Name MARKING SCHEME ..... Index No.....

School..... Candidate's sign..... Date.....

232/3
PHYSICS
PAPER 3
(PRACTICALS)
TIME: 2 ½ HRS

SUKELLEMO JET

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

INSTRUCTIONS TO CANDIDATES.

1. Write your name and Index number in the spaces provided at the top of this page
2. Sign and write the date of examination in the spaces provided above.
3. Answer all questions in the spaces provided
4. You are supposed to spend the first 15 minutes of the 2 ½ hours allowed for this paper reading the whole paper carefully before commencing your work.
5. Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.
6. Candidates are advised to record their observations as soon as they are made.
7. Non- programmable silent electronic calculators and KNEC Mathematical tables may be used .

FOR EXAMINERS USE ONLY **TOTAL**

Question 1

	a	h	i	b	c	d	e	f	
Maximum score	5	2	2	3	2	1	3	2	20
Candidate score									

Question 2

	b	c	d	g	h	i	j	
Maximum score	1	2	2	6	5	2	2	20
Candidates score								

This paper consists of ~~10~~ 11 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

QUESTION ONE

PART A (9 Marks)

You are provided with the following

- A glass block
- Soft board
- Five optical pins
- Four thumb tacks
- Plain paper
- Vernier calliper **(to be shared)**

Proceed as follows

a) Using the vernier calliper provided, measure the length l , width w and thickness T of the rectangular glass block . **(3marks)**

l = 10.25 ± 0.20 2d.P. in cm ✓1

w = 6.26 ± 0.20 2d.P. in cm ✓1

T= 1.85 ± 0.20 2d.P. in cm ✓1

For each measurement deny ½ mk for missing Unit.

Determine the volume **V** of the rectangular glass block in SI units given that

$V = lwT$ **(2marks)**

Correct substitution ✓1
(ignore units)

Correct evaluation in SI units ✓1
Exact or 4 S.f.

b) Place the glass block on the plain piece of paper. Draw its outline

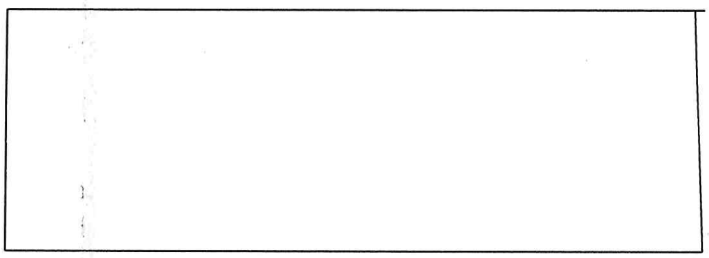


FIGURE 1

c) Remove the glass block. Mark a point x on one of the longest sides of the outline around the mid – way point. Push a pin P_1 on this point.(**P_1 is at point x)**

d) Replace the glass block to sit perfectly on it's outline.

e) On the opposite side push two pins P_2 and P_3 on the right of x so that they appear to be in line with P_1.

f) **Repeat step (e)** but with P_4 and P_5 on the left of x.

g) Remove the glass block and draw a line joining P_2 and P_3 then another line joining P_4 and P_5. Extend the lines P_2P_3 and P_4P_5 to intersect at y as shown in **figure 2 .**

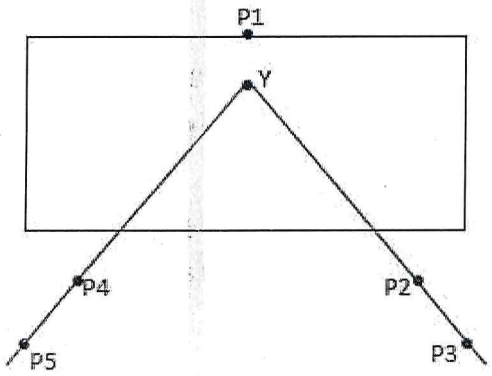


FIGURE 2

h) Measure the distance xy. **(2marks)**

xy =2.6 ± 0.3.....cm 1 d.p. a must ✓ 1

=0.026.....m 3 d.p. a must ✓ 1

Correct conversion

i) Calculate the value η given that **(2marks)**

$$\eta = \frac{w}{(w - xy)}$$

.....

Correct Substitution ✓ 1

Correct Evaluation ✓ 1

(Exact or 4 S.f.) 1

.....

PART B (11marks)

You are provided with the following:

- a pendulum bob
- a metre rule
- a 50 g mass
- some hot water **(at 80 ± 10^{0}C)**
- some cold water **(at 25 ± 10^{0}C)**
- some thread
- a thermometer
- a complete stand
- a beaker

Proceed as follows:

(a) Using a piece of thread suspend the metre rule from the clamp on the stand and adjust the position of the thread until the metre rule balances horizontally. Note this position as O **(This position must be maintained throughout the experiment).**

(b) Using another piece of thread suspend the pendulum bob from the metre rule at a point 30 cm from O. Suspend the 50 g mass on the opposite side of O using another piece of thread. Adjust the position of the thread attached to the 50 g mass until the metre rule balances once more. **See figure 3.**

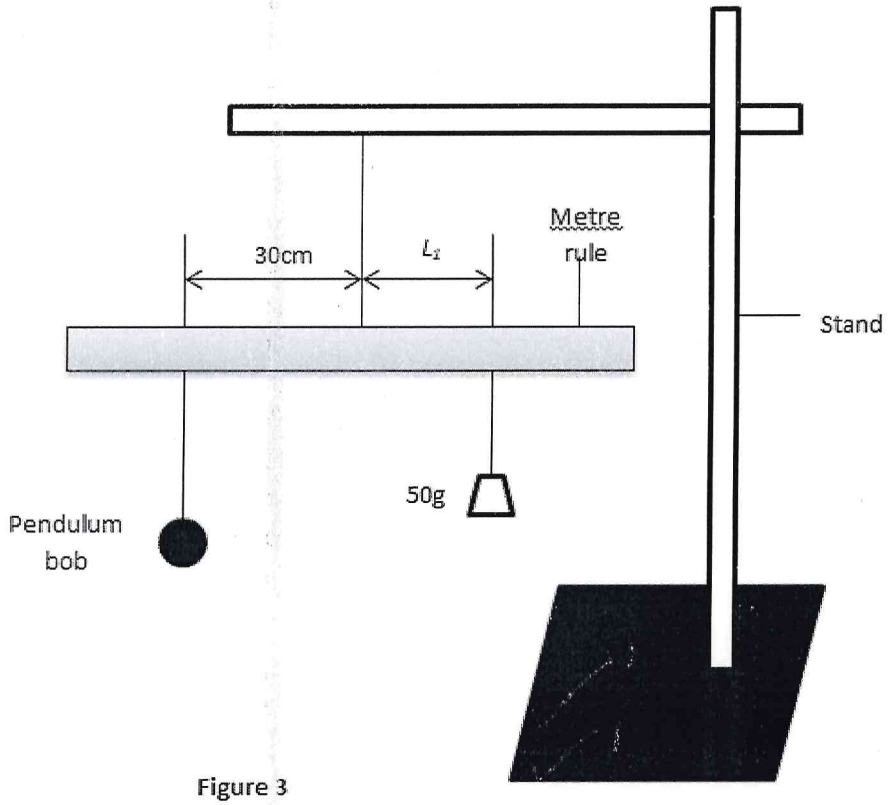


Figure 3

(I) Determine the distance l_1 between O and the point of support of the 50 g mass.

l_1 = 41.5 ± 2.0 ✓1 ..... cm

1 d.p. a must.

(1mark)

(ii) Determine the weight W_1 of the pendulum bob in air. ***(Take g = 10 N kg^{-1})*** **(2marks)**

$W_1 \times 30 = \left(\frac{50}{1000} \times 10\right) \times 41.5$ ✓1

(The principle of moments must be used)

$W_1 = 0.6917$ N ✓1 (Exact or 4 S.f)

Deny ½ mk for missing Unit.

accept truncation

(c) Put cold water into the beaker (approximately three quarter ($^3/_4$ full). With the pendulum bob still at 30 cm from O, determine the distance l_2 of the 50 g mass at which the metre rule balances when the pendulum bob is fully submerged in the cold water. **See figure 4.**

The student should not work in grammes and Convert to weight.

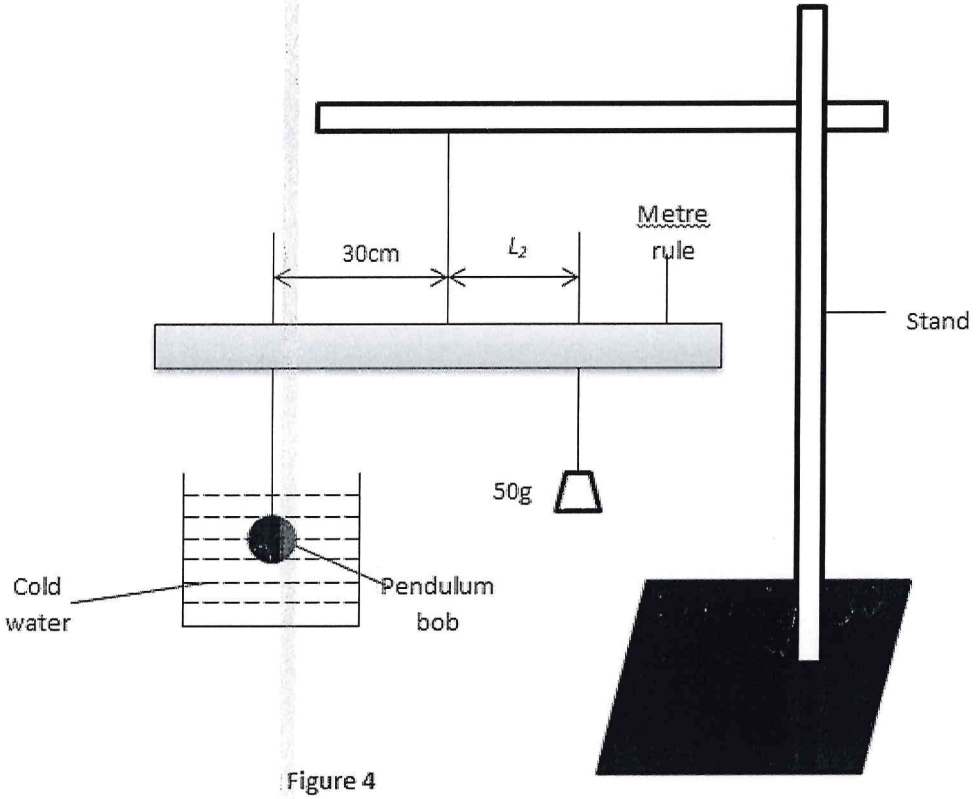


Figure 4

(I) l_2 = 35.0 ± 2.0 ✓1 ..... cm **(1mark)**

1 d.p. a must.

(II) Determine the weight W_2 of the ~~prism~~ pendulum bob in the cold water **(1mark)** ✓1/2

$W_2 \times 30 = \left(\frac{50}{1000} \times 10\right) \times 35.0$ ✓1/2

$W_2 = 0.5833$ N ✓1

Accept missing unit but penalise wrong unit.

Same conditions as (ii) on pg 5

(d) Measure and record the temperature T_1 of the cold water when the system is balanced.

T_1 = 25 ± 10 °C ✓1 ..... unit. **(1mark)**

Deny 1/2 mk for missing unit.

(e) Now pour out the cold water and replace it with hot water. Balance the metre rule with the pendulum bob fully submerged in hot water. **Ensure that the pendulum bob is still supported at 30 cm from 0.**

i. Determine the distance l_3 of the point of support of the 50 g mass when the pendulum bob is submerged in hot water.

32.5 ± 3.0 ✓ 1

l_3 = Must be less than L_2 ..... cm
1 d.p. a must
(1mark)

ii. Measure and record the temperature T_2 of the hot water ✓ 1

T_2 = 70°C – 90°C Deny ½ mk for missing unit. .....
(1mark)

iii. Determine the weight W_3 of the ~~prism~~ pendulum bob in hot water
(1mark)

same conditions as (ii) on page 5

$W_3 \times 30 = \left(\frac{50}{1000} \times 10\right) \times 32.5$ ✓ 1/2

$W_3 = 0.5416$ N ✓ 1/2

Accept missing unit but Penalise wrong unit.

(f) Determine the constant **k** for the water given **(2marks)**

$$k = \frac{(W_1-W_2)(W_1-W_3)}{(W_1-W_3)(T_2-T_1)}$$

Correct Substitution ✓ 1

Correct evaluation ✓ 1

Deny ½ mk for missing unit

(Exact or 4 s.f.)

QUESTION TWO

You are provided with the following

- A voltmeter
- An ammeter
- A galvanometer
- Two new dry cells and a cell holder
- A switch S
- 8 connecting wires each with a crocodile clip at one end properly soldered or tightly fixed
- A resistance wire labeled **X**
- A resistance wire labeled **AB** mounted on a millimetre scale
- Six 10 ohm carbon resistors
- A jockey

Proceed as follows:

(a) Set up the circuit, with the cells in **parallel** as shown in **figure 5**.

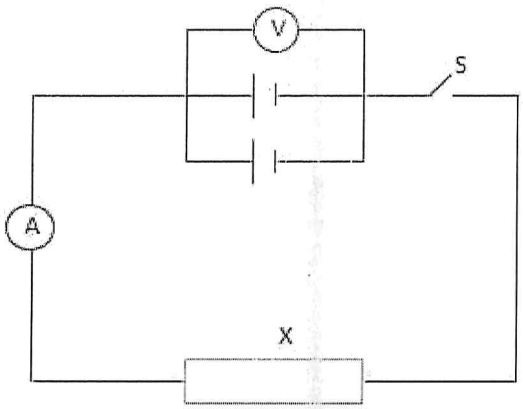


FIGURE 5

(b) With the switch open, record the reading E of the voltmeter.

E = ... **(1mark)**

1.5 ± 0.1 V ✓ 1

Deny ½mk for missing unit.

(c) Close the switch. Record the current **I** flowing in the circuit and the potential difference V across the cells.

I = ..0·24 A.. ✓1 ..... **(1mark)**

V= ..1·3 V.. ✓1 ..... **(1mark)**

Deny ½ mk for each missing unit.

(d) Given that **E = V + Ir** and **V = IX**

Determine the internal resistance **r** of the combined cells and the resistance of the wire labeled **X.**

1·5 = 1·3 + (0·24 × r) [Substitution] ✓½

r = ..r = 0·8333 [Evaluation]..Ohms ✓½ **(1mark)**

X = ..1·3 / 0·24 ✓½ = 5·417 ✓½ Ohms **(1mark)**

(e) Now set up the circuit as shown in **figure 6.** Z is one of the 10 ohms carbon resistors.

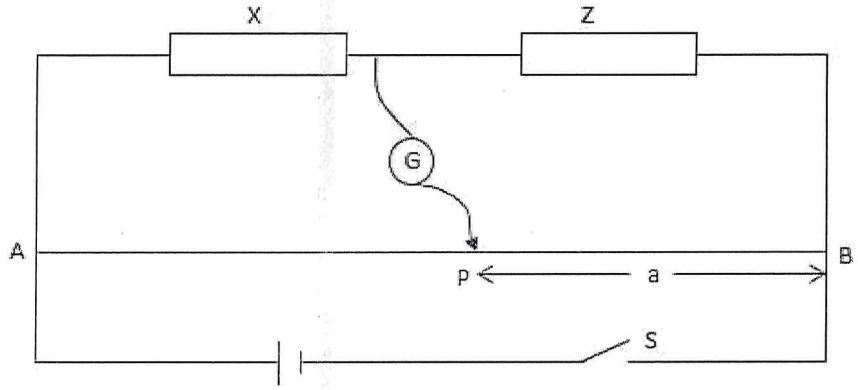


FIGURE 6

(f) Close the switch. Tap the jockey at various points on the wire AB and locate a point P at which the galvanometer shows zero deflection. Measure and record in **table 2** the length **a, where a = PB.**

(g) Repeat the procedure in (f) using **two** resistors in parallel, **three** resistors in parallel, **four** resistors in parallel, **five** resistors in parallel and **six** resistors in parallel. Record your readings in **table 2**. Complete the table. **R is the effective resistance for the parallel combination.**

Number of 10Ω carbon resistors	one	two	three	four	five	six
a (cm) ±3 i.d.p.	73.5	56.8	45.7	38.6	33.3	29.9
$\frac{1}{R}$ (Ω^{-1})	All Correct @			1 mk.		
$\frac{1}{a}$ (cm^{-1})	All Correct @			1 mk.		

Any 4 correct @ 1mk each. ✓ 4 mks

Exact or 4 s.f. ✓ 1 mk ✓ 1 mk

(6marks)

(h)Plot a graph of $\frac{1}{a}$ (y-axis) against $\frac{1}{R}$ **(5marks)**

(i)Determine the slope, **m**, of the graph. No mark for Line, No slope **(2marks)**

Δy interval @ ½ mk, Δx interval @ ½ mk. ✓ 1

Correct evaluation @ 1mk ✓ 1

Exact or 4 S.f. Deny ½ mk for missing unit.

(j)Given that $\frac{1}{a} = \frac{X}{kR} + \frac{1}{k}$, where k = 100cm.

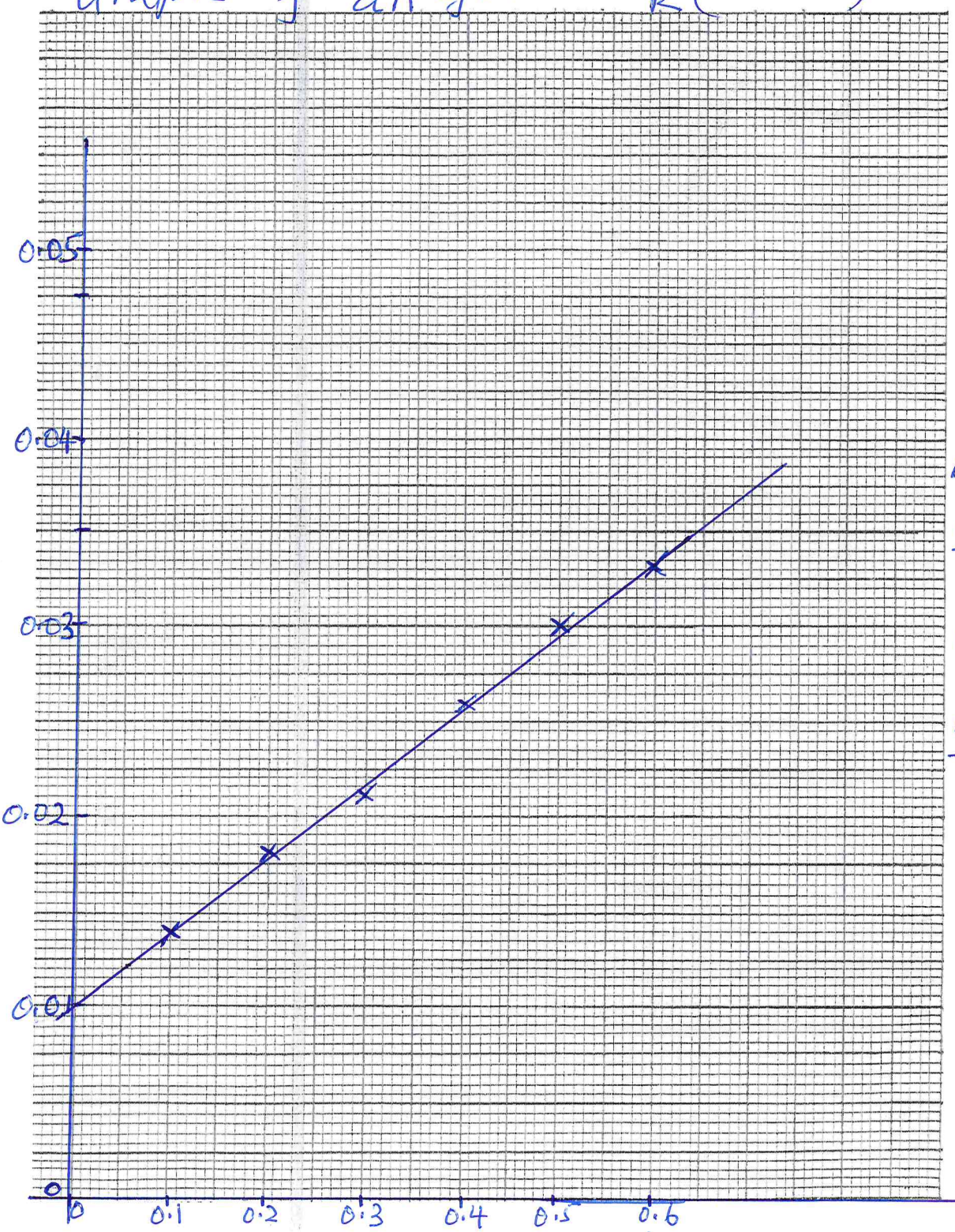
Use the graph to determine X. **(2marks)**

$\frac{X}{k}$ = slope or answer @ (i) ✓ 1

Correct evaluation for X ✓ 1

(Deny ½ mk for missing unit)

Graph of $\frac{1}{a}\Lambda$ against $\frac{1}{R}(\Omega^{-1})$ (cm^{-1})



A - 1
S - 1
P - 2
L - 1
4

Penalty - Deny marks for the line if all points lie on the line.