

**MAKINDU DISTRICT INTER – SECONDARY SCHOOL**  
**FORM 4 JOINT EXAMINATIONS 2014**  
**PHYSICS 232/3**

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**CONFIDENTIAL**

Each candidate is required to have the following

- A clean burette
- Retort stand
- Two clamps and two bosses
- A metre rule
- Water in a 250ml beaker
- 100ml beaker
- A stop watch
- Two 200g masses
- Two pieces of thread approximately 15cm each
- About 200ml of water in a 250ml beaker labeled L
- A knife edge
- A vernier calipers

**Each candidate will require the following**

- One metre rule
- 100cm of Nichrome wire (S.W.G.28) free of kinks
- One retort stand, boss and clamp
- A stop watch
- An overflow (Eureka) can
- One 100ml beaker
- One 50ml measuring cylinder
- A piece of cotton thread about 30cm long
- Water in a 250ml beaker
- Two pieces of wood approximately 5cmx3cm by 0.5cm
- A micrometer screw gauge (to be shared)
- One three hundred gram (300g) mass with a hook Labeled m

**Each candidate is required to have the following**

- Two dry cells (1.5V size D Eveready Red)
- An ammeter (0-1A)
- A voltmeter (0-5v)
- A cell holder
- Five connecting wires, two with crocodile clips
- A jockey
- A nichrome wire (SWG 28) mounted on a mm scale and labeled PQ

NAME ..... DATE .....

INDEX NO. .... SIGNATURE .....

**232/3**  
**PHYSICS**  
**PAPER 3**  
**PRACTICAL**  
**JULY / AUGUST, 2014**  
**TIME: 2 1/4 HOURS**

**MAKINDU DISTRICT INTER – SECONDARY SCHOOLS EXAMINATION**

*Kenya Certificate of Secondary Education*

**232/3**  
**PHYSICS**  
**PAPER 3**  
**PRACTICAL**  
**TIME: 2 1/2 HOURS**

**INSTRUCTIONS TO CANDIDATES**

- Write **your name** and **index number** in the spaces provided
- Answer **ALL** the questions in the spaces provided in the question paper.
- You are supposed to spend the first 15 minutes of the 2 1/4 hours allowed for this paper reading the whole paper carefully before commencing your work.
- Marks are given for clear record of observations made, their suitability, accuracy and the use made of them.
- Candidates are advised to record their observations as soon as they are made.
- **Non-programmable** silent electronic calculators and KNEC mathematical table may be used.
- This paper consists of 6 printed pages. Candidates should check to ensure that all pages are printed as indicated and no questions are missing

**FOR EXAMINER'S USE ONLY**

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	20	
2	20	
TOTAL	40	

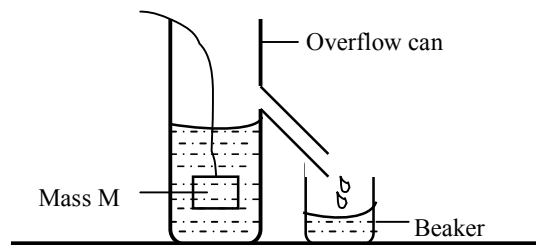
1. You are provided with the following apparatus

- A meter rule
- A wire of length at least 100cm
- A retort stand
- A stop watch
- a micrometer screw gauge
- An overflow can
- A 100ml beaker
- A 50ml measuring cylinder
- A piece of thread
- Water in a 250ml beaker
- Two pieces of wood
- Mass labeled m

**PROCEDURE**

a)

- i. Fill an overflow can with water to overflowing and then let it drain.
- ii. Immerse the mass m into the can. Collect the overflow water into a beaker as shown below.



iii. Using the measuring cylinder provided, determine the volume  $V$  of the water collected in the beaker  
 $V = \dots\dots\dots$  (1mark)

iv. Calculate  $I$  given that  $I = \frac{10^6 m}{V}$  where  $m = 0.30\text{kg}$  (2mks)

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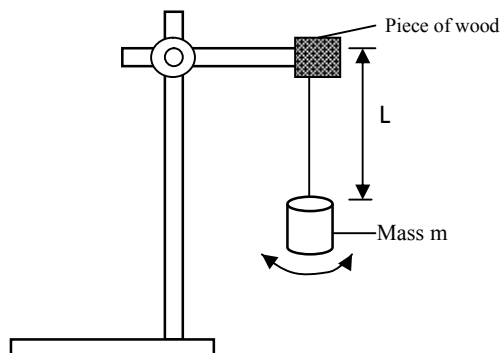
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b) Set up the apparatus as shown below. Ensure that the wire is free of kinks and the end tied to the hook is firm and the hook does not move.

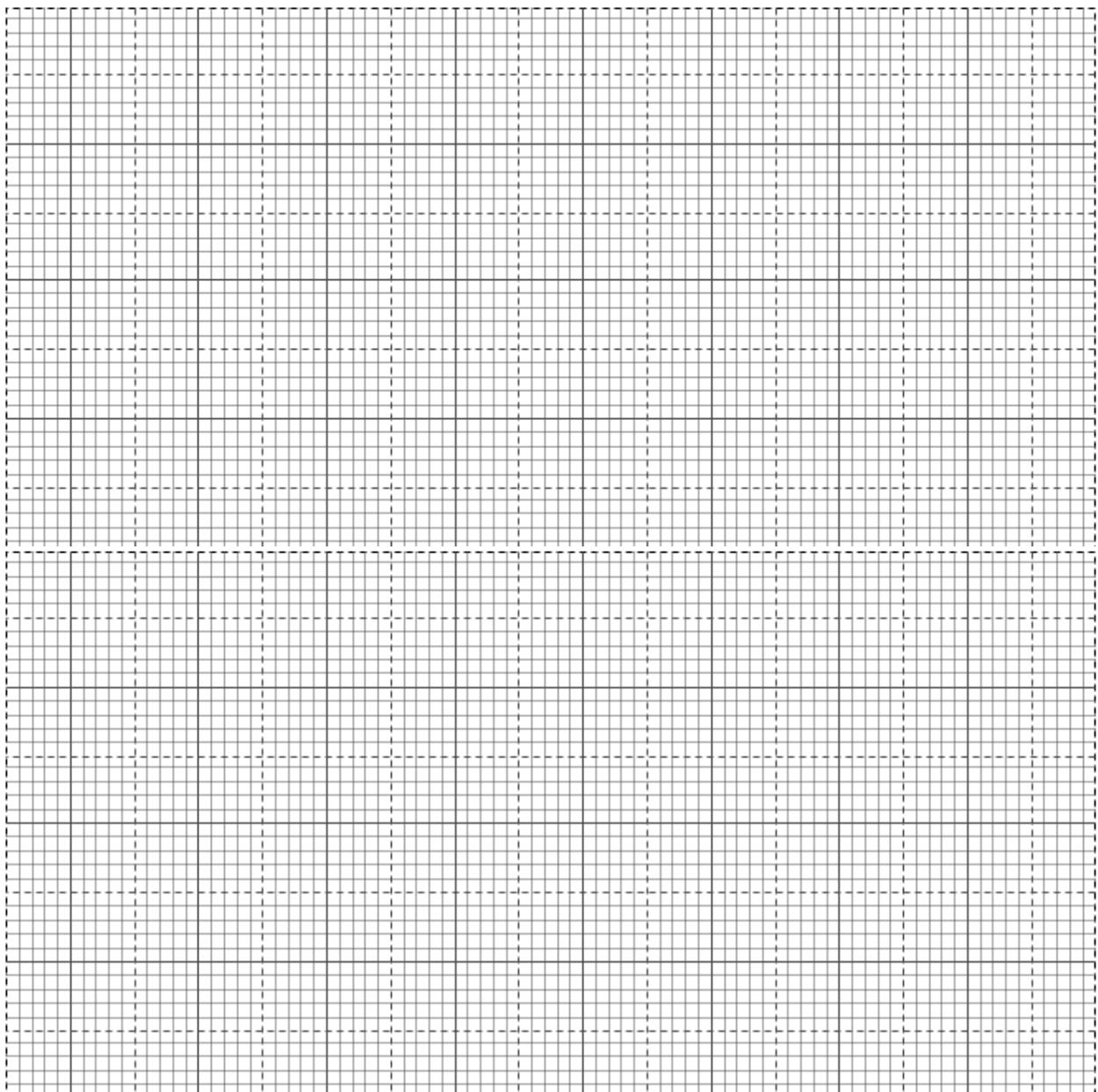


- c) Adjust the length  $L$  of the wire so that  $L=70\text{cm}$ . Give the mass  $m$  a slight twist so that when released, it oscillates about the vertical as shown above. Measure the time  $t$  for twenty oscillations and record in the table below.
- d) Repeat the procedure above for other values of  $L$  as shown and complete the table.

Length $L$ (cm)	70	60	50	40	30	20
Length $L$ (m)						
Time for 20 oscillation						
Period $T$ (s)						
$T^2$ ( $s^2$ )						

(5mark)

- e) On the grid provided plot a graph of  $T^2$ ( $s^2$ )( $y$  – axis against  $L$ (cm) (5marks)



i. Measure the diameter of the wire

d=.....metre

(1mark)

ii. Determine the slope of the graph

(2marks)

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iii. Given that  $T^2 = \frac{32\pi^2 l}{Gd}$  determine the value of the constant G

(3mark)

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**PART TWO**

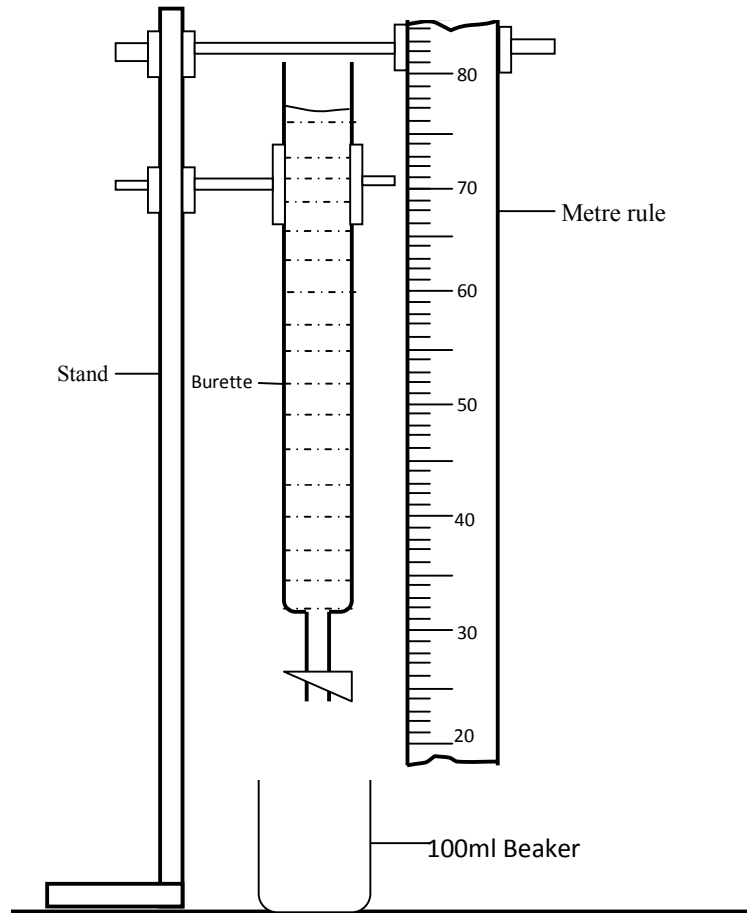
You are provided with the following apparatus

- A clean burette
- Retort stand
- Two clamps and 2 bosses
- A metre rule
- Water
- 100ml beaker
- A stop watch

**PROCEDURE**

- a) Clamp the burette and metre rule vertically and as close to each other as possible
- b) Adjust the position of the burette so that its lower end is 10cm above the bench and place the 100ml beaker underneath it.

c) Fill the burette with water to a height above the 70cm mark of the metre rule as shown below.



- By trial and error method adjust the rate of flow of the water until the time taken for the water to flow from 70cm mark to 65cm is between 25-30 seconds.
- Once this flow rate has been achieved do not alter the flow rate for the rest of the experiment.
- Fill the burette again with water to a level above the 70cm mark.
- With the water level at the 70cm mark (at  $t=0$ ) start the stop watch. Note the time taken for the height  $h$  of the water surface in the burette to decrease by 5cm; Do not stop the watch.
- Continue to record the time taken for the height  $h$  of water surface to decrease by successive 5.0cm marks till you have 10 more readings.
- Enter the results in the table below
- Stop the watch and close the burette tap.
- Repeat the procedure to get second and third set of readings for  $t$ .

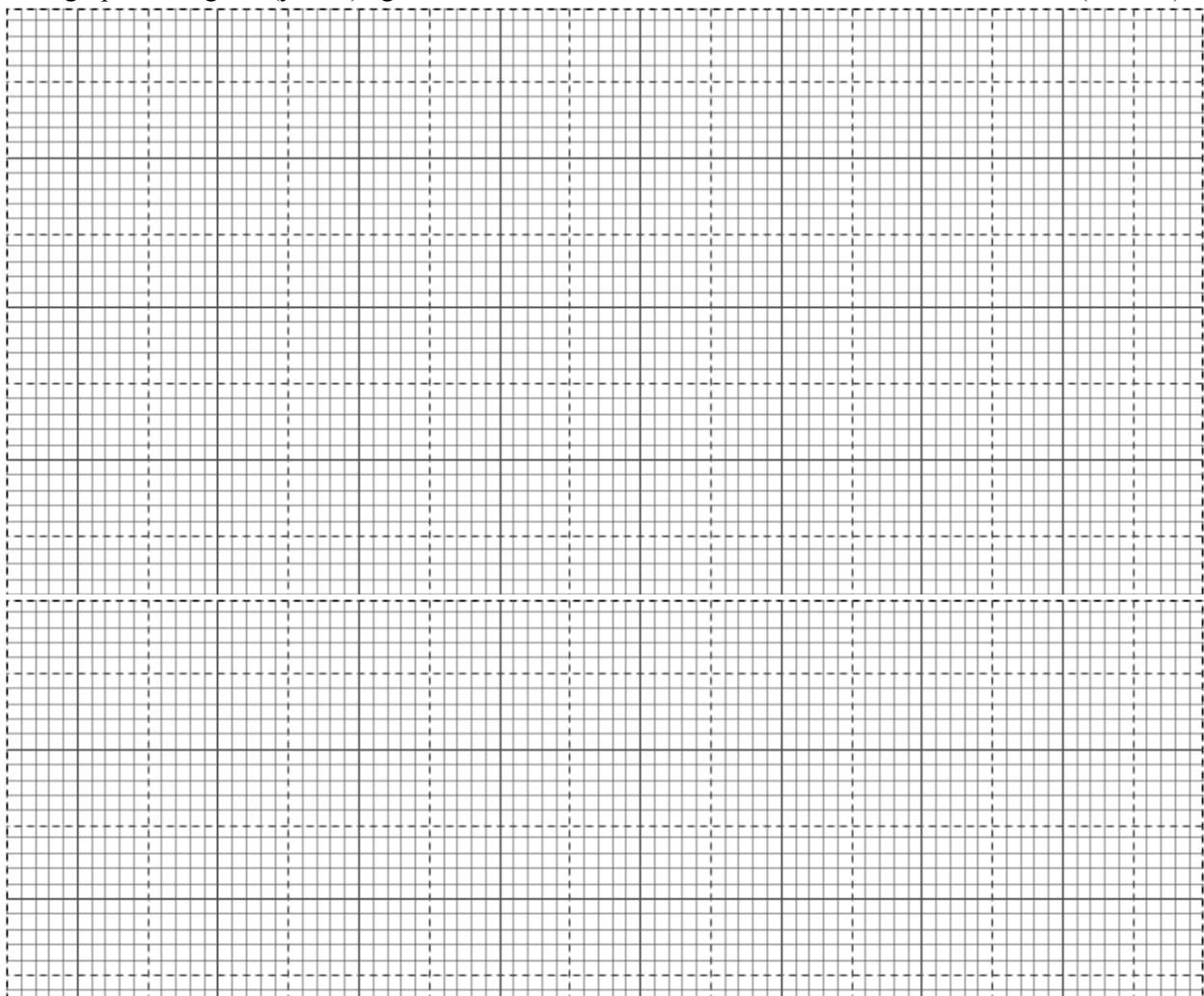
Height h(cm)	Time (s)			
	Trial 1	Trial 2	Trial 3	Mean time t
70				
65				
60				
55				
50				
45				
40				
35				
30				
25				
20				

(6marks)

Complete the table above and calculate the mean time t

c) Plot a graph of height h (y-axis) against mean time t

(5marks)



d) Use your graph to determine the time taken for the height  $h$  to change from 64cm to 32cm. (2marks)

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e) From the graph determine the time  $t$  when  $h=35$ cm (1mark)

**PART THREE**

You are provided with the following apparatus

- 2 200g masses
- 2 pieces of thread
- A metre rule
- A beaker
- A knife edge
- A vernier calipers
- Liquid labeled L

**PROCEDURE**

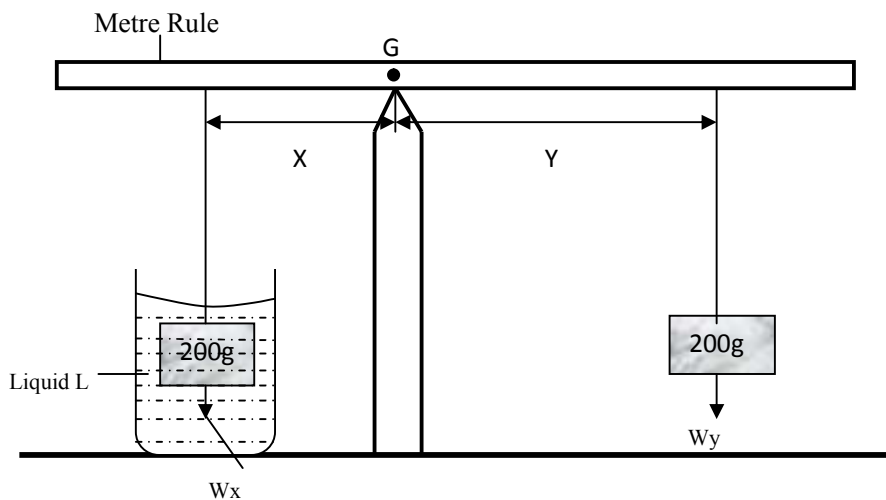
f) Using the vernier calipers, determine the volume of the 200g mass provided. (2marks)

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g) Arrange the apparatus as shown in the diagram below such that  $x=100$ mm from pivot (centre of gravity of the metre rule) with 200g mass completely immersed in liquid L and hang the other 200g mass from the metre rule and adjust its position until the system is in equilibrium.





i) Determine the distance  $y$  in mm

$Y = \dots\dots\dots$  (1mark)

Given that  $\frac{Y}{X} = \frac{W_X}{W_Y}$  where  $W_X$  is the apparent weight of the mass in the liquid L and  $W_Y$  is the actual weight.

Calculate the value of  $W_X$  and the up thrust  $U$  of the liquid (3marks)

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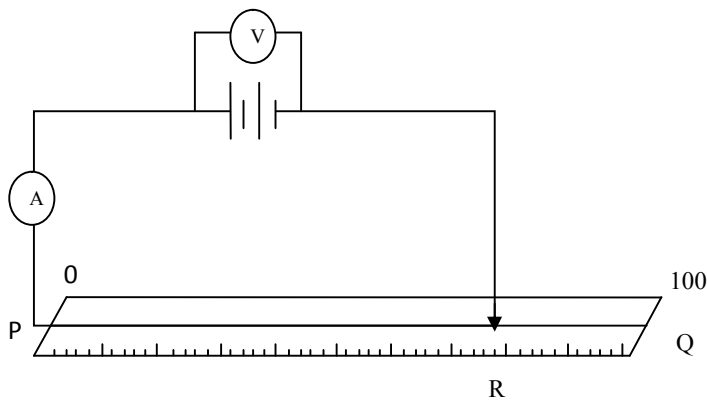
**PART FOUR**

You are provided with the following apparatus

- Two dry cells
- An ammeter
- A voltmeter
- A cell holder
- Five connecting wires
- A jockey
- A nichrome wire mounted on a mm scale labeled PQ

**PROCEDURE**

a) Set up the apparatus as shown below



Disconnect the jockey from the wire at point R and record the voltmeter reading  $V$  and the corresponding ammeter reading. (2marks)

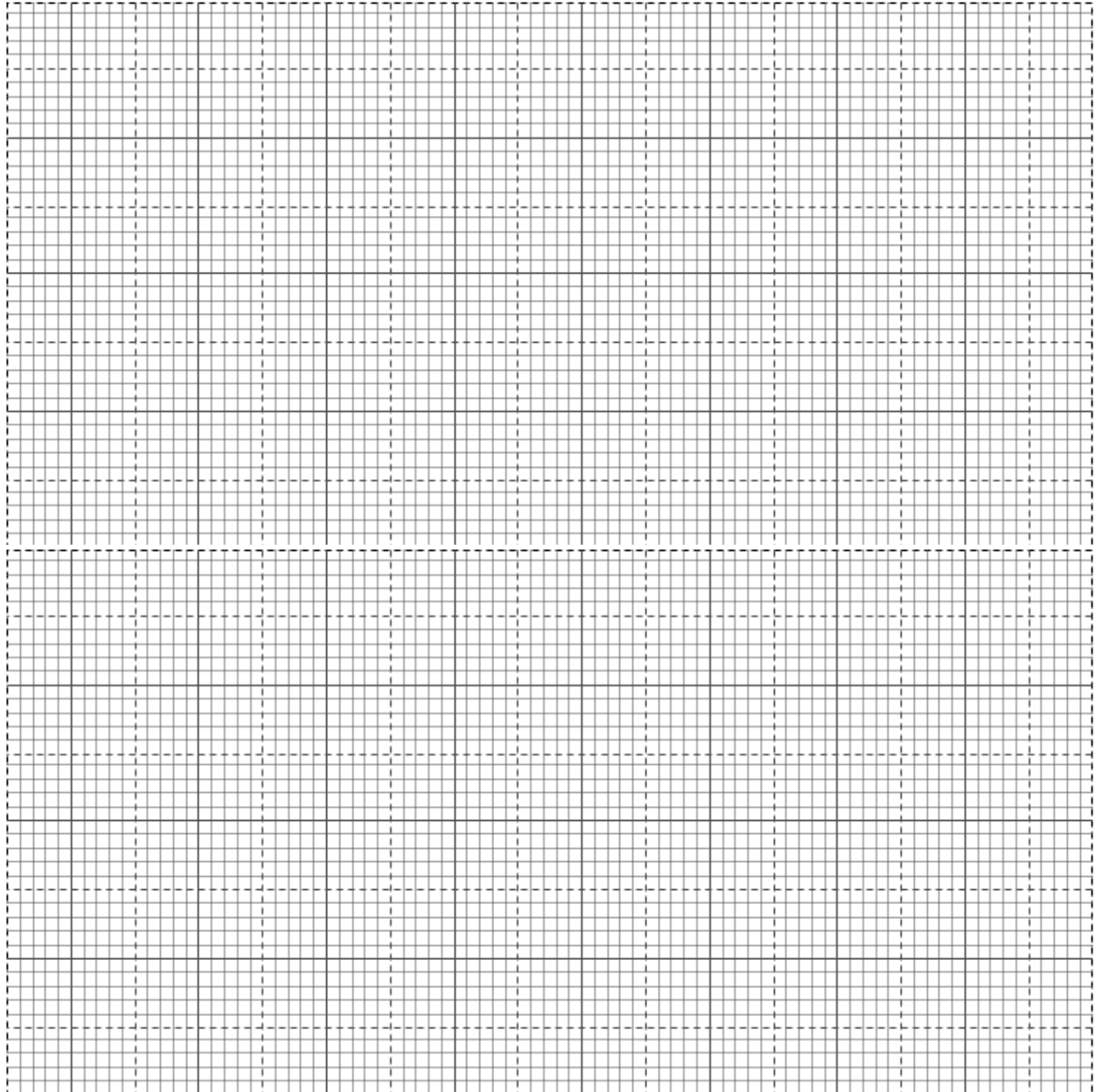
$V = \dots\dots\dots$

$I = \dots\dots\dots$

b) Now connect the jockey at the 70cm mark and record the voltmeter reading  $V$  and the corresponding ammeter reading in the table below. Repeat for values of  $V$  and  $I$  at the 50cm, 40cm, 30cm, 20cm and 10cm mark (6 marks)

Length cm	70	50	40	30	20	10
p.d (v)						
Current I(A)						

c) Plot a graph of p.d (v) against current I (5marks)



d) From the graph determine  
 a. The e.m.f of one cell (2marks)

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b. The internal resistance of one cell

(3marks)

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c. The voltage p.d when current  $I=0.05A$

(1mark)

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d. The current  $I$  when the p.d voltage is  $1.0V$

(1mark)

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**MAKINDU DISTRICT INTER SECONDARY SCHOOLS EXAMINATION 2014**  
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**PHYSICS**  
**PAPER 3**  
**MARKING SCHEME**

- a)  $v=45.0\text{cm}^3$  ✓  
 b)  $I=\frac{10^6 \times 0.30}{45 \times 10^{-6}}$  ✓ =  $0.006667 \times 10^{12} = 6.667 \times 10^9 \text{kg/m}^3$   
 d)

Length L(cm)	70	60	50	40	30	20
Length L(m)	0.70	0.60	0.50	0.40	0.30	0.20
Time for 20 oscillation ±2s	61.01	56.08	51.36	46.06	39.81	32.80
Period T (s)	3.051	2.804	2.568	2.303	1.991	1.640
$T^2(\text{s}^2)$	9.309	7.862	6.595	5.304	3.960	2.690

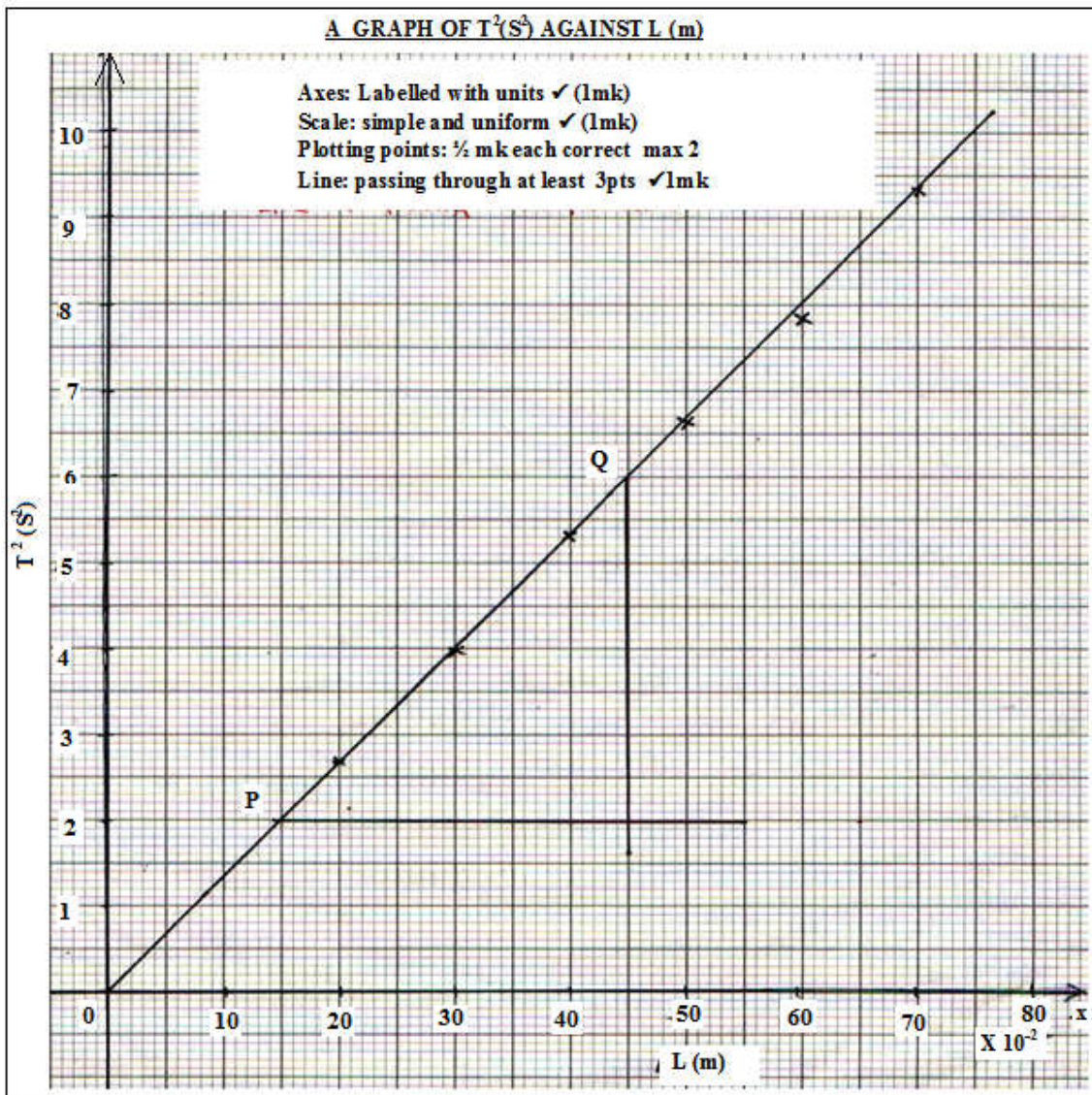
*Correct conversion or length L in m ✓(1mk)*

*Time for 20 oscillation (½ mark for each value with range maximum 3mks)*

*Correct evaluation for period ✓(1mk)*

*Correct evaluation  $T^2$  ✓(1mk)*

- e) Graph



g) i)  $d = 0.32 \times 10^{-3} = 3.2 \times 10^{-4} \checkmark$

ii) Slope  $= \frac{6-2}{(45-15)10^{-2}} \checkmark = \frac{4}{3} \times 10^2 = 133 \text{ s}^2/\text{m} \checkmark$

iii)  $T^2 = \frac{32\pi^2 l}{Gd} = y = mx + c$

Slope  $= \frac{32\pi^2}{Gd} \checkmark = G = \frac{32\pi^2}{\text{slope} \times d} \checkmark = \frac{32 \times (3.142)^2}{133 \times 3.2 \times 10^{-4}} = \frac{315.909}{0.04256} = 7,424.577 \text{ s}^2$

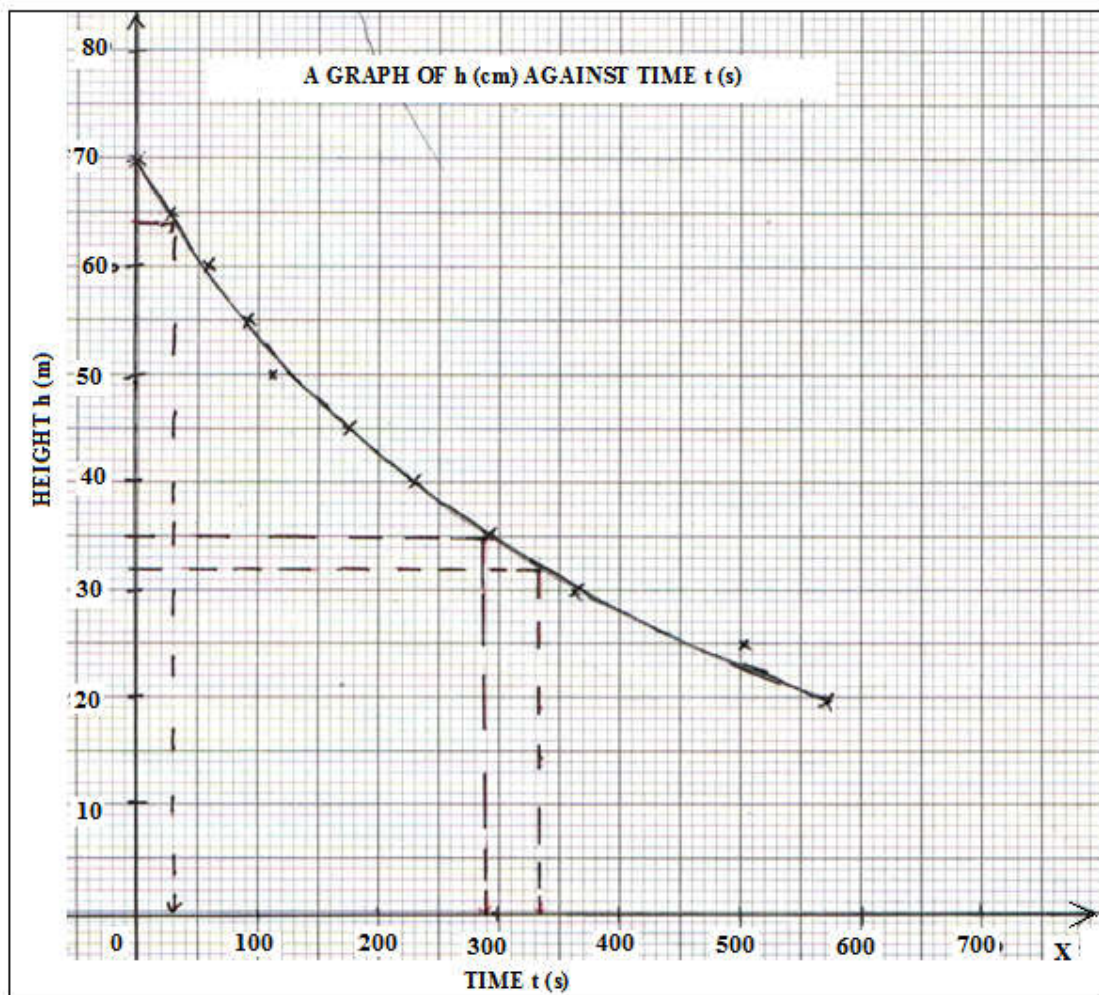
b)

H cm	Trial 1	Trial 2	Trial 3	Mean time t(s)
70	0	0	0	0
65	30	27	28	28.33
60	61	56	57	58.00
55	105	87	86	92.67
50	151	122	124	112.33
45	207	163	168	179.33
40	274	206	212	230.67
35	344	256	272	290.67
30	434	327	338	366.33
25	452	406	413	453.67
20	592	506	527	575.67

Trial =1 mark each max 3

Mean time=1 mark for any current value max (3mks)

c)



d)  $h=64\text{sec}; t=30.0\text{s}\sqrt{1/2}$

$h=32; t=335.0\text{s}\sqrt{1/2}$

Time taken  $= (335 - 30)\text{s} = 305\text{s}\checkmark$

e) From the graph when  $h=35\text{cm}; t=290\text{s}$ 

f)  $v = \pi r^2 h$

$= 3.142 \times \left(\frac{3.18}{2}\right)^2 \times 3.22\checkmark = 25.577\text{cm}^3\checkmark$

g) i)  $y=88\text{mm}$ 

$$\text{ii) } \frac{Y}{X} = \frac{wx}{wy} = Wx = \frac{yx(wy)}{x}$$

$$= \frac{88\text{mm} \times 2\text{N}}{100\text{mm}}\checkmark$$

$$= 1.76\text{N}\checkmark$$

up thrust = real weight - apparent weight

$U = Wy - Wx$

$= 2.0 - 1.76$

$= 0.24\text{N}\checkmark$

**PART FOUR**

a)  $v = (3.0 \pm 0.2\text{V} = 0\text{A})$

b)

Length cm	70	50	40	30	20	10
p.d $v$ (v)	2.4	2.3	2.2	2.1	2.0	1.8
Current I	0.18	0.21	0.25	0.29	0.32	0.38

@<sup>1/2</sup>

c) graph

d) From the graph

i. e.m.f of one cell

intercept = e.m.f of two cells in series  $\checkmark$ 

$= 2.96\text{V}$

e.m.f of one cell  $= \frac{2.96}{2} = 1.48\text{V}\checkmark$

ii. Internal resistance of one cell

$E = V + Ir = V - rI + E = \text{gradient} = -r$

gradient  $= \frac{\Delta V}{\Delta I} = \frac{2.5 - 0.8}{0.15 - 0.7}\checkmark$

i.  $= \frac{1.7}{-0.55} = -3.09\Omega$

internal resistance of one cell  $\frac{-3.09\Omega}{2} = -r\checkmark = r = 1.55\Omega\checkmark$

iii. When  $I=0.5\text{A}$  from the graph p.d =  $1.42\text{V}\checkmark$ iv. When p.d =  $1.0\text{V}$  from graph  $I=0.62\text{A}\checkmark$



