## KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY JOINT EXAMINATION - 2016

Kenya Certificate of Secondary Education
PHYSICS
PAPER 3
(PRACTICAL)
TIME: 2½ HOURS

## INSTRUCTIONS TO CANDIDATES:

1. Write your name and index number in spaces provided above.
2. Sign and write the date of examination in spaces provided above.
3. Answer all the questions in spaces provided in the question paper.
4. You are supposed to spend the first 15 minutes of $2 \frac{1}{2}$ hours allowed for this paper reading the whole paper carefully before commencing the work.
5. Marks are given for clear record of the observations actually made, their suitability, accuracy and the use made of them.
6. Candidates are advised to record their observations as soon as they are made.
7. Non-programmable silent electronic calculators and KNEC Mathematical table may be used.

FOR EXAMINER'S USE ONLY

| Question 1 | b | c | d | e(i) | e(ii) | Part B | g | h |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Maximum Score | 1 | 5 | 5 | 2 | 3 |  | 2 | 2 |
| Candidate's Score |  |  |  |  |  |  |  |  |


| Question 2 | a | b | c(i) | c(ii) | d | e | Part B (i) | j(i) | j(ii) |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Maximum Score | 1 | 5 | 1 | 2 | 1 | 1 | 3 | 5 | 1 |
| Candidate's Score |  |  |  |  |  |  |  |  |  |

## Question 1

## PART A

You are provided with the following.

- A resistance wire PQ mounted on a mm scale.
- An ammeter.
- A voltmeter.
- A switch K.
- Two new dry cells and cell holder.
- Seven connecting wires at least two with crocodile clips.

Proceed as follows:
(a) Set up the circuit as shown in figure 1 below.

(b) Open the switch and record the voltmeter readings.
E = ........................ volts.
(c) (i) Starting with $\mathrm{L}=70 \mathrm{~cm}$, read and record the readings of voltmeter and ammeter in table 1 provided.

Table 1

| Length L(cm) | 70 | 50 | 40 | 30 | 20 | 10 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Current I(A) |  |  |  |  |  |  |
| P.d, V (Volts) |  |  |  |  |  |  |

(ii) Repeat step $c(i)$ above for other values of $L$ given in the table, 1 above. ( 5 marks)
(d) Plot a graph of p.d (y-axis) against I.

(e) Given that the graph is governed by the equation $\mathrm{E}=\mathrm{V}+\mathrm{Ir}$, determine.
(i) the e.m.f of the two cells in series.
(ii) the internal resistance of the two cells.

## PART B

You are provided with the following.

- A lens and lens holder.
- A candle.
- A screen.
- A metre rule.

Proceed as follows:
Set up the apparatus as shown in figure 2.

(f) Starting with $\mathrm{U}=30 \mathrm{~cm}$, adjust the position of the screen to obtain a sharp image of the candle. Record the value of V in Table 2.
(g) Repeat the procedure in (f) for $\mathrm{U}=40 \mathrm{~cm}$. Complete the table.

| $\mathrm{U}(\mathrm{cm})$ | $\mathrm{V}(\mathrm{cm})$ | $m=\frac{V}{U}$ |
| :---: | :--- | :--- |
| 30 |  |  |
| 40 |  |  |

Table 2
(h) Given that the focal length of the lens satisfies the equation $f=\frac{V}{1+m}$ determine the average value of focal length $f$.

## Question 2

## PART A

You are provided with the following:

- A metre rule.
- A knife edge.
- One 50 g mass and a 100 g mass.
- Some thread.
- Some water in a beaker.
- Liquid L in a beaker.
- Tissue paper.

Proceed as follows:
(a) Balance the metre rule on the knife edge and record the reading at this point.

Balance point $\qquad$ cm

For the rest of this experiment the knife edge must be placed at this position.
(b) Set up the apparatus as shown in the figure 1. Use the thread provided to hang the masses such that the positions of the support can be adjusted.


The balance is attained by adjusting the position of the 100 g mass. Note that the distance $\mathbf{X}$ and $\mathbf{D}$ are measured from the knife edge and the 50 g mass is fully immersed in water. Record the values of $\mathbf{X}$ and $\mathbf{D}$.
$X=$ $\qquad$ cm
(1 mark)
(1 mark)
D = cm

Apply the principle of moments to determine the weight $\mathrm{W}_{1}$ of the 50 g mass in water and hence determine the upthrust $\mathrm{U}_{\mathrm{w}}$ in water.
$\mathbf{W}_{1}=$ $\qquad$
$\qquad$
$\qquad$
$\mathbf{U}_{\mathbf{w}}=$

Remove the 50 g mass from the water and dry it using tissue paper.
(c) (i) Now balance the metre rule when the 50 g mass is fully immersed in the liquid L . Record the value of the distance $\chi$.
$\chi=$ cm
(ii) Apply the principle of moments to determine the weight $\mathrm{W}_{2}$ of the 50 g mass in the liquid L and hence determine the up thrust $\mathrm{U}_{\mathrm{L}}$ in the liquid.
$\qquad$
(d) Determine the relative density R.D of the liquid L, given that:
(e) Find the density of liquid $\chi$ in $\mathrm{kg} / \mathrm{m}^{3}$. (Given that density of water in $1000 \mathrm{~kg} / \mathrm{m}^{3}$ ).

## PART B

You are provided with the following:

- A rectangular glass block.
- Four optical pins.
- A piece of soft board.
- A plain sheet of paper.
- Cello tape.

You are required to have your own Mathematical set.
Proceed as follows.
(f) Place the plain sheet of paper on the soft board and fix it using the cello tape provided. Place the glass block at the centre of the sheet, draw its outline. Remove the glass block.

(g) Draw a normal at a point 2 cm from the end of one of the longer side of the block outline. This normal line will be used for the rest of the experiment. Draw a line at an angle $\theta=25^{\circ}$ from the normal. Stick two pins $\mathrm{P}_{1}$ and $\mathrm{P}_{2}$ vertically on this line.
(h) By viewing through the glass from the opposite side, stick two other pins $\mathrm{P}_{3}$ and $\mathrm{P}_{4}$ vertically such that they are in line with the images of the first two pins. Draw a line through the marks made by $\mathrm{P}_{3}$ and $\mathrm{P}_{4}$ to touch the outline. Extend the line $\mathrm{P}_{1} \mathrm{P}_{2}$ through the outline (dotted line). Measure and record in the table the perpendicular distance $d$ between the extended line and the line $P_{3} P_{4}$. Record this value in the table.
(i) Repeat the procedure in (g) and (h) for other values of $\theta$ shown in the table.

| $\theta(\mathrm{deg})$ | 25 | 35 | 40 | 45 | 55 | 60 | 56 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathrm{~d}(\mathrm{~cm})$ |  |  |  |  |  |  |  |

(j) (i) Plot a graph of d against $\theta$.
(ii) Use the graph to estimate the value of d when $\theta=0$.


