

MARKING SCHEME.

SUKELEMO MOCK EXAMINATIONS  
Kenya Certificate of Secondary Education (K.C.S.E)  
PHYSICS  
(PRACTICAL)  
Paper 3 – December 2020

QUESTION ONE

Part A

(a) Measure the length  $l$  of the boiling tube provided using a metre rule

$l = \dots\dots 15.0 \text{ cm}$  (1mark)

$\pm 0.2$  deny  $\frac{1}{2}$  mk for missing unit.  
1 d.p. a must

(b) Measure the external diameter  $d$  of the boiling tube at the middle using a Vernier callipers.

$d = \dots 2.46 \text{ cm}$

(1mark)

$\pm 0.05 \text{ cm}$  deny  $\frac{1}{2}$  mk for missing unit.  
2 d.p. a must.

(c) Calculate the external volume of the boiling tube.  $V_1 = \frac{11d^2l}{14}$  (1mark)

Substitution of value at (a) and (b)

Exact evaluation or 4 s.f – deny  $\frac{1}{2}$  mk for missing unit.

(d) Completely fill the boiling tube with water. Pour the water into the measuring cylinder. Read and record the volume  $V_2$  of the water.

$V_2 = 62 \text{ cm}^3$

(1mark)

$\pm 1 \text{ cm}^3$  Deny  $\frac{1}{2}$  mk for missing unit.  
whole number.

(e) Calculate the volume  $V_3$  of the glass used to make the boiling tube. (1mark)

Answer in (c) –  $V_2$  (exact subtraction)

Deny  $\frac{1}{2}$  mk for missing unit.

(f) Using the electronic balance measure the mass of the boiling tube

Mass =  $0.0269 \pm 0.0005$  kg (1mark)

*4 d.p. a must.*

(e) Determine the density of the glass. (1mark)

Answer in (f) / Answer in (e) ✓ <sup>1/2</sup>

Exact evaluation or 4 s.f. ✓ <sup>1/2</sup> *Deny 1/2 mk for missing unit. Ignore units.*

### PART B

(a) Record the voltmeter reading when the switch is open.

$E = 1.6$  V (1mark) *Deny 1/2 mk for missing unit. ±0.2, 1 d.p. a must.*

(ii) Close the switch and record the voltmeter and ammeter readings V and I.

$V = 1.0$  V (1mark) *±0.2, 1 d.p. a must; deny 1/2 mk for missing unit.*

$I = 0.09$  A (1mark)

*±0.02  
2 d.p. a must; deny 1/2 mk for missing unit.*

(iii) Explain why V is less than E. (1mark)

**volts are lost in overcoming the internal resistance**

(iv) Now connect the voltmeter across the carbon resistor X and record voltmeter reading  $V_1$  when the switch is on.

$V_1 = 1.0$  V (1mark)

*±0.2, 1 d.p. a must; deny 1/2 mk for missing unit.*

(v) Determine X given that

$$X = \frac{V_1}{I}$$

(1mark)

Correct substitution ✓ <sup>1/2</sup>

Exact evaluation or 4 s.f. ✓ <sup>1/2</sup>

*Ignore units.*

(b) Using the micrometre screw gauge, measure and record the diameter D of the resistance wire R provided

D = 0.00045 m (1mark)

*±0.00005  
5 d.p. must, accept std form of 1 d.p. i.e. 4.5 × 10<sup>-4</sup>*

(i) Move the sliding jockey along the resistance wire AB and note the length L<sub>1</sub> and L<sub>2</sub> where the galvanometer pointer points at the zero mark. Record the values of L<sub>1</sub> and L<sub>2</sub>.

L<sub>1</sub> = 0.00035 m (1mark)

*±0.00005  
5 d.p. must*

L<sub>2</sub> = 0.00045 m (1mark)

*±0.00005 ; 5 d.p. must.*

(ii) Determine the resistance of the resistance wire R using the relationship, (2marks)

$$\frac{R}{L_1} = \frac{X}{L_2}$$

Correct substitution ✓

Exact evaluation or 4 s.f ✓

*Deny 1/2 mark for missing unit*

(iii) Determine the resistance of the wire R per metre. (1 mark)

Correct substitution ✓ 1/2

Exact evaluation or 4 s.f ✓ 1/2

*Ignore units.*

(iv) Given that,  $R = \frac{0.1114S}{D^2}$  determine the value of S, where R is the resistance per metre. (1 mark)

Correct substitution ✓ <sup>1/2</sup>

Exact evaluation or 4 s.f. ✓ <sup>1/2</sup>  
Ignore units.

## QUESTION TWO PART A

(a) Measure and record the width  $t$  of the glass block using the vernier calipers provided.

$t = 0.0650$  (m) (1 mark)

*±0.010  
4 d.p. must*

(b)  $O^1OP = 10^0$  (1 mark) *±2 Deny 1/2 mk for missing unit.*

(c)  $OO^1P = 20^0$  (1 mark) *±2 Deny 1/2 mk for missing unit.*

Measure the perpendicular distance  $d$  from the line  $O^1N$  to  $OP$  produced.

(d)  $d = 0.012$  (m) (1 mark)

*±0.002  
3 d.p. must*

(e) Determine  $t_1$  given that,  $t_1 = \frac{d \cos \text{angle}(OO^1P)}{\sin \text{angle}(O^1OP)}$ .

(2 marks)

Correct substitution ✓ <sup>1</sup>

Exact evaluation or 4 s.f. ✓ <sup>1</sup>

*Deny 1/2 mk for a missing unit.*

(f) How do the values of  $t$  and  $t_1$  compare .

(1mark)

**They are equal or approximately the same**

**NB. The worksheet should be handed in with the question paper.**

**PART B**

(e) Complete the table.

(8marks)

*Repeated values to be treated as one.*

p(cm)	21.0	19.0	17.0	15.0	13.0	10.0	8.0
q(cm) $\pm 1.0$	17.0	18.0	19.0	20.0	20.7	20.0	19.8
Time $t$ for 10 oscillations (s) $\pm 2.00$	8.50	9.50	10.50	10.50	12.50	13.50	17.50
Periodic time $T$ (s)	<i>All must be correct</i>						
$\frac{p}{q}$	<i>Exact or 4 s.f (all correct)</i>						

*1d.p.  $6 \times \frac{1}{2} = 3$  mks*

*2d.p.  $6 \times \frac{1}{2} = 3$  mks*

*1mk*

*1mk.*

(g) (i) Plot a graph of  $T$  (y axis) against  $\frac{p}{q}$

(4marks)

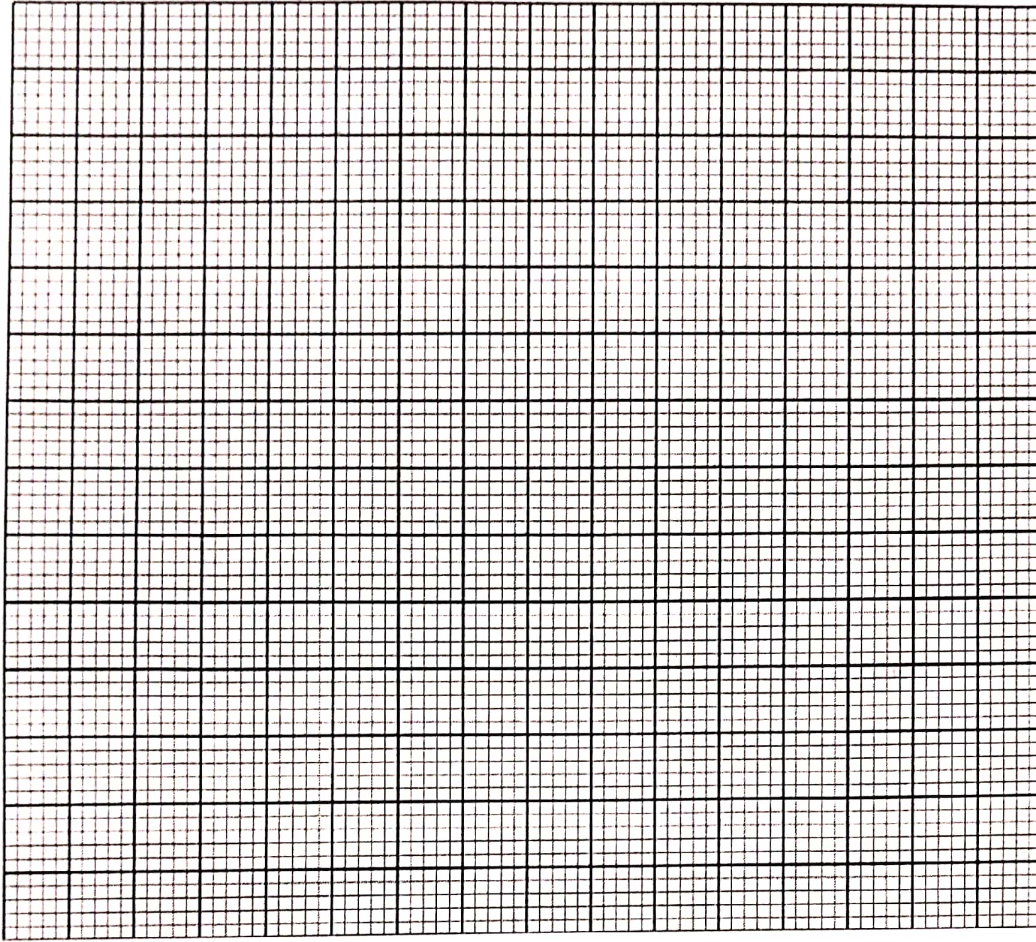
A-----1/2

S-----1/2

P-----2

C-----1

*Curve.*



(ii) Determine the slope  $S$  of the graph when  $\frac{p}{q} = 2.0$

Tangent line drawn at  $\frac{p}{q} = 2.0$  ✓<sup>1/2</sup>

(2marks)

Change in  $y$ , change in  $x$ ; marked independently ✓<sup>1/2</sup>

Exact evaluation or 4 s.f ✓<sup>1/2</sup>

*Ignore units but award 1/2 mk if the candidate has second as a unit.*

(iii) Determine the constant  $k$  given that  $k = \frac{5}{\pi} \sqrt{Dg}$  where  $g = 10\text{m/s}^2$  (2marks)

Correct substitution ✓<sup>1</sup>

Exact evaluation or 4 s.f ✓<sup>1</sup>

*Deny 1/2 mk for missing unit.*