Name ..... Adm No .....

Class..... Date.....Student's signature.....

232/3
PHYSICS
(Practical)
Paper 3
Time 2 1/2 HOURS

BUNAMFAN CLUSTER EXAMINATION 2021

Kenya Certificate of Secondary Education (K.C.S.E)

232/3

PHYSICS

(PRACTICAL)

Paper 3

Time 2 1/2 HOURS

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(i)	a(ii)	b(ii)	c	d	e(i)	TOTAL
Maximum score	2	1	6	5	3	3	
Candidates score							

QUESTION 2	a	b	f	h	i	j	k	l	s	t	u	v
Maximum score	2	2	2	1	2	1	2	1	3	2	1	1
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

You are provided with the following:
- Two dry cells and a cell holder
- One voltmeter (0 – 5V)
- One ammeter (0 – 1A) or (0 – 2.5A)
- Six resistors labeled AB
- One resistor labeled R
- A switch
- 6 connecting wires with crocodile clip at one end
- Jockey attached to a connecting wire

(a) Set up the circuit as shown in figure 1

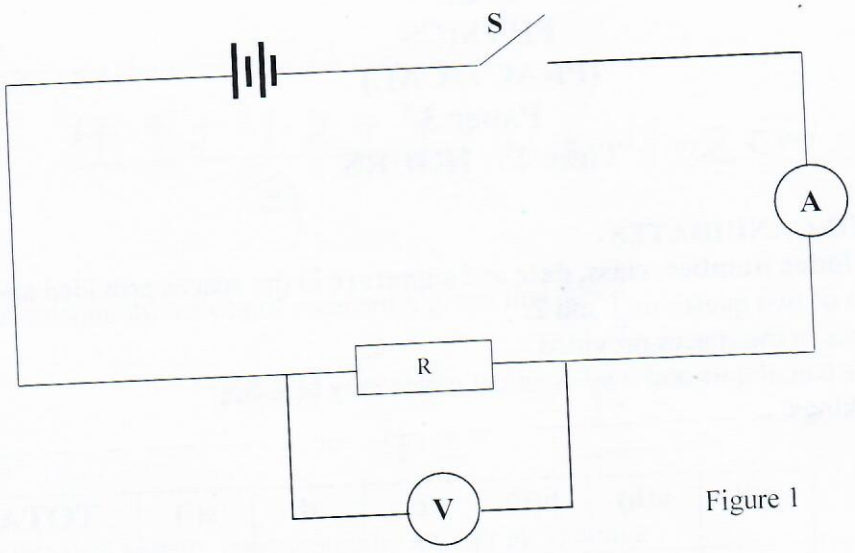


Figure 1

(i) Close the switch, s. Read and record the voltmeter and ammeter readings

V = 2.40 ± 0.20 V (Accept 1 dp) (1mark)

I = 0.24 ± 0.02A (Accept 2dp only) (1mark)

(ii) Determine the value of R given that $R = \frac{V}{I}$ (1mark)

$\frac{2.4}{0.24} = 10 V/A$

$= 10 \Omega$

(b) Set the circuit as shown in figure 2

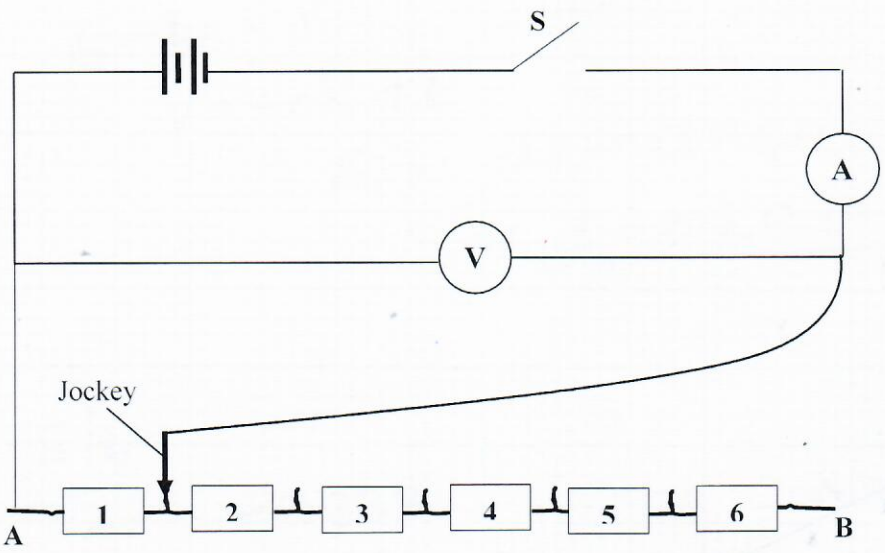


Figure 2

(i) With the jockey across resistor 1 as shown in figure 2 above, close the switch, read and record the ammeter and voltmeter readings in table.

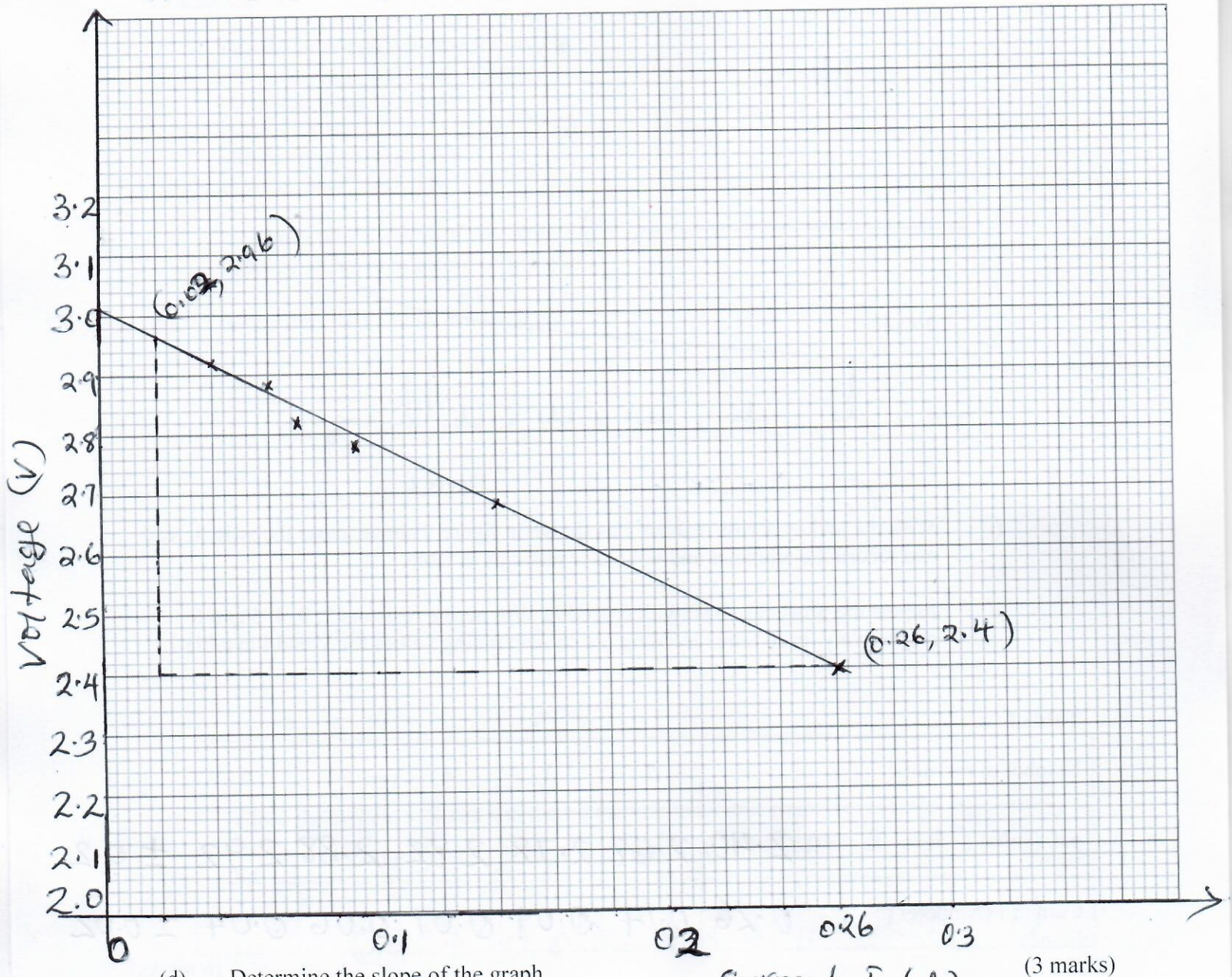
(ii) Repeat the procedure b (i) with crocodile clips across resistors 2, 3, 4, 5 and 6 respectively, each time recording the corresponding values for V and I in table 1

Table 1

Number of resistors	1	2	3	4	5	6	
p.d. (volts)	2·40	2·68	2·78	2·82	2·88	2·92	± 0·2
Current I (Amperes)	0·26	0·14	0·09	0·07	0·06	0·04	± 0·02

(6 marks)

(c) On the grid provided plot the graph of p.d (V) (y axis) against I (A) (5 marks)



(d) Determine the slope of the graph (3 marks)

$$\frac{2.96-2.4}{0.02-0.26} = \frac{0.56}{-0.24} = -2.333\ V/A$$

$$= -2.333\ \Omega$$

(e) Given that $E = V + Ir$ use your graph and this equation to determine the value of:

(3 marks)

(i) **E**

$E - Ir = V$

$V = -rI + E$

E = the intercept on V-axis

$= 3.02 \pm 0.10\ V$ (Accept 1dp)

(ii) **r**

Slope $= -r$

$-r = -2.333$

$r = 2.333\ \Omega$

PART A

You are provided with the following:

- Lump of plasticine
- 50g mass
- Stand, boss and clamp
- 3 pieces of threads
- Meter rule
- Measuring cylinder
- Some water in a beaker

(a) Put 50ml of water in a measuring cylinder.
Mould the plasticine into a shape that can fit into the measuring cylinder without touching its wall and tie it with the thread and completely immerse it in water in the measuring cylinder to determine it volume, V.

V=..12 ±1.. (1mark)

V=..1.2×10^{-5}.. m^3 or $0.000012\ m^3$ (1mark)

(b) Given that upthrust, **U** experience by the plasticine in water is $\mathbf{U=V\rho g}$
Where: **V** – volume of the plasticine
ρ - density of water ($1 g/cm^3$)
g – acceleration due to gravity
Determine upthrust **U** on the of plasticine (2 marks)

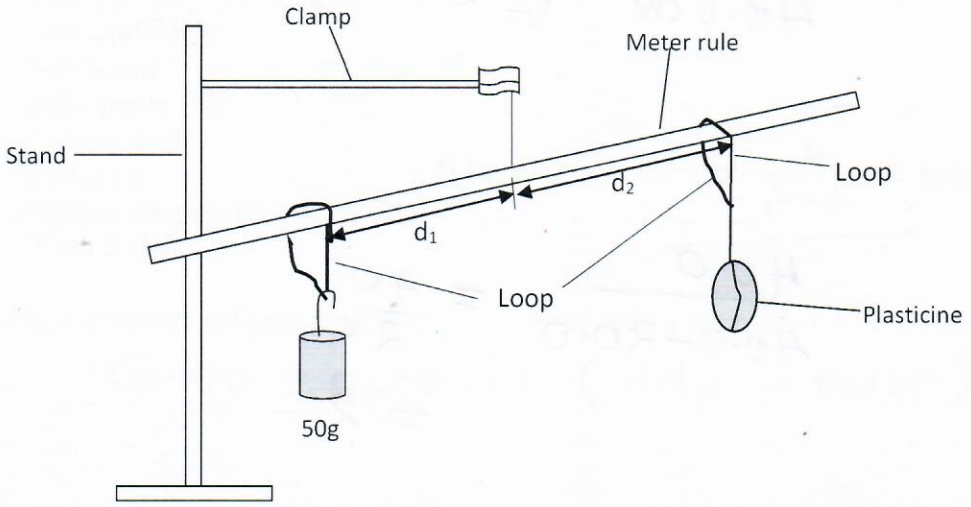
$U = 1.2 \times 10^{-5} \times 1000 \times 10$

$= 0.12\ N$

(c) Tie the meter rule with the thread at the center (50cm mark) and suspend it on the stand as shown on the figure below.

(d) Tie 50g mass with the thread and suspend it on the meter rule at a distance d_1 = 8cm from the center as shown on the figure.

e) Suspend the plasticine on the meter rule and then adjust distance d_2 of the plasticine such that the system balances horizontally as shown in the set up below.



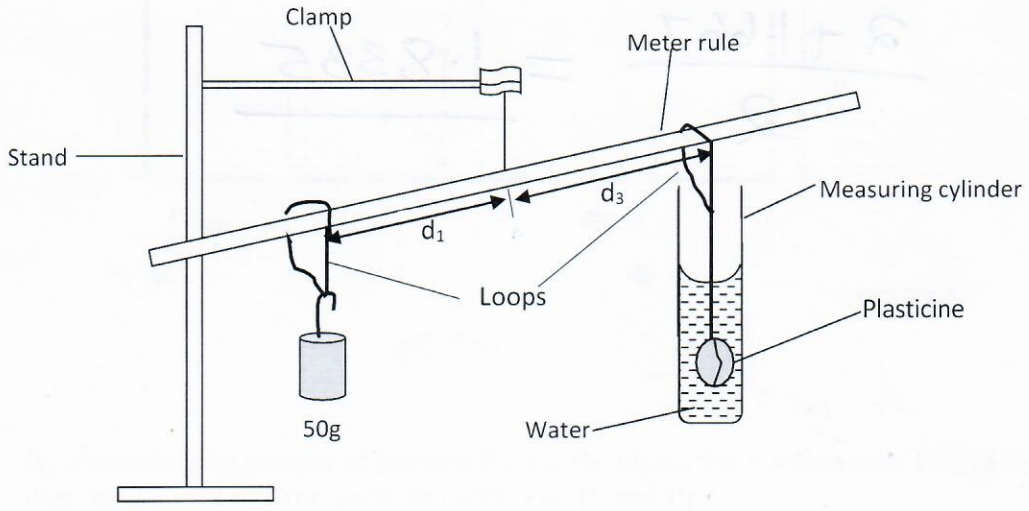
(f) Using the principle of moment determine the weight, **W** of the plasticine when the system is balancing horizontally. (2 marks)

$d_2 = 20cm = 0.2m$.

$0.5N \times 0.08m = 0.2 \times W$

$W = 0.2N$

(g) Immerse the suspended plasticine in the water in the measuring cylinder and adjust distance d_3 of the plasticine such that the system balances horizontally as shown below



(h) Record the value of d_3 (1mark)

40.0 cm (± 2.0cm)

(i) Given $R = \frac{d_3}{d_3 - d_2}$ determine the value of **R** (2marks)

$$\frac{40.0}{40.0-20.0} = \frac{40}{20}$$

$$= 2$$

(j) Repeat when $d_1 = 10$cm (1mark)

$d_3 = 50.0$ (± 2.0cm)

$$\frac{50}{50-20} = 1.667$$

(k) Average of R (2 marks)

$$\frac{2 + 1.667}{2} = 1.8335$$

PART B

You are provide with

- Rectangular glass block
- Four optical pins
- Soft board
- Plain paper
- 2 thumb tacks
- Cellotape
- Vernier calipers (to be shared)
- 30cm Ruler

(l) Using the vernier calipers provided, measure and record the breadth b of the glass block

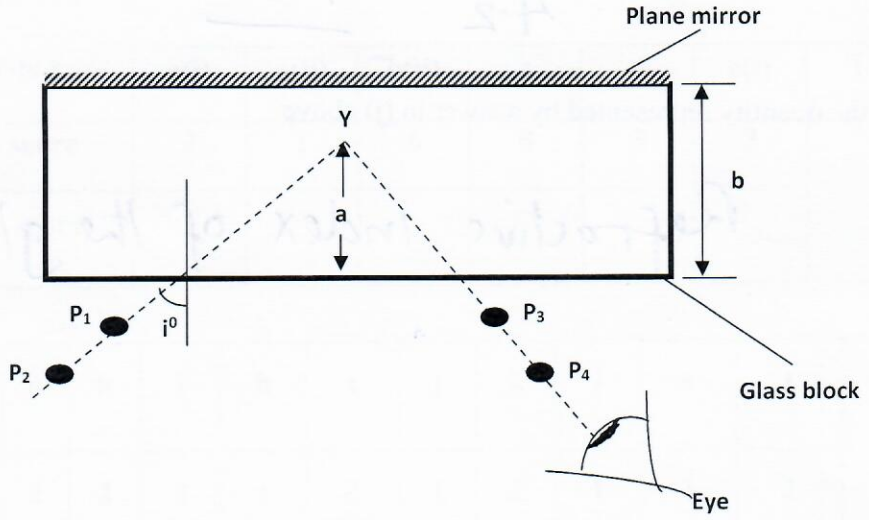
b= 6·40 ± 0·20 cm (2dp a must) (1mark)

(m) Place the plain sheet of paper on the soft board and fix it using the thumb pins. Place the glass block on the soft board and trace its outline.

(n) Remove the glass block and draw a normal at about **2cm** from the end of the longer side of the glass block outline.

(o) Draw a line at an angle $\mathbf{i = 10^0}$ from the normal. Fix two pins $\mathbf{P_1}$ and $\mathbf{P_2}$ on that line.

(p) Arrange the glass block and the plane mirror as shown below.



(q) By observing the images of the pins $\mathbf{P_1}$ and $\mathbf{P_2}$, locate the position pins $\mathbf{P_3}$ and $\mathbf{P_4}$ such that they appear in a line (no parallax) with pins $\mathbf{P_1}$ and $\mathbf{P_2}$

(r) Join the points P_3 and $\mathbf{P_4}$ and extend them to intersect line $\mathbf{P_1P_2}$ produced. Measure the perpendicular distance **Y** with the ruler.

(s) Repeat the procedure for other values of **i** and complete the table below.

Angle $\mathbf{i}^0$	**20**	**30**	**40**
Distance **a (cm)**	4·3	4·2	4·1

± 0·2 cm

1 dp
A must.

(3 marks)

(punish for repeated values)

(t) Determine the average of the values of **a** (2 marks)

$$\frac{4.3 + 4.2 + 4.1}{3} = 4.2\text{ cm}$$

(u) Determine the values of constant k given that $k = \frac{b}{a}$ (1 mark)

$$k = \frac{6.3}{4.2} = 1.5$$

(v) State the quantity represented by answer in (j) above (1 mark)

Refractive index of the glass.