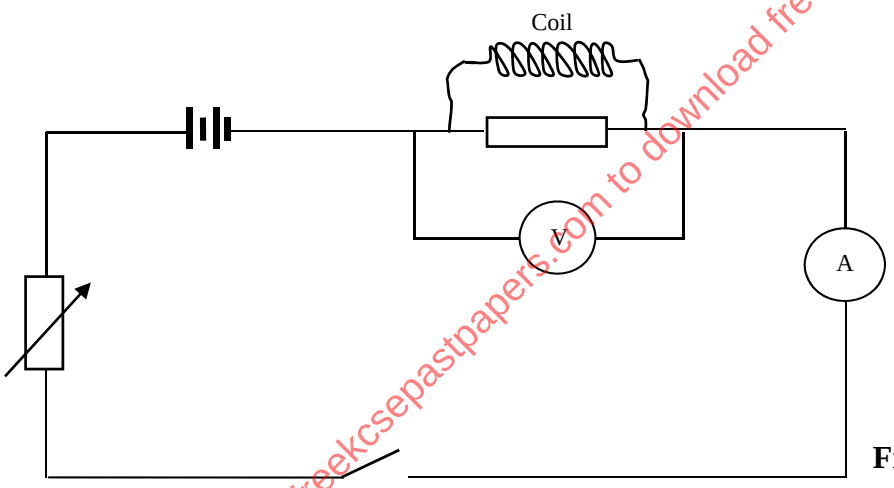

Figure 5

c) Close the switch and the adjust the variable resistor such that the ammeter read a current of I_1=**0.08A** and record the corresponding voltmeter reading $\mathbf{V_1}$

i) $\mathbf{V_1}$ =…… (1mark)

ii) Calculate resistance $\mathbf{R_1 = \frac{V_1}{I_1}}$ (1mark)

d) Repeat (c) above for current of I_2 = **0.16A** and record the corresponding voltmeter reading $\mathbf{V_2}$

i) $\mathbf{V_2}$ =…… (1mark)

ii) Calculate resistance $\mathbf{R_2} = \frac{\mathbf{V_2}}{\mathbf{I_2}}$ (1mark)

e) Find the average value of resistance **R** (1mark)

f) Determine the resistance, **C** of the coil (2marks)

g) Now set up the apparatus as shown in **Figure 6** below such that the voltmeter is connected across the cells, **10Ω** carbon resistor and the coil are in parallel connection.

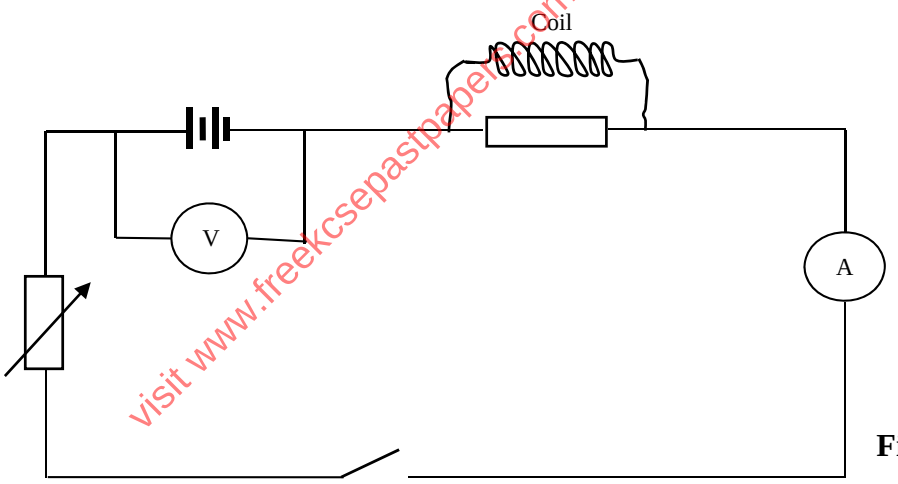

Figure 6

h) Close the switch and the adjust the variable resistor such that the ammeter reads a current of **0.04A** and note the corresponding voltmeter reading. Record the value in the **Table 4** below.

i) Repeat (h) above for other values of current and voltage and complete the **Table 4** below

Current, I (A)	**0.04**	**0.08**	**0.12**	**0.16**	**0.20**	**0.24**
Voltage, V(V)						

(4marks) **Table 4**

j) On the grid provided plot a graph of **Voltage, V (V)** against **Current, I (A)** (5marks)

k) Determine the slope of the of the graph (2marks)

l) Given that graph is related to equation **E = V + Ir** where **E** and **r** are the emf and internal resistance of the cells respectively, use your graph to determine the value of:

E =…… (1mark)

r =……. (1mark)

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