NAME: …… **INDEX NO.** ……..……

SCHOOL: …….. **DATE:**……

CANDIDATE'S SIGN. ……..

232/3

PHYSICS

PAPER 3

JULY /AUGUST 2014

TIME: 2½ HOURS

KISUMU WEST DISTRICT JOINT EVALUATION EXAM

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

PHYSICS

PAPER 3

INSTRUCTIONS TO CANDIDATES:

- *Write your **name** and **index number** in the spaces provided above.*
- *Sign and write the **date** of the examination in the spaces provided above.*
- *You are supposed to spend the first 15 minutes of the 2 ½ hours allowed for this paper reading the whole paper carefully.*
- *Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.*

For Examiners' Use Only

Question 1

PART	A					B	
Marks Score	b	c	e	f	g	h	i
	1	1	5	5	3	2	3
Candidate's score							

Question 2

PART	A			B					
Marks Score	a	b	c	d	e(i)	e(ii)	e (iii)	e (iv)	f
	1	1	1	1	5	5	3	2	1
Candidate's score									

This paper consists of 8 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. This question consists of two parts A and B attempt both parts

PART A

You are provided with the following:

- two pieces of wooden blocks
- a retort stand, boss and clamp
- a glass marble
- a piece of cotton thread
- a square piece of polythene paper
- a half-metre rule
- a 20 grammes metal mass
- some water
- a 250 ml beaker
- some tissue paper

Proceed as follows:

(a) Cut two pieces of cotton thread measuring 60cm and 30cm respectively. Use the threads to make two loops. Suspend the half-metre rule freely at its centre of gravity, **P** using the longer loop.

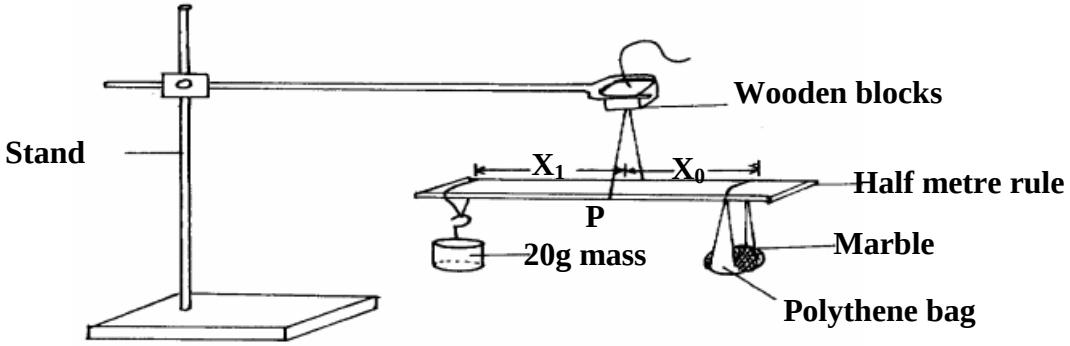


Fig. 1 (a)

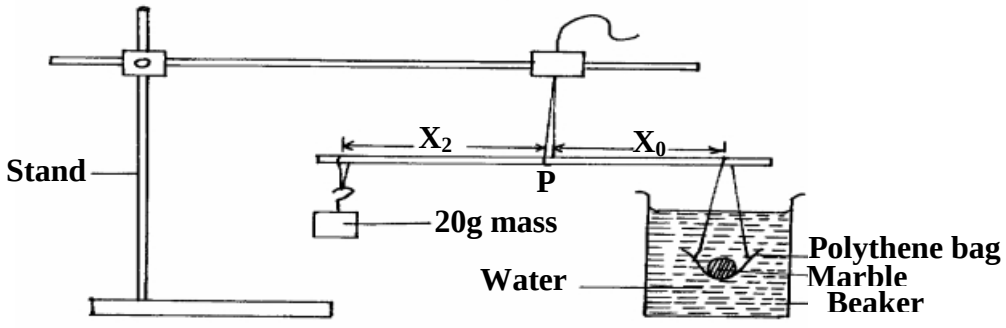


Fig. 1(b)

(b) Suspend the glass marble using threads and the square polythene paper at a distance $\mathbf{X_0}$ = 15cm from the point of suspension, **P**. Also use the shorter thread loop to suspend the 20g metal mass on the opposite side and adjust its position till the half-metre rule is horizontal as in figure 1(a) above. Record the corresponding distance $\mathbf{X_1}$ of the 20g mass from **P**

$\mathbf{X_1}$ = ……cm (1mk)

(c) Fill the beaker with water up to about three quarters capacity. Maintain the distance $\mathbf{X_0}$ invariant as you immerse the glass marble in water and slide the thread holding the 20g metal mass, till the half-metre rule is horizontal again. Note the new corresponding distance $\mathbf{X_2}$ (i.e distance between point of suspension of 20g mass and **P**)

X_2 = …… cm (1mk)

(d) Repeat the procedure in **(b)** and **(c)** for increased values of X_0 as given in table 1 below.

NB:- **After every attempt, wipe the polythene paper and marble dry with the tissue paper provided.**

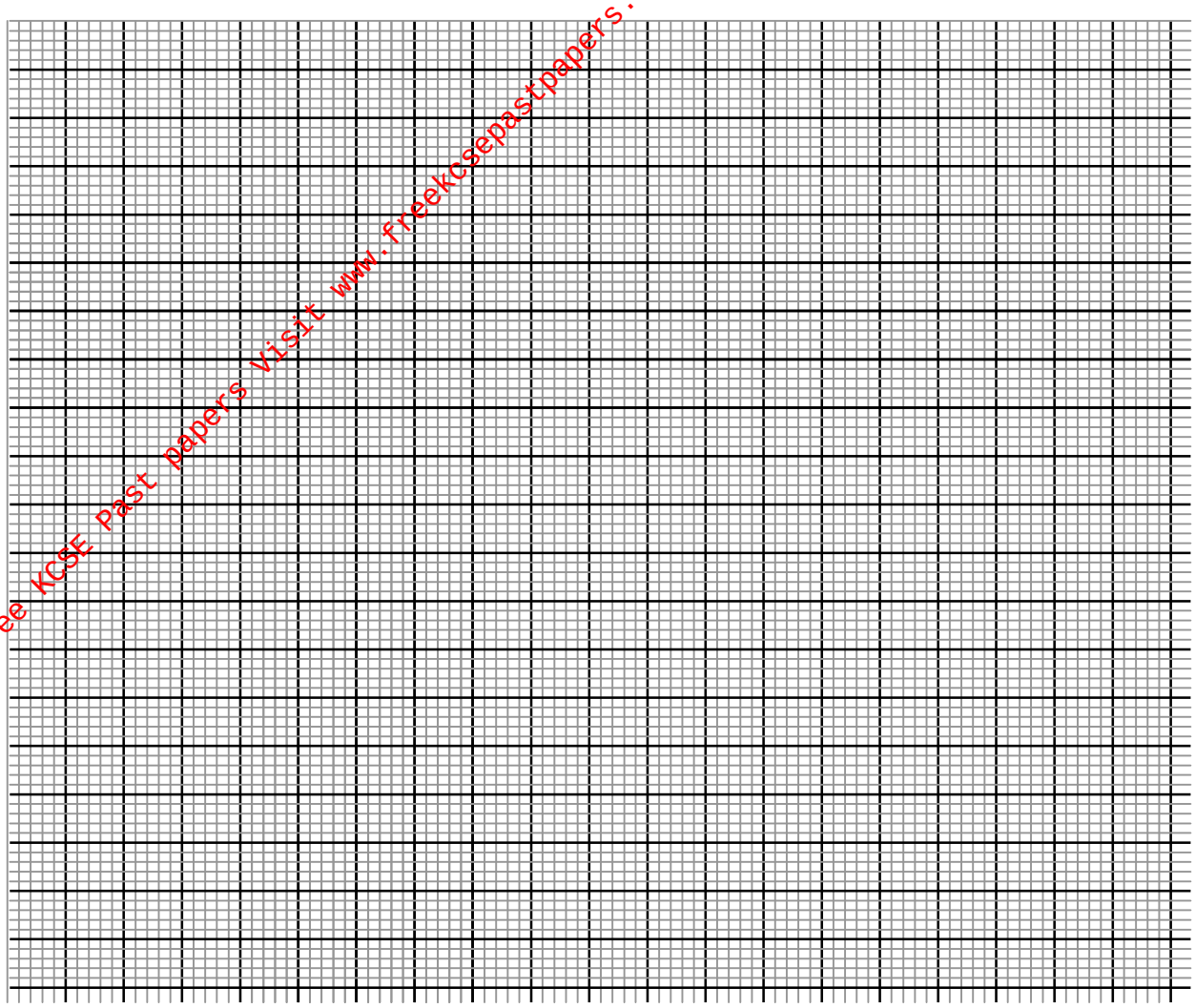
- **Ensure this experiment is done in a draught free area.**

(e) Complete the table 1 (5mks)

Table 1

Distance of marble in air $\mathbf{X_0}$ (cm)	**15**	**17**	**19**	**21**	**23**	**24.5**
Distance of 20g metal mass, $\mathbf{X_1}$ (cm)						
Distance of 20g metal mass, $\mathbf{X_2}$ (cm) When marble is in water						
$\mathbf{X_1}$ - $\mathbf{X_2}$ (cm)						

(f) On the grid provided, plot a graph of $\mathbf{X_1} - \mathbf{X_2}$ (y-axis) against $\mathbf{X_1}$ (5mks)



(g) Determine the slopes, **S** of the graph (3mks)

PART B

You are provided with the following:

- vernier callipers
- glass marble

Proceed as follows

h) Using the vernier callipers, measure the diameter of the glass marble

1st attempt; diameter $\mathbf{D_1}$ = ……cm

2nd attempt (after spinning the glass marble)

Diameter $\mathbf{D_2}$ = …… cm (1mk)

Determine the value of **D** in the expression:

$$D = \frac{D_1 + D_2}{2}$$

= ……cm (1mk)

(i) Find the volume of the glass marble in m^3

Volume = …… (3mks)

This question consists of two parts; A and B

Attempt both parts and attach the two plain papers used in this question

2. PART A

You are provided with the following:

- a soft board
- a white plain paper
- Four (4) optical pins
- a mounted plane mirror labeled **XY**
- Some plasticine (or 4 drawing pins)

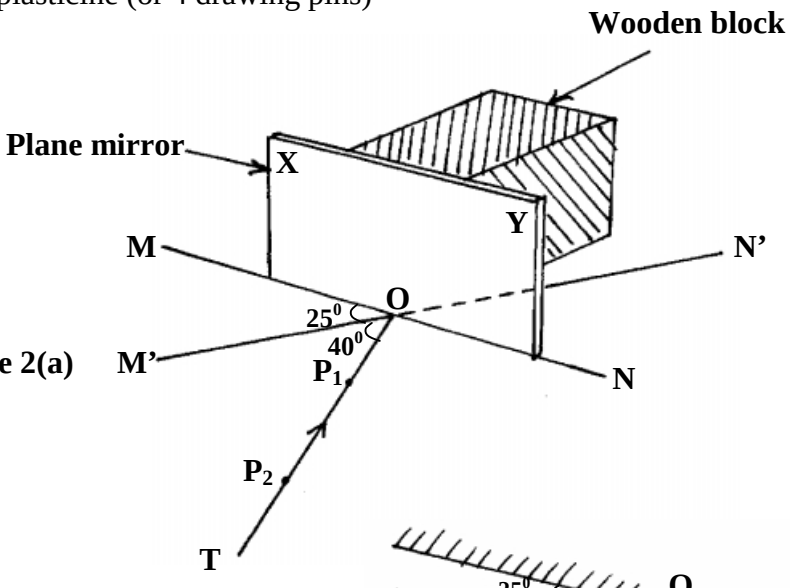


Figure 2(a)

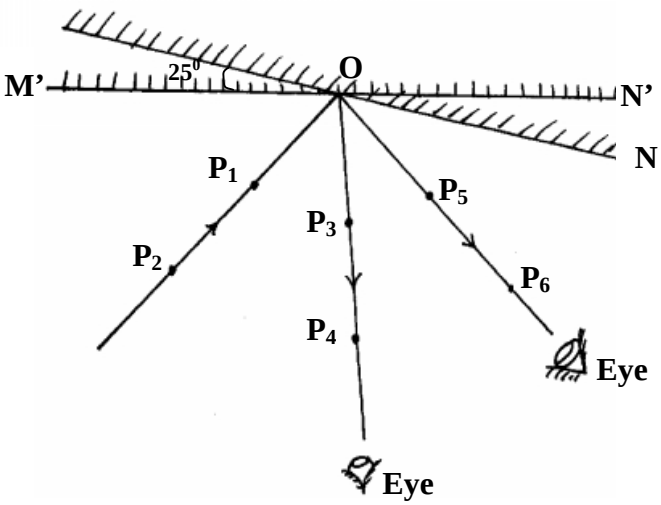


Figure 2(b)

Proceed as follows:

(a) Use small lumps of plasticine (or drawing pins) to stick the white plain-paper provided onto the soft board and draw a straight line **MN** on the paper.

- Draw another straight line **M'N'** which intercepts the line **MN** at point **O.**
- The two lines **MN** and **M'N'** make a vertical acute angle of 25^0 with each other at **O**
- Draw a third line **OT** which makes an angle of 40^0 with **OM**'. Fix two pins; $\mathbf{P_1}$ and $\mathbf{P_2}$ along the line **OT. OT** is representing the approaching ray of light. See figure 2(a) (1mk)

(b) Place the plane mirror **XY** lengthwise along line **MN**. Fix pins $\mathbf{P_3}$ and $\mathbf{P_4}$ in line with the images of $\mathbf{P_1}$ and $\mathbf{P_2}$ as they appear through the mirror.

- Remove the pins $\mathbf{P_3}$ and $\mathbf{P_4}$, then draw line $\mathbf{OP_3P_4}$.
- Line $\mathbf{OP_3P_4}$ is representing the reflected ray of light. (1mk)

(c) (i) Rotate the plane mirror **XY** through the angle of 25^0 about point **O** such that it lies along the line **M'N'.**

- Using two pins again, repeat step **(b)** above to obtain the new position of the reflected ray. Label the marks of the two pins $\mathbf{P_5}$ and $\mathbf{P_6}$ respectively.
- Line $\mathbf{OP_5P_6}$ is representing a new position of the reflected ray after rotation.

See figure 2 (b).

(ii) Measure the size of a cute angle ó between the lines $\mathbf{OP_3P_4}$ and $\mathbf{OP_5P_6}$

Angle ó = ……(1mk)

PART B

You are provided with the following:

- a soft board
- a white plain paper
- 4 optical pins
- 4 drawing pins or (some plasticine)
- a mounted plane mirror labelled **XY**

(d) (i) ***Proceed as follows***

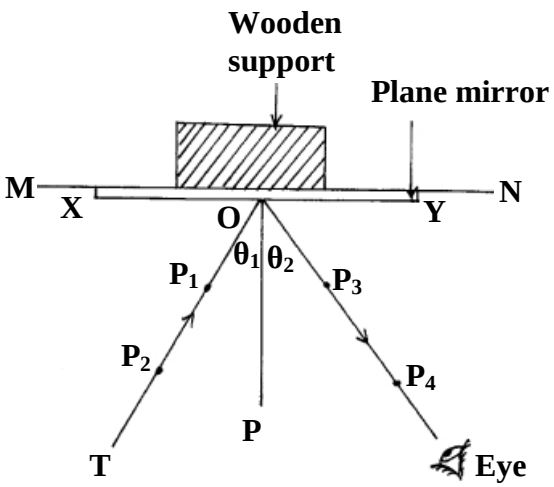


Figure 3

Use small lumps of plasticine (or drawing pins) to stick the white plain paper onto the soft board. (Use the second paper provided).

- Draw a straight line **MN**
- Draw another straight line **ON** which is perpendicular to **MN** at **O**. Line **ON** is representing the normal, see **figure 3** above.

Draw a third line **OT** which intercepts **MN** at **O** and makes acute angle $\Theta_1 = 10^0$ with the normal to the left.

Fix pins P_1 and P_2 onto line **OT**. Line **OT** is representing the approaching ray of light.

Measure the acute angle $\Theta_1 = 10^0$ between the approaching ray and the normal.

- Place the plane mirror **XY** lengthwise along the line **MN** and observe from the opposite side of the normal to locate the images of P_1 and P_2 as they appear in the mirror
- Fix pins P_3 and P_4 such that they are in line with the images of P_1 and P_2 as they appear in the mirror.

(ii) Remove the mirror, join P_3 and P_4 and produce it to meet at **O** so as to obtain the reflected ray.

Measure angle Θ_2, the angle between the normal, **PO** and OP_3P_4

Angle Θ_2 = …….. (1mk)

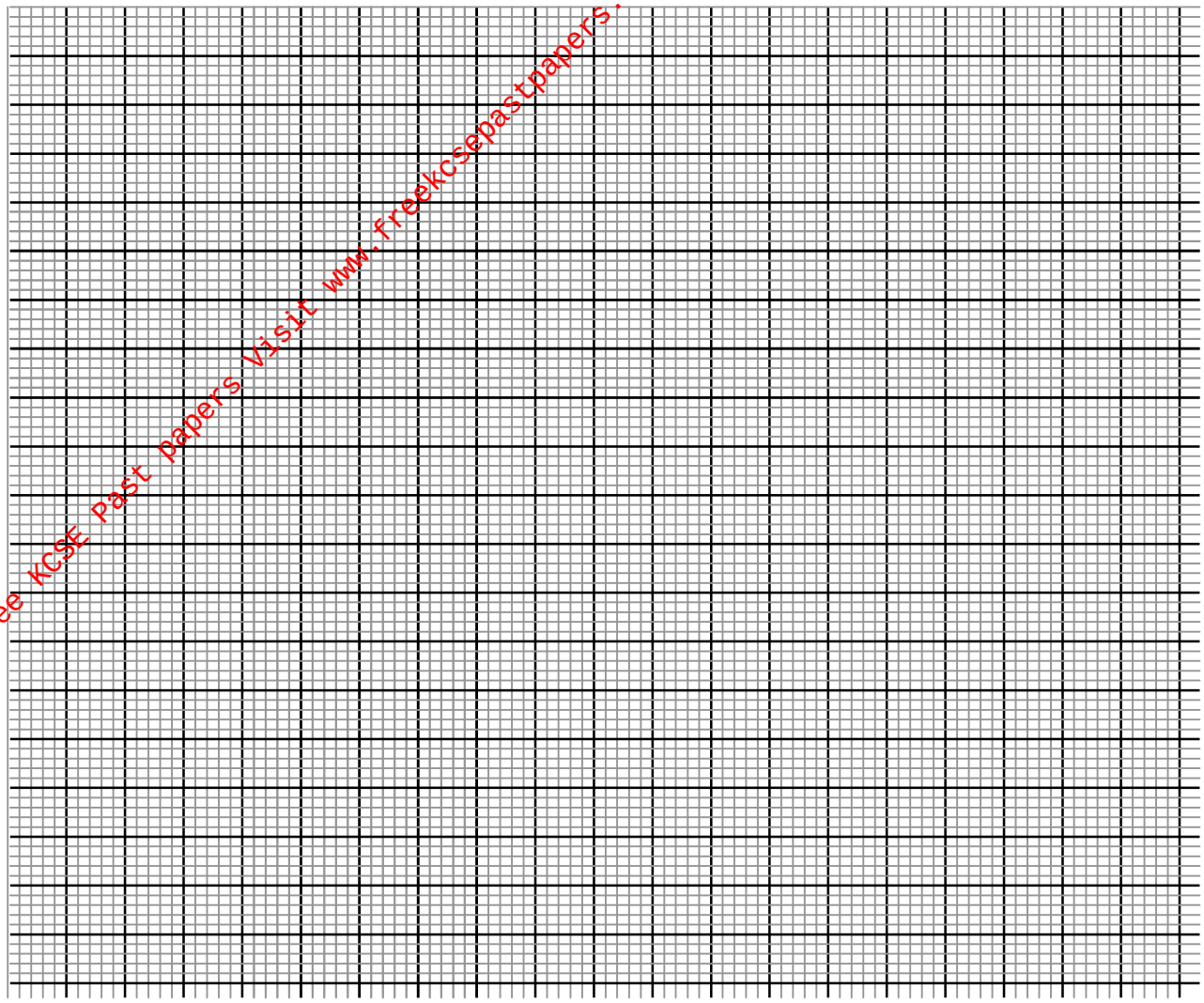
(e) Repeat step (d) above for the values of Θ_1 given in table 2.

i) Complete table 2

Table 2 (5mks)

Θ_1	10	20	30	40	45	55
Θ_2						
Cos Θ_1						
Cos Θ_2						

(ii) Plot a graph of cos Θ_2 (y-axis) against cos Θ_1 (5mks)



(iii) Determine the slope **S** of the graph in e(ii) above. (3mks)

(iv) Find the value of Φ in the expression $27 = \frac{\Phi}{S}$ (2mks)

(f) State the physical law that is verified by the results of question 2 part **B**. (1mk)