**Name ……………………………………………………………… Index Number………………………………..**

**232/2**
**PHYSICS**
**Paper 3**
**(PRACTICAL)**
**March/April 2011**
2 hours

**Candidate's signature ……………………..**
**Date ………………………………………………**

# MOKASA JOINT EVALUATION EXAMINATION

**Kenya Certificate of Secondary Education**

PHYSICS

**Paper 3**

**(PRACTICAL)**

## Instructions to Candidates

(a) *Write your name and index number in the spaces provided above.*
(b) *Sign and write the date of the examination in the spaces provided above.*
*(c) Answer ALL the questions in the spaces provided.*
*(d) Mathematical tables and silent electronic calculators may be used.*
*(e) All working MUST be clearly shown where necessary. Marks are given for a clear record of the observations actually made, for their suitability and accuracy and for the use made of them.*
*(f) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.*

**For Examiner's use only**

***Question 1***

| | *Table* | *a* | *b* | *c* | *d* | *Total* |
|---|---|---|---|---|---|---|
| ***Maximum Score*** | *7* | *3* | *5* | *2* | *3* | |
| ***Candidate's Score*** | | | | | | |

***Question 2***

| | *Table* | *a* | *b* | *c* | *d* | *Total* |
|---|---|---|---|---|---|---|
| ***Maximum Score*** | *7* | *3* | *5* | *2* | *3* | |
| ***Candidate's Score*** | | | | | | |

1. You are provided with the following
    - A metre rule
    - A solid labeled N
    - Two combined solid labeled M
    - Water in a 250 ml beaker labeled W
    - Kerosene in a 250ml beaker labeled K
    - Two pieces of cotton thread approximately 20cm each
    - A knife edge
    - Some tissue paper

    **Proceed as follows**

    (i) Balance the metre rule at its centre of gravity. Note the mark at which it balance, let it be O

    (ii) Suspend the combined solids M at a distance d= 20cm from O. Balance it with the mass N suspended in air at a distance $d_1$ from O on the other side of the metre rule as shown in figure 1. Record distance $d_1$ of N from O in table 1.

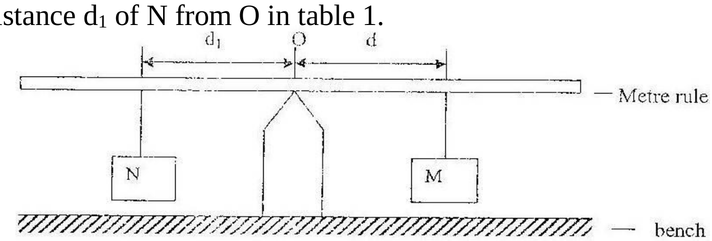

Figure 1. M in air

    (iii) While maintaining the distance d, immerse mass M completely in water, ( but not touching the bottom of the beaker) then adjust the position of N to balance the metre at its c.o.g again. See figure 2. Record the new distance $d_2$ for the mass N in table 1.

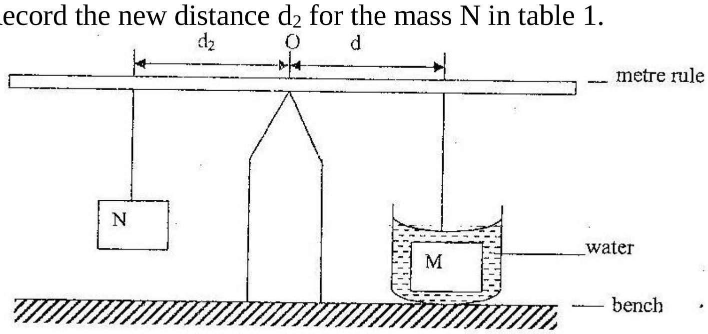

Figure 2. M in water

    (iv) Still maintain the distance d, wipe mass M dry and immerse it completely in kerosene ( but not touching the bottom of the beaker) then adjust the position of N to balance the metre rule at its c.o.g again, see figure 3. Record the new distance $d_3$ for the mass N in table 1.

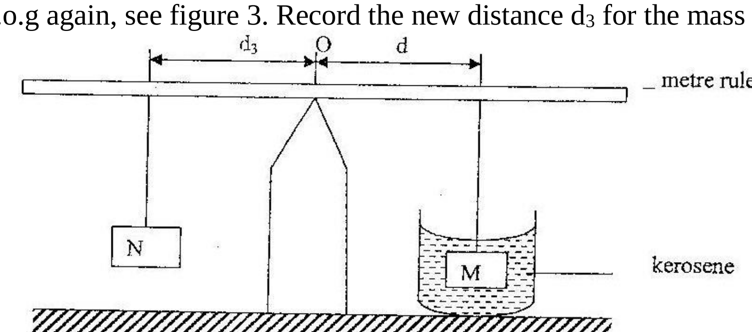

Figure 3 M in kerosene

    (v) Remove the mass M from kerosene and wipe it dry. Increase the distance d in figure 1 to a new value of 25 cm and repeat the procedures (ii), (iii) and (iv) above, each time filling table 1 respectively.

    (vi) Repeat for three other values of d ( i.e 30, 35 and 38) each time completing table 1 appropriately.

| Distance d (cm) of M from O when both are suspended in air | Distance $d_1$ (cm) of N when M is in air | Distance $d_2$ (cm) of N when M is in water | Distance $d_3$ (cm) of N when M is in kerosene | $d_1 - d_2$ (cm) | $d_1 - d_3$ (cm) |
|---|---|---|---|---|---|
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 38 | | | | | |

( 7 mks)

(vii) Given that the relative density (R.D) of solid M is determined by the relationship R.D = $\frac{d_1}{d_1 - d_2}$ find using the results obtained the relative density of solid M. ( 3 mks)

(b) On the grid provided, plot a graph of $d_1 - d_3$ against $d_1 - d_2$ ( 5 mks)

(c) Calculate the gradient of the graph ( 2 mks)

(d) Given that the relative density of kerosene is given by R.D = $\frac{d_1 - d_3}{d_1 - d_2}$. Use your graph to determine the density of kerosene. Take the density of water as $1 g/cm^3$ ( 3 mks)

2. You are provided with the following:
    - A rectangular glass block
    - 4 optical pins
    - 4 thumb pins
    - A soft board
    - A plain sheet of paper
    - A half metre rule

**Proceed as follows**

(a) Using the thumb pins, fix the sheet of paper on the soft board

(b) Place the glass block in the middle of the plain paper and trace its outline PQRS with the help of the half metre rule, see figure 4

(c) Remove the glass block and construct near P along the edge PQ and label the point of intersection of the normal and edge PQ as B.

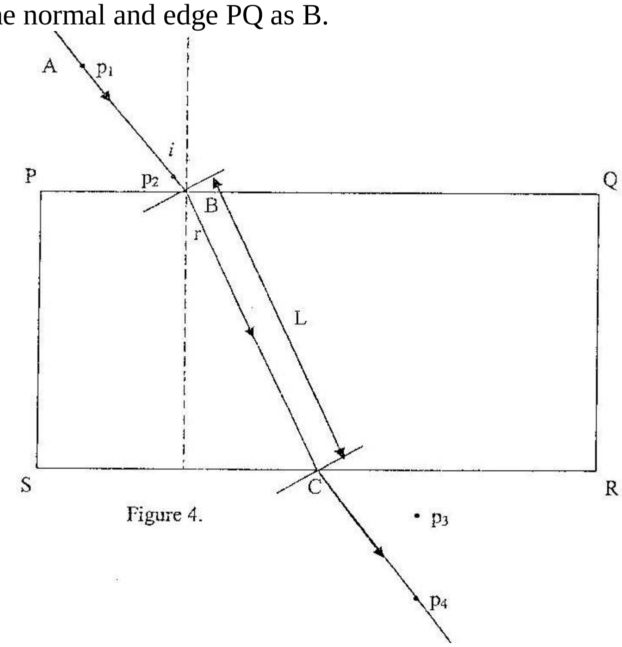


Figure 4.

(d) Construct an incident ray AB at an angle I equal to $20^0$
(e) Put the half metre rule along the line SR and return the glass block into its trace.
(f) Remove the half metre rule and fix pins $p_1$ and $p_2$ on the incident ray AB and looking through the block from the side SR fix pins $p_3$ and $p_4$ such that they are in line with pins $p_1$ and $p_2$.
(g) Remove the glass block and join $p_3$ and $p_4$ to meet the side SR of the block C.
(h) Join B and C to show the path of the ray through the glass block
(i) Measure the length L (cm) and record its value in table 2.
(j) Repeat the procedure above for other angles of incidence of $30^0$, $40^0$, $50^0$ and $60^0$ as shown in table 2, completing the table each time appropriately.

Table 2

| $i^0$ | L (cm) | $\frac{1}{L^2}$ ( $cm^{-2}$) | $Sin^2 i^0$ |
|---|---|---|---|
| 20 | | | |
| 30 | | | |
| 40 | | | |
| 50 | | | |
| 60 | | | |

( 5 mks)

(k) Plot a graph of $\frac{1}{L^2}$ ( y – axis) against $\sin^2 i$ ( x- axis)
(l) (ii) Find the slopes S, of your graph ( 3 mks)
(iii) Determine the intercepts $C_x$ on the x- axis and $C_y$ on the y- axis ( 2 mks)
(m) (i) Given that $n_1 = \sqrt{C_y}$ and $n_2 = \sqrt{-SC_x}$ determine the values of $n_1$ and $n_2$ ( 3 mks)
(ii) Hence determine the ration $\frac{n_1}{n_2}$ ( 1 mk)
(n) Fix your ray drawings to the question paper and hand in ( 1 mk)