232/3
PHYSICS
PAPER 3 (PRACTICAL)
Time: $2^1/_2$ hours

KCSE 2023 TOP PREDICTION MASTER CYCLE 1

Name: ..... Index No: .....Stream .....

Candidate's Signature: ..... Date:.....

Instructions to Candidates

(a) Write your name and index number in the spaces provided above.
(b) Sign and write the date of the examination paper.
*(c) Answer **ALL** the questions in the spaces provided in the question paper.*
*(d) ALL working **MUST** be clearly shown where necessary.*
(e) Mathematical tables and silent electronic calculators may be used.
(f) Candidates should check the paper to ascertain that all the pages are printed as indicated and that no questions are missing.
*(g) **Non-programmable** silent electronic calculators and KNEC mathematical tables may be used.*
*(h) **This paper consists of 11 printed pages***
*(i) **Candidates should answer all the questions in English.***

For Examiners' Use Only:

QUESTION	MARKS	CANDIDATE'S SCORE
QUESTION 1	20	
QUESTION 2 PART A	8	
QUESTION 2 PART B	6	
QUESTION 2 PART C	6	
GRAND TOTAL	40	

Question 1

You are provided with the following apparatus:

- Rectangular glass block
- Two plain papers
- Four optical pins
- Four paper pins or thumb pins
- Protractor
- Half meter rule

PART A

PROCEDURE:

a) Place the glass block on the plain paper on its largest area, trace it's outline and mark it's sides **ABC** and **D**. Mark the point $\mathbf{P_0}$ on the center of side **BC** as shown in **Figure 1** below.

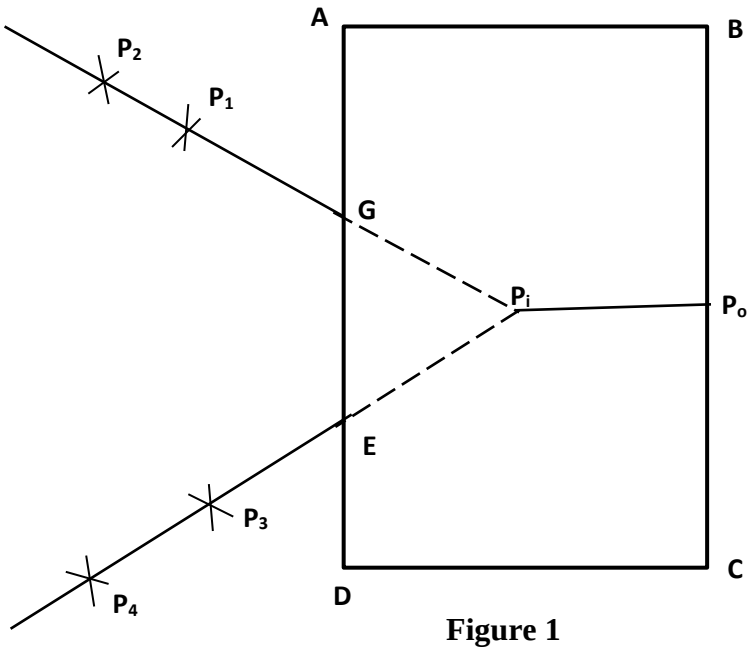


Figure 1

b) Measure the breadth of the glass block.

b =... ... ... cm (1 mark)

c) Replace the glass block and fix an object pin at $\mathbf{P_0}$ such that the pin lies along the surface of the glass block.

d) With your eye on the side **AD** closer to **A**, fix pins $\mathbf{P_1}$ and $\mathbf{P_2}$ such that they are in line with the image $\mathbf{P_i}$ of $\mathbf{P_o}$ as seen from the side **AD** through the glass block.

e) From the same side **AD** closer to **D**, fix pins $\mathbf{P_3}$ and $\mathbf{P_4}$ such that they are in line with the image **Pi** of $\mathbf{P_0}$ seen through the glass block.

f) Remove the glass block and join $\mathbf{P_1}$ and $\mathbf{P_2}$, and $\mathbf{P_3}$ and $\mathbf{P_4}$ to meet at $\mathbf{P_i}$.

g) Join $\mathbf{P_0}$ to $\mathbf{P_i}$ and measure length $\mathbf{P_0P_i}$

P_0P_i =……..m (1 mark)

h) Determine the ratio; $\frac{b}{b-P_0\,P_i}$ = n (2 marks)

(Hand in the outline with the question paper.) (1 mark)

PART B

a) Trace the outline of the glass block again on the second plain paper and label it **ABCD** as shown in **Figure 2**.

b) Construct a normal on the side **AB** approximately 3cm from **A** and measure angle of incidence i $=35^0$ (secure the plain paper using paper pins).

c) Replace the glass block on the outline and fix pins $\mathbf{P_1}$ and $\mathbf{P_2}$ along the line of 35^0.

d) Viewing from the sides **CD** through the block, fix pins $\mathbf{P_3}$ and $\mathbf{P_4}$ such that they appear in line with the images of $\mathbf{P_1}$ and $\mathbf{P_2}$.

e) Join $\mathbf{P_3}$ and $\mathbf{P_4}$ and join **x** and **y**.

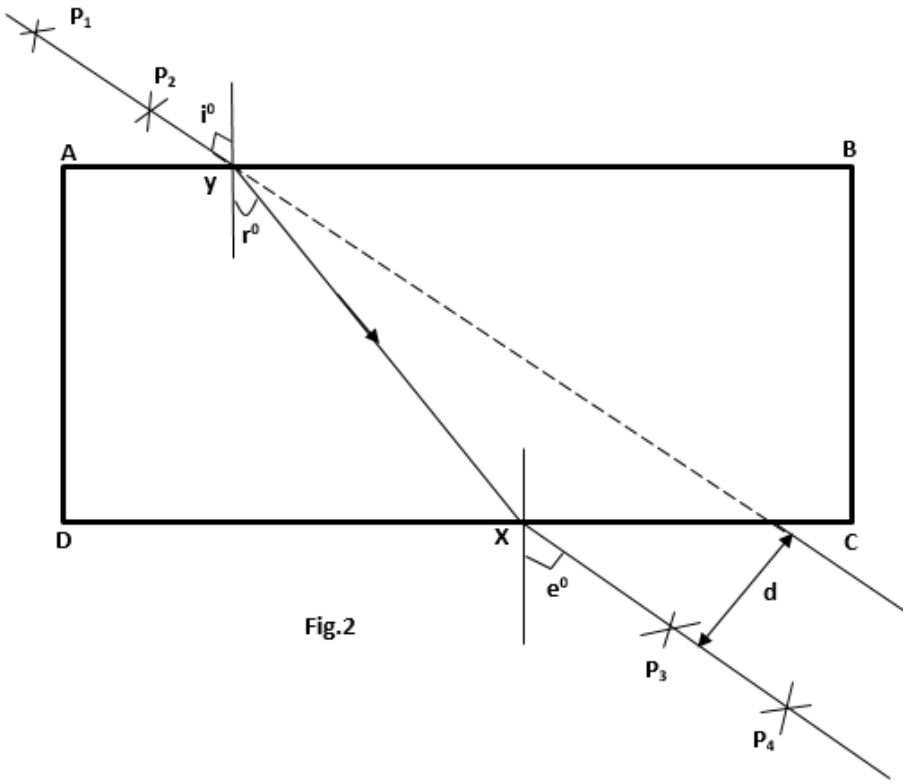


Fig.2

f) Extend the line **P_1** and **P_2** to obtain lateral displacement as shown in the figure and measure the lateral displacement **d** and angle **r^0.**

g) Tabulate your results.

h) Repeat the procedure in (i) to (vi) for angles of incidence 45^0, 55^0,65^0 and 75^0.

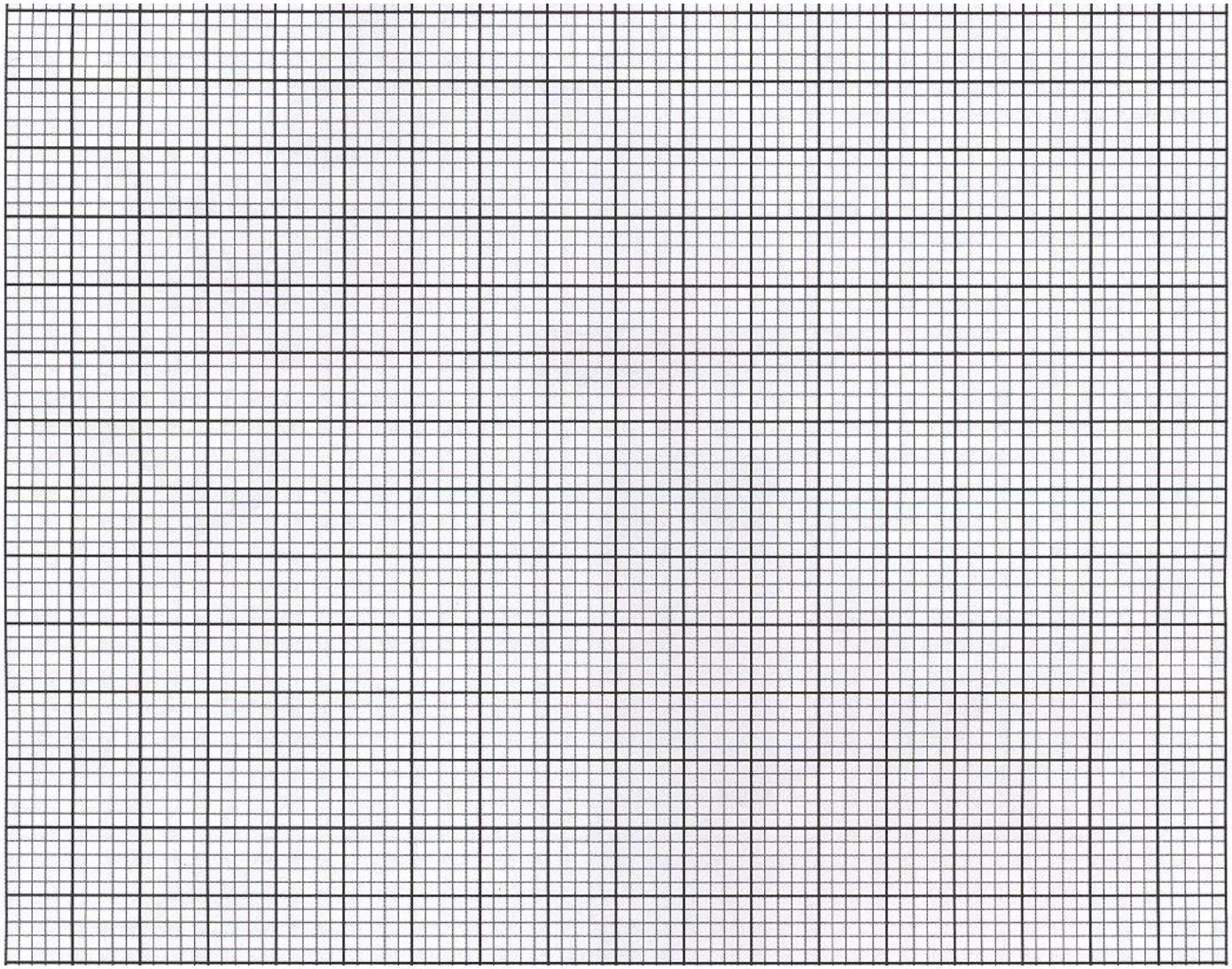
(Hand in the plain paper on which you have done your experiment together with the exam paper)

(2 marks)

i^0	35	45	55	65	75
r^0					
d(cm)					

(5 marks)

i) Plot a graph of **d (cm)** against **r^0** (5 marks)



j) From your graph:

i) Determine the value $\mathbf{r}^0$ where the lateral displacement d equals to the breadth **b** of the block.

$\mathbf{r}^0$ = …… (1 mark)

ii) Given that **k** sin $\mathbf{r}^0$=1, determine the value of **k** (2 marks)

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Question 2

PART A

- A glass beaker
- A metal solid
- Some water
- Source of Heat
- A piece of cotton thread
- A plastic beaker wrapped with tissue paper on the outside.
- A thermometer
- Liquid L
- Measuring balance to be shared

Proceed as follows:

(a) Fill the glass beaker with the water provided and place it on the heat source.

Use the piece of thread to carefully lower the metal solid to the bottom of the beaker. Heat the water to its boiling point. Use the thermometer to measure its point.

Boiling point of water =……Kelvin (1 mark)

b) Find the following measurements using appropriate instruments

Mass of the metal solid $\mathbf{M_s}$ = …… g (½ mark)

Mass of the wrapped empty plastic beaker

$\mathbf{M_1}$……g (1 mark)

Use the plastic beaker to measure 240ml of **liquid L**, hence find the joint mass of the plastic beaker and its content **liquid L**,

$\mathbf{M_2}$ =…… g (½ mark)

Initial temperature of **liquid L**, $\mathbf{T_1}$ = ……..Kelvin (1 mark)

c) At boiling point of water, quickly transfer the metal solid into **liquid L**, stir well and measure the temperature of the mixture immediately.

Temperature of the mixture

$\mathbf{T_2}$ = ……. Kelvin (1 mark)

d) By using the measurements taken in parts (a), (b) and (c) as well as the equation provided below, determine the specific heat capacity of liquid L.

(Take S.H.C. of metal solid = 480Jkg^{-1}k^{-1} and S.H.C. of plastic = 359 Jkg^{-1}k^{-1})

(Heat lost by metal solid) = (heat gained by **liquid L**) + (heat gained by plastic beaker) (3 marks)

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PART B

You are provided with the following apparatus:

- A nichrome wire
- A 20g mass
- A meter rule
- A test –tube
- A retort stand, boss, and clamp

Proceed as follows:

a) Measure the length, L, of the nichrome wire provided
L = ……. cm (½ mark)

b) Wind the whole length of the wire tightly on the test-tube making sure that the turns are as close as possible but not overlapping. Measure the length, **β**, of the coil made.
β =……. cm (½ mark)

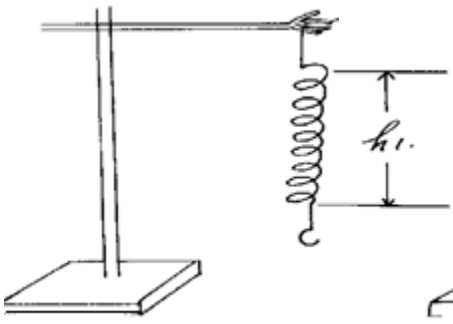
c) Remove the coil from the test-tube. Straighten the first and the last turns of coil. Bend one end to make a hook.

d) Count and record the number, **N**, of complete turns remaining on the coil.
N =…… (1 mark)

e) Measure and record the distance $\mathbf{h_1}$ between the end turns of the coil as shown on the **Figure 1** below.

$\mathbf{h_1}$= ……. (½ mark)

Figure 1



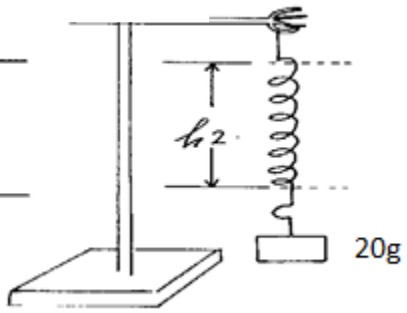


Figure 2

f) Load a 20 g mass on the coil as shown in **Figure 2** above. Measure and record the distance, $\mathbf{h_2}$, between the end turns of the coil.

$\mathbf{h_2}$ = ……. (½ mark)

g) Determine the spring constant **K** in S.I units. (1 mark)

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h) Obtain the constant, **P**, for the wire from the expression: (2 marks)

$$P = \frac{4mgR^3}{Kr^4}$$

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Where: **m** is the mass used, **g** is acceleration due to gravity ($g = 10m/s^2$),

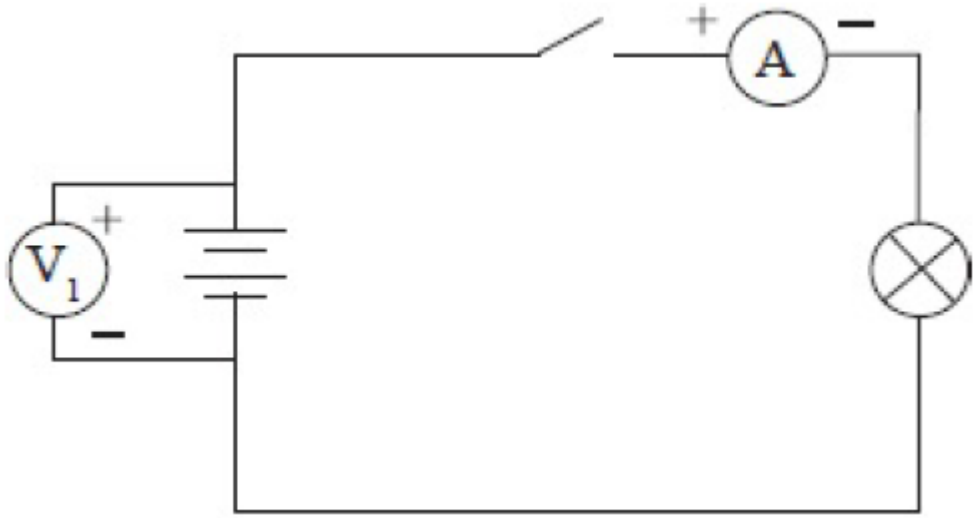
$$R = \frac{L}{2\pi N} \quad \text{and} \quad r = \frac{\beta}{2\pi N}$$

PART C

You are provided with the following:

- Two cells
- A 2.5 V torch bulb in a bulb holder
- 10 Connecting wires
- Switch
- Ammeter (0 – 3A),
- Voltmeter (0 – 5 V)
- Two cell holders

PROCEDURE 1



SET UP ONE

Set up the circuit shown in figure above.
a) Read and record the voltmeter V_1 and ammeter A_1 readings.

V_1 …….. (½ mark)

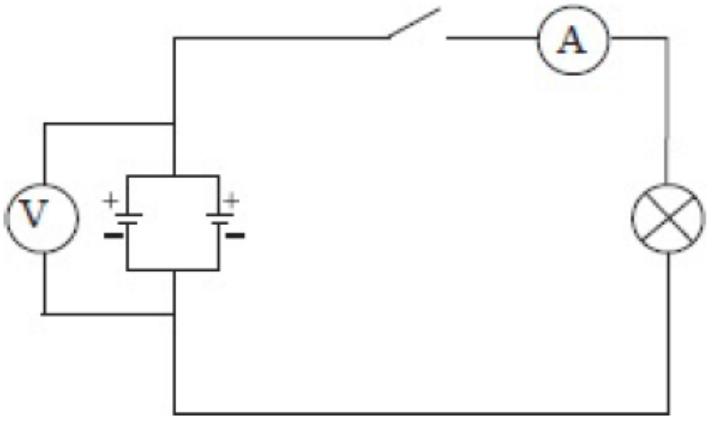
• Switch on the circuit.
b) Read and record the voltmeter and ammeter readings. Note the brightness of the bulb.

V_2 …….. (½ mark)

A_1…….. (½ mark)

PROCEDURE 2

• Connect the circuit as shown in figure below



SET UP TWO

c) Read and record the voltmeter reading $\mathbf{V_3}$

$\mathbf{V_3}$ …….. (½ mark)

• Put on the switch. Take note of the brightness of the bulb

d) Read and record the voltmeter and ammeter readings.

$\mathbf{V_4}$ ..... (½ mark)

$\mathbf{A_2}$..... (½ mark)

e) Compare the values of $\mathbf{V_1}$ and $\mathbf{V_3}$ (1 mark)

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f) Make a conclusion on (e) above (1 mark)

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g) In which set up does the bulb light for a longer time? Explain in terms of $\mathbf{A_1}$ and $\mathbf{A_2}$ (1mark)

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