PRACTICAL MARKING SCHEME

232/3
PHYSICS
Paper 3(PRACTICAL)

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

• *MARKING SCHEME*

QUESTION	PART	MAXIMUM SCORE	CANDIDATE'S SCORE
1	A	05	
	B	15	
2	A	10	
	B	10	
		40	

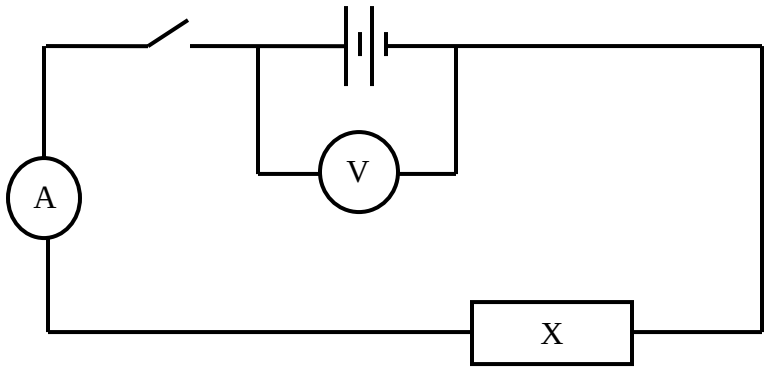
QUESTION 1

You are provided with the following apparatus;

- A carbon resistor labelled X .
- A carbon resistor labelled Z
- A voltmeter (0 – 5V)
- An ammeter (0 – 1A)
- 5 10Ω carbon resistors.
- Centre zero galvanometer.
- 2 new dry cells and cell holder.
- 8 connecting wires at least 4 with crocodile clips at one end.
- Jockey
- A resistance wire labelled AB mounted on mm scale.
- A switch.

PART A

a) Set up the circuit below.



b) Record the voltmeter reading E when the switch is open.

E = ……3.0±0.2……V (1mk)

c) Close the switch and record the voltmeter and Ammeter readings V and I respectively.

V = ……2.7±0.2……V (1mk)

I = ……0.26±0.02……A (1mk)

d) Account for the difference between E and V. (1mk)

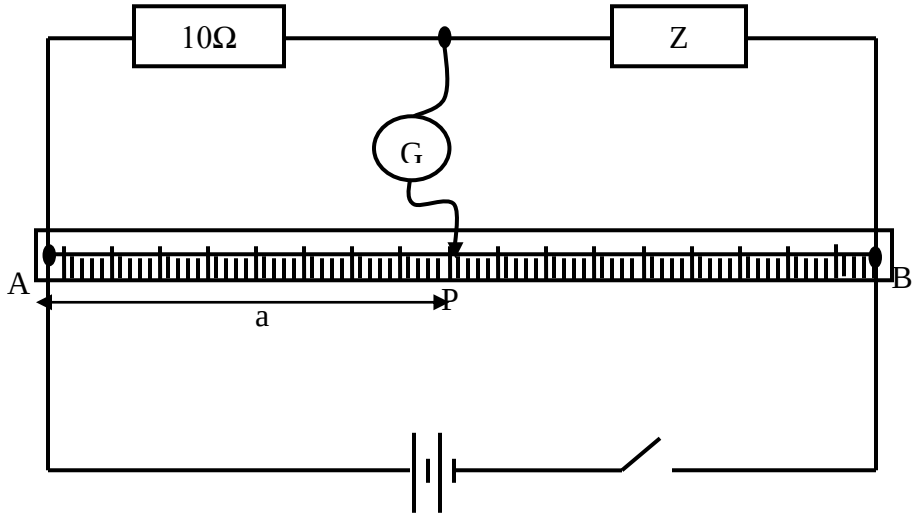
……lost voltage……

e) Calculate the resistance R for resistor X. (1mk)

$R = \frac{V}{I} = \frac{2.7}{0.26} = 10.38\Omega$ (**student's work……answer with correct units correct to 4 s.f**. or exact)

PART B

a) Set up the circuit as shown in the figure below.



b) Close the switch. Tap the jockey at various points on the wire AB and locate point P at which the galvanometer shows zero deflection. Measure and record in the table below the length a where a = AP.

c) Repeat procedure b) using two 10Ω resistors in series, then three resistors in series, then four resistors in series and five resistors in series.

d) Record your readings in the table below and complete the table where X is the effective resistance for the series combination. (5mks)

Number of 10Ω carbon resistors	**One**	**Two**	**Three**	**Four**	**Five**
X (Ω)	10	20	30	40	50
a (cm)	9.1	16.5	23.0	24.1	29.5
$^1/_X$ (Ω^{-1})	0.1	0.05	0.03333	0.025	0.02
$^1/_a$ (cm^{-1})	0.1099	0.06061	0.04348	0.04149	0.03390

1mk

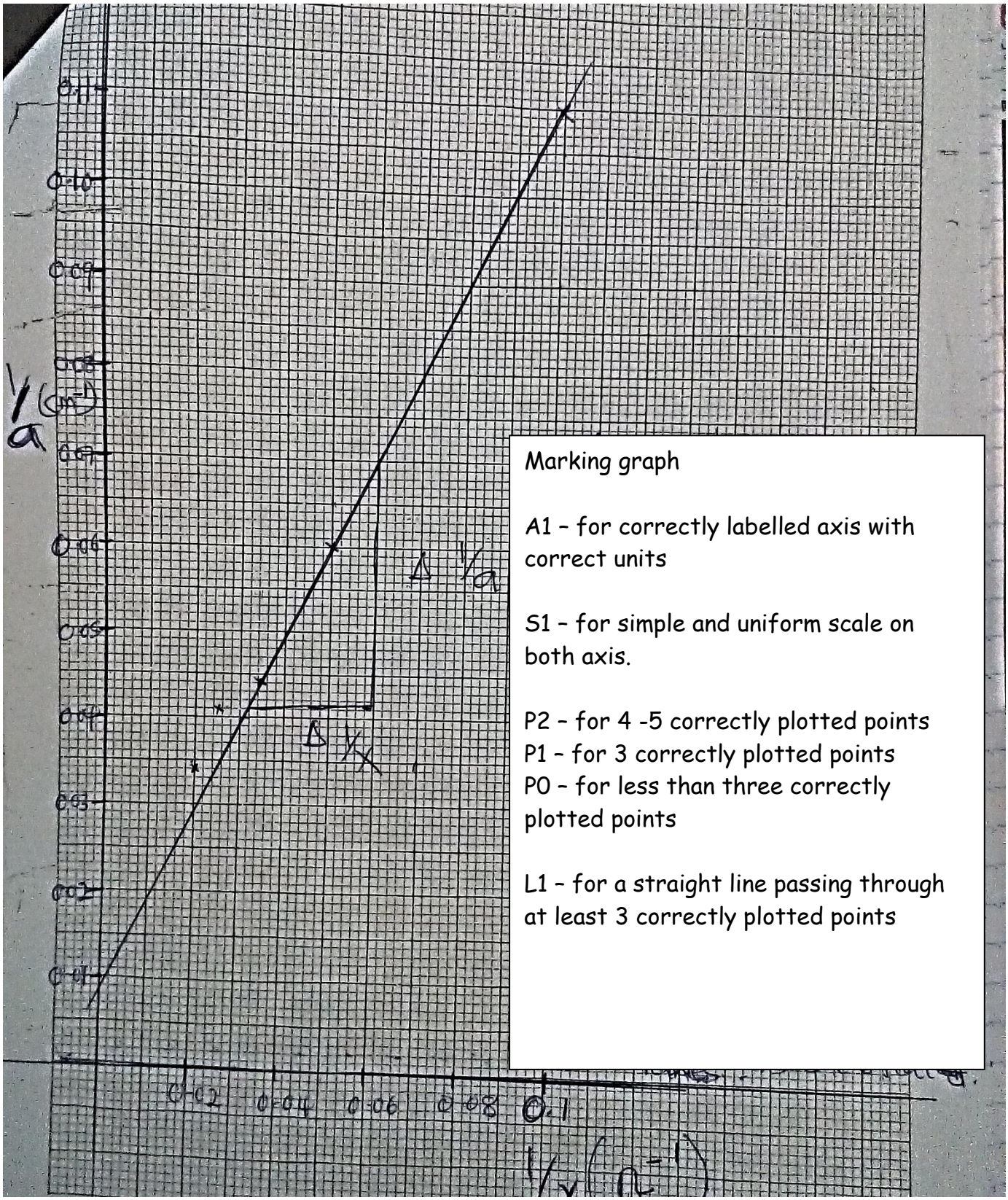
±2.0cm @$^1/_2$ max 2mks

1mk

1mk

4 s.f. or exact

e) Plot a graph of $\mathbf{1/a}$ $\mathbf{(cm^{-1})}$ against $\mathbf{1/x}$ $\mathbf{(\Omega^{-1})}$ (5mks)



Marking graph

A1 – for correctly labelled axis with correct units

S1 – for simple and uniform scale on both axis.

P2 – for 4 -5 correctly plotted points
P1 – for 3 correctly plotted points
P0 – for less than three correctly plotted points

L1 – for a straight line passing through at least 3 correctly plotted points

f) Determine the slope m of the graph. (3mks)

$$slope = \frac{0.07 - 0.041}{0.06 - 0.031}\surd$$
$$= \frac{0.029}{0.029} = 1\Omega/cm\surd$$

Follow student's work.
Deny if L mark is 0
Answer correct to 4 s. f. or exact with units.
Deny ½ mk if no units

g) Given that $\frac{1}{a} = \frac{R}{K} \cdot \frac{1}{X} + \frac{1}{K}$ where K = 100cm, use the graph to determine R. (2mks)

$$\frac{R}{K} = slope$$
$$\frac{R}{100} = 1$$

R = 100Ω/cm

Follow student's work.

Answer correct to 4 s. f. or exact with units.
Deny ½ mk if no units

QUESTION B

PART A

You are provided with the following;

- Metre rule.
- Screen
- Glass beaker (250ml)
- Water plasticine.
- A candle.

Proceed as follows;

a) Add a volume V= 200ml of water into the beaker.

b) Measure the value of h, the height of water in the beaker.

h = ……*7.0±0.5*……cm (1mk)

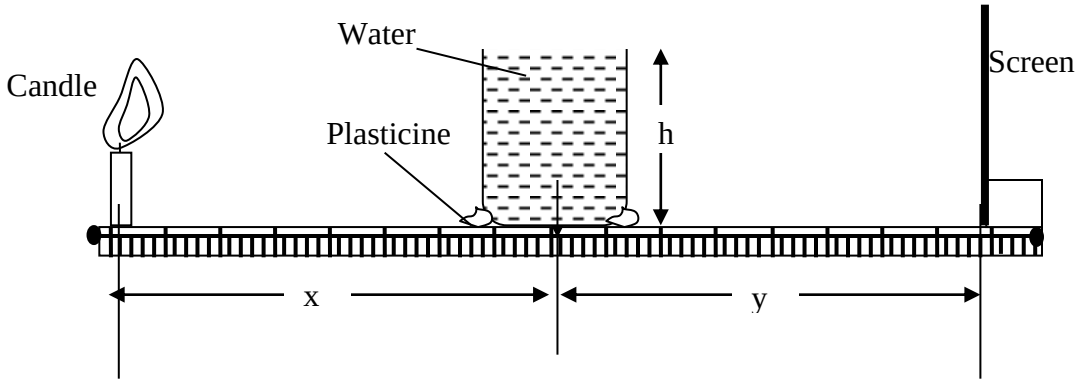
c) Calculate the value of internal radius R of the beaker using the formula $R = \sqrt{\frac{V}{\pi h}}$ where $\pi = {}^{22}/_{7}$

$$R = \sqrt{\frac{200}{\frac{22}{7} \times 7.0}}$$
$$R = \sqrt{9.095}$$
R = 3.016cm

Follow student's work. (2mks)

Answer correct to 4 s. f. or exact with units.
Deny ½ mk if no units

d) Fill the beaker with water and set the apparatus as shown below.



e) Position the candle which acts as an object above the metre rule and 10R from the centre of the water 'lens'.

f) Measure the object distance x. (1mk)

x = ……*30.2±0.2*……cm

g) Move the screen towards or away from the water lens to obtain a sharp and focused bright image (line) on the screen.

h) Measure the value of image distance y. (1mk)

y = ……*6.0 ±0.2*……cm

i) Repeat the experiment for the other values of x in the table below and note and record the corresponding values of y. Complete the table.

Beaker position	**10R**	**9R**	**8R**
x	**30.2**	**27.1**	**24.0**
y	**6.0**	**8.8**	**9.8**
$S = \frac{xy}{x+y}$	**5.005**	**6.643**	**6.959**

± 0.2cm ½ mk @ in columns 2 n 3

1mk correct to 4 s.f. or exact all values

I. Determine the average value of S. (2mks)

$$S_{average} = \frac{\mathbf{5.005 + 6.643 + 6.959}}{3} = 6.202$$

Follow student's work.

Answer correct to 4 s. f. or exact with units.
Deny ½ mk if no units

II. What does S represent. (1mk)

PART B

You are provided with the following;

- Vernier calipers. (can be shared)
- Micrometer screw gauge (can be shared)
- Boiling tube.
- Test tube.
- Some water in a beaker
- Half metre rule.
- 2 ball bearings.
- Some sand.
- Spatula
- Complete retort stand.

i. Measure and record the diameter of one ball bearing using the micrometer screw gauge.

d = ……5.78±0.02……mm ($^1/_2$mk)

ii. Determine the volume V of the ball bearing. (1mk)

$$V = \frac{4}{3} \times 3.142 \times \left(\frac{0.578}{2}\right)^3$$

Follow student's work.

V = ……0.1011……cm^3

Answer correct to 4 s. f. or exact with units.
Deny ½ mk if no units

iii. Measure and record the outer diameter D of the test tube using the vernier calipers.

D = ……1.85±0.02 ……cm ($^1/_2$mk)

iv. Calculate the cross-sectional area A of the tube. (1mk)

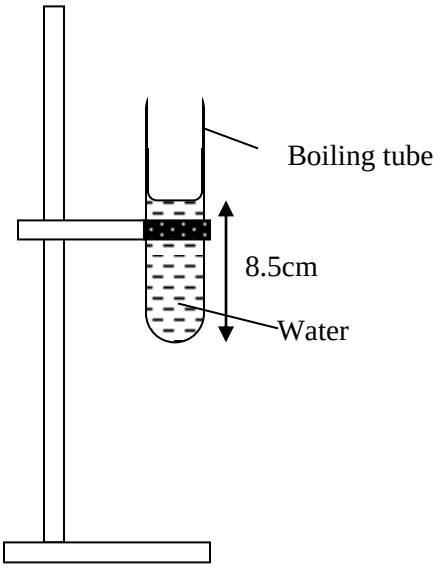
$$A = 3.142 \times \left(\frac{1.85}{2}\right)^2$$

Follow student's work.

Answer correct to 4 s. f. or exact with units.
Deny ½ mk if no units

A ……2.688……cm^2

v. Mount the boiling tube on the clamp as shown below and put some water to a height of about 8.5cm from bottom.



vi. Gently lower the test tube into the water in the boiling tube.

vii. Add some sand into the test tube bit by bit until the test tube floats upright in the water.

viii. Note and record height ho of the water in the boiling tube from the bottom.

ho = ……13.0±0.5……cm (1mk)

ix. Gently lower one ball bearing into the test tube and note and record the new level h in the table below.

x. Add the other ball bearing and note and record the corresponding height h.

xi. Compute the values of h- ho and complete the table. (2mks)

No. of ball bearings (N)	Height h (cm)	h – ho (cm)
1	13.5 ± 0.2 (½ mk)	0.5
2	14.0 ± 0.2 (½ mk)	1.0

1mk for correct evaluation of both values of (h – ho)

xii. Calculate S the average value of X where $\boldsymbol{X = \frac{h - ho}{N}}$ (1mk)

$$S_{average} = \frac{\mathbf{0.5 + 0.5}}{2} = 0.5cm$$

Follow student's work.

Answer correct to 4 s. f. or exact with units.
Deny ½ mk if no units

xiii. Given that $\boldsymbol{S = \frac{V\ell s}{A\ell e}}$

where $\underline{\ell}s$ *is the density of steel and* $\underline{\ell}e$ *the density of water, determine the ratio of*

$\boldsymbol{\frac{\ell s}{\ell e}}$ *(2mks)*

$$0.5 = \frac{V}{A} \times \boldsymbol{\frac{\ell s}{\ell e}}$$

$$\boldsymbol{\frac{\ell s}{\ell e} = 13.29}$$

Follow student's work.

Answer correct to 4 s. f. or exact with units.
Deny answer mark if wrong units are used

xiv. What is the significance of the ratio $\boldsymbol{\frac{\ell s}{\ell e}}$

(1mk)

Relative density of steel