**NYERI COUNTY FORM FOUR JOINT ASSESSMENT**
Kenya Certificate of Secondary Education
232/3
PHYSICS
Paper 3
July/August 2015

1. You are provided with the following apparatus.
- Two retort stand + bosses + clamps
- Two pieces of thread (about 70cm long)
- Cellotape (2 pieces 10 cm long each)
- Half meter rule
- Metre rule
- Stop watch

Procedure

a) Set up the apparatus as shown with suspending length , L, as 60cm and points of suspension be 5cm from the ends. Fix firmly with cellotape for half metre rule to remain horizontal.
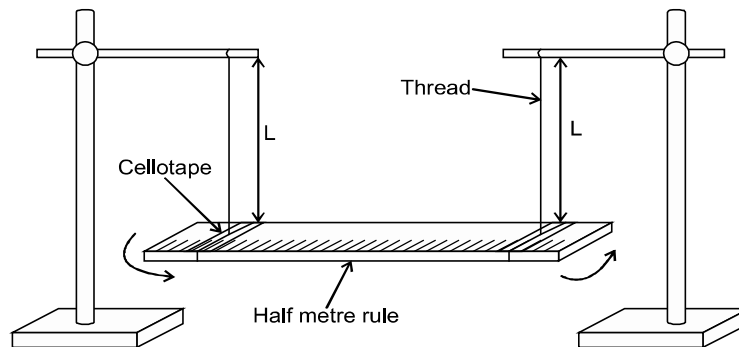
b) Displace both ends of half metre rule through a small angle for the rule to make oscillations along a horizontal plane.
c) Determine and record time for 10 oscillations.
d) Adjust length, L, to 55cm, 50cm, 45cm, 40cm, 35cm and 30cm and repeat b and c above.
e) Record time, t, in the table below.

Length L (cm)	Time for 10 oscillations t(s)	Periodic time T(s)	Log L	Log T
60				
55				
50				
45				
40				
35				
30				

(7 marks)

f) Plot a graph of log T (y-axis) against log L (x - axis) (5 marks)
g) Determine the slope, S, of the graph. (3 marks)
h) Given that $T = KL^n$, determine the value of n. (2 marks)
i) Use the graph to determine the value of K. (3 marks)

2. A. You are provided with the following apparatus.
- Four optical pins
- 30cm ruler
- Protractor
- Soft board
- White plain paper
- Cellotape (about 10 cm long)
- 1 dry cell
- Ammeter
- Voltmeter
- Torch bulb
- Switch.
- 7 connecting wires. (4 with crocodile clip)

Procedure
a) Trace the outcome of the glass block on the white paper.
b) Draw a normal NK, 2cm from point A on side AB
c) Measure an angle (i) 10° from the normal.
d) Place back the glass block on the outline and fix a plane mirror on opposite side of AB, using a cellotape vertically along the length of block as shown.
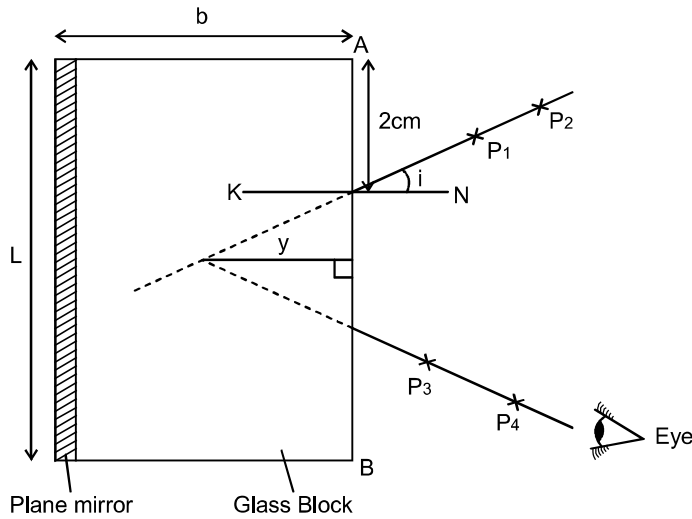

e) Fix two pins P_1 and P_2 as shown in the figure.
f) By observing image of P_1 and P_2 locate two pins P_3 and P_4 such that they appear to be on line with images of P_1 and P_2
g) Remove the pins and the block. Join P_3 P_4 and produce the line to meet line P_1P_2 produced.
Measure the perpendicular distance y.
h) Repeat the same for angles of 15°, 20°, 25°, 30°, 35°, and 40° and record the results in the table below.
(NB: *The paper work must be submitted together with the question paper.*)

Angle i	10°	15°	20°	25°	30°	35°	40°
y (cm)							

i) Plot a graph of y (cm) (y-axis) against angle i (x-axis.)   (5 marks)
   I)   Use the graph to determine y_o the value of y when angle i = 0
        y_o .... cm   (1 mark)
   II) Measure and record breadth (b) of the glass block.
        b .... cm   (1 mark)
   III) Determine the value of η given that   (2 marks)

$$\eta = \frac{b}{y_O}$$

B. Set up the following circuit.
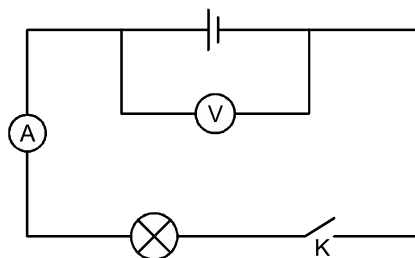
I. Record the voltmeter reading when K is open
   V_i .... cm   (1 mark)
II. Close the switch and record the new reading of the voltmeter and ammeter.
   V_2 .... volts.   (1 mark)
   I = ... A   (1 mark)
III. Given that E = I (R + r), use the above results to determine the resistance, R, of the bulb.   (3 marks)

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MARKING SCHEME

1. e)

Length L(cm)	Time for 10 oscillations t(s)	Periodic time T(s)	Log L	Log T
60	11.22	1.122	1.778	0.0499
55	9.93	0.993	1.74	-0.00305
50	9.28	0.928	1.699	-0.032
45	8.96	0.896	1.653	-0.0476
40	8.75	0.875	1.6	-0.057
35	8.22	0.822	1.54	-0.085
30	7.5	0.7523	1.47	-0.123

g)
$$S = \frac{Dy}{Dx}$$
$$= \frac{2.0 - 0}{17.6 - 16.8} = \frac{2.0}{0.8} = 2.5$$

$$\mathbf{T = KL^n}$$
$$\mathbf{LogT = \log K + nLogL} \quad / \quad \mathbf{\underset{y}{LogT} = \underset{mx}{nLogL} + \underset{c}{\log K}}$$

$\therefore$ n = slope = 2.5 ✔**1**

i) C = log k ✔**1**
    y - intercept
    log k = 34.4×10^{-2}
    k = anti log 34.4×10^{-2} ✔**1**
    = 2.208 ✔**1**

GRAPH
Question 2

i°	10	15	20	25	30	35	40	
y(cm)	4.5	4.3	4.1	3.9	3.7	3.5	3.4	±0.1

Each point 1 mark for maximum 5 points - 5 marks

GRAPH

i) I. $y_o = 4.9$cm
    II. b = 6.1cm ± 0.1 **1 mark**
    III. n = <u>b</u>   Substitution - ½ mark
         y_o Evaluation - ½ mark
         Accuracy - 1 mark (1.20 - 1.54)

j) V_1=1.5V ± 0.1 **1 mark**
    V_2 = 1.3 V **1 mark**
    I = 0.8A **1 mark**
    E = IR + IV   **1 mark**
    V_1 = E
    V_2 = IR   **1 mark**

$$R = \frac{V_2}{I} = \frac{1.3}{0.8} = 1.625\Omega \qquad \textbf{\textit{1 mark}}$$