KENYA NATIONAL EXAMINATION COUNCIL

KCSE, 2014

PHYSICS PAPER 3 ANALYSIS

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3.4.4 Physics Paper 3 (232/3)

In this practical paper some candidates seemed to have pre conceived results that could otherwise not be obtained from the outlined procedure. They obtained unrealistic readings in the tables.
However form the responses that were analyzed the following practical tasks were poorly performed.

Question 1 part B

(e) Set up the circuit shown in **Figure 2.** S and T are crocodile clips.

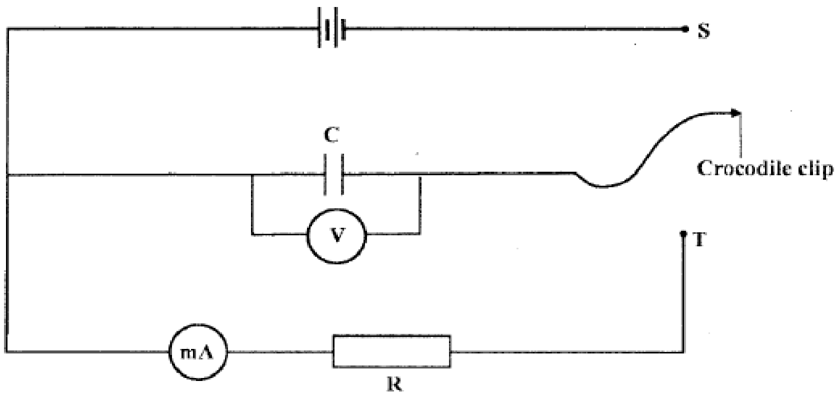


Figure 2

(i) Charge the capacitor **C** by connecting the crocodile clip to **S**. Record the reading of the voltmeter, **V**.

V = ______________________ (1 mark)

(ii) Calculate the value of the current I_o, given that $I_o = \frac{V}{R}$ (where $R = 4.7 \times 10^3\ \Omega$) (3 marks)

(f) (i) Discharge the capacitor by disconnecting the crocodile clip from **S** and connecting it to **T**. Observe and record the highest reading of the milliammeter I_1. (This is the current at $t_o = 0$).
(You may have to repeat the process to obtain an accurate value).

I_1 = ________________ (1 mark)

(ii) Recharge the capacitor by connecting the crocodile clip to **S**.

(iii) Discharge the capacitor and at the same time start the stop watch to measure the time $\mathbf{t_1}$ taken for the current to decrease to half the value of $\mathbf{I_1}$ i.e $\left(\frac{1}{2}I_1\right)$.

$\mathbf{t_1}$ = ____ (1 mark)

(g) (i) Recharge the capacitor and repeat the procedure in f(iii) to measure the time $\mathbf{t_2}$ taken for the current to decrease to one tenth of the value of $\mathbf{I_1}$ i.e $(\frac{1}{10}I_1)$.

$\mathbf{t_2}$ = ____________________

(1 mark)

(ii) Use the values of the currents $I_1, \frac{1}{2}I_1, \frac{1}{10}I_1$ and their corresponding times to draw a graph of current I (y axis) against time on the grid provided.

(3 marks)

Candidates were required to set up a circuit and charge a capacitor before they timed the discharging rates.

Weakness

Many candidates were not able to get the highest reading of the milliammeter in part f, and the subsequent readings. They were therefore not able to get the correct trend of the curve expected in g(ii)

Expected response

V = 3.1 volts ± 0.1

$I_0 = \frac{V}{R} = \frac{3.1}{4.7 \# 10^3}$ A

= 0.659 mA

(3 marks)

I_1 = 0.63 mA

For $\frac{I_1}{2}$

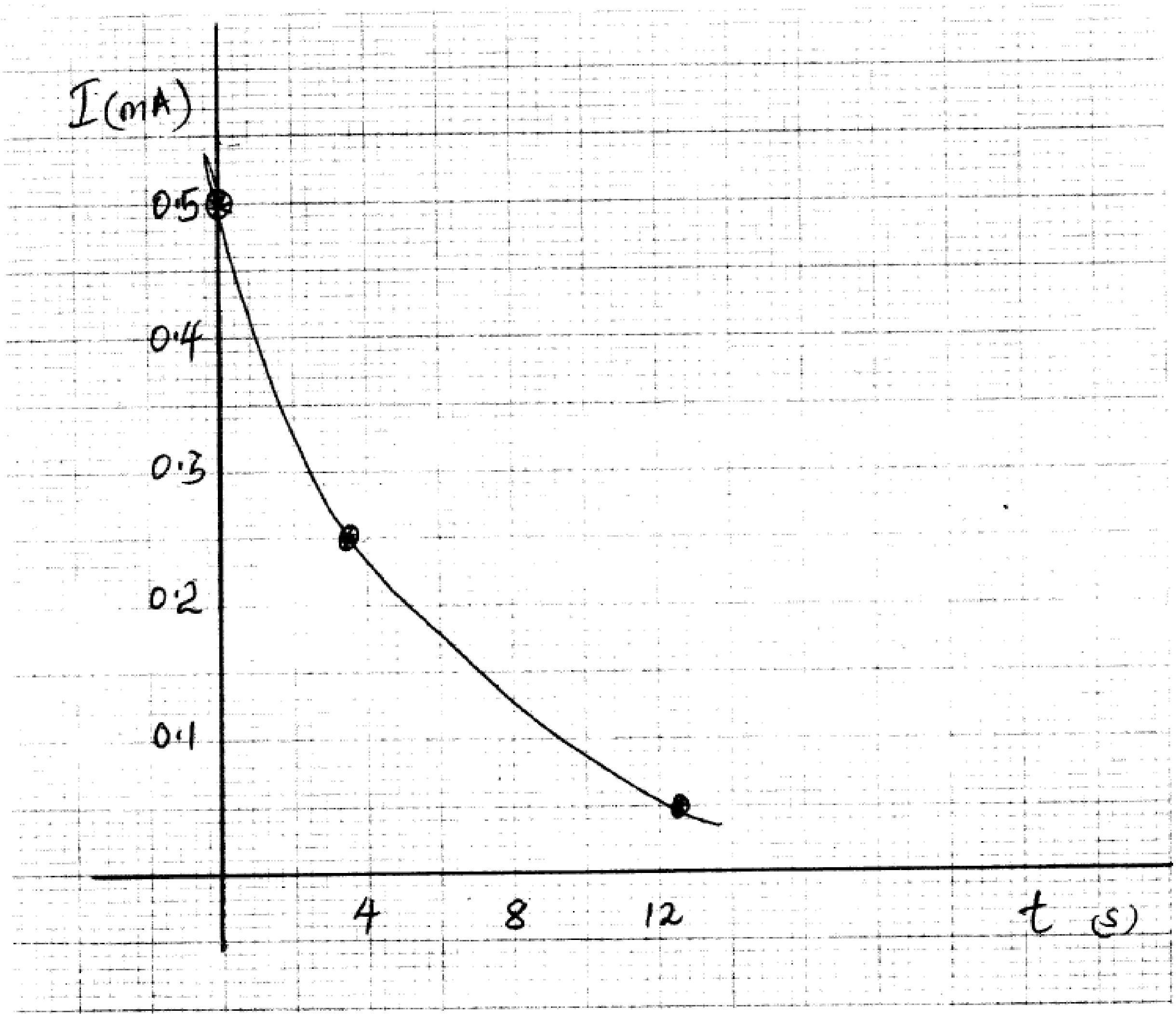
t_1 = 3.9 s

(1 mark)

For $\frac{I_1}{10}$

t_2 = 13.5 s (1 mark)

I	0.5	0.25	0.05
t	0	3.6	12.5



Question 2

You are provided with the following:

- a stand boss and clamp
- two wooden blocks
- a stopwatch
- a half metre rule or metre rule
- a mettallic rod
- a bare copper wire labelled **M** attached to a crocodile clip
- a bare copper wire labelled **N** attached to a crocodile clip.

Proceed as follows:

(a) Clamp wire **M** between the wooden blocks so that the length ***l*** of wire between the wooden blocks and the point of its attachment on the crocodile clip is 5 cm. Clamp the mettallic rod at its mid point using the crocodile clip attached to wire **M**.
(See figure 3)

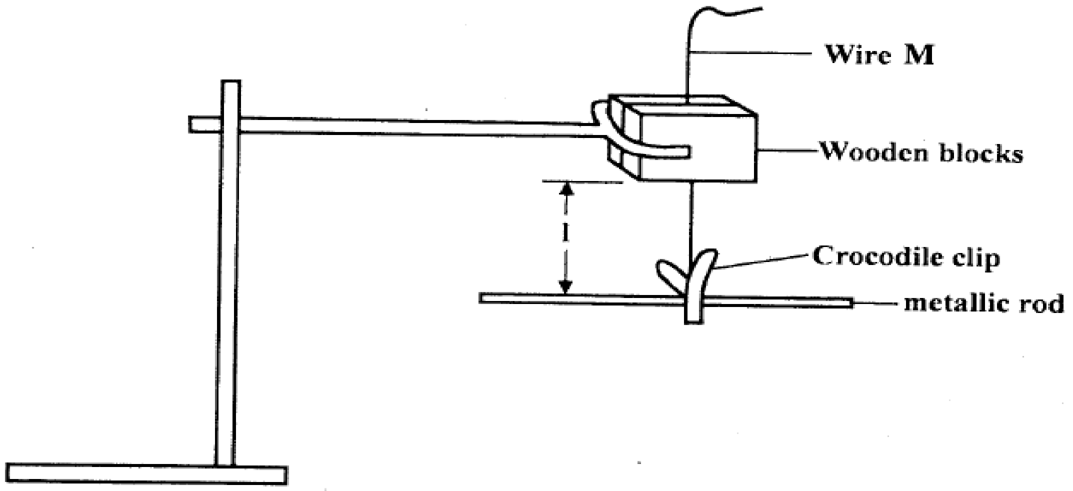


Figure 3

(b) Displace the rod through a small angle in a horizontal plane about its mid point so that when released, it oscillates in the same plane. Record the time t for 10 oscillations and determine the period **T** in **Table 1**.

(c) Repeat part (b) for the other lengths of wire **M** shown in **Table 1**.

(d) Complete **Table 1**. (6 marks)

Table 1

l (cm)	5	10	15	20	25	30
t (s)						
T (s)						
T^2 (s^2)						

(e) Plot a graph of ***l*** (y axis) against T^2. (5 marks)

(f) Determine the gradient of the graph, S. (3 marks)

(g) Now replace wire **M** with wire **N** in the set up.

(i) For l = 20 cm, displace the rod through a small angle in a horizontal plane and measure the time t_N for 10 oscillations.

t_N = ______________ (1 mark)

(ii) Determine the period T_N = ______________ (1 mark)

(iii) Calculate T_N^2 (1 mark)

(iv) Determine the value of H given that $H = \frac{0.2}{T_N^2}$.

(1 mark)

(v) Calculate the value of $\frac{H}{S}$. (2 marks)

Candidates were required to measure the oscillations of a wire in a horizontal plane with varying heights of the supporting wire.

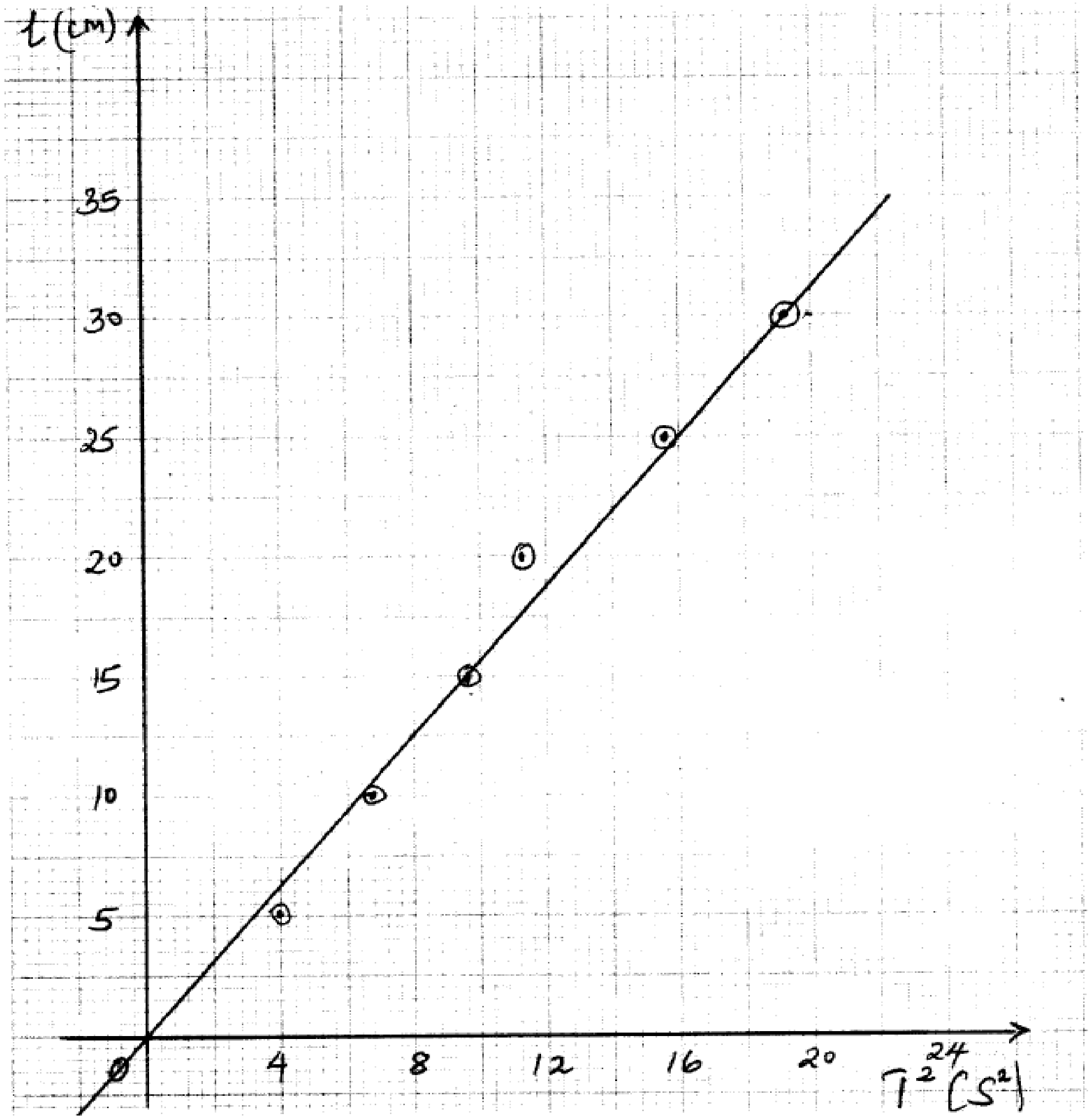
Weakness

Form the readings that were observed some candidates displaced the wire in a vertical plane and not the horizontal plane. Many candidates slacked knowledge on vertical and horizontal plane orientations.

Expected response

l (cm)	5	10	15	20	25	30
t (s)	20.1	26.3	31.2	33.0	39.6	43.4
T (s)	2.01	2.63	3.12	3.3	3.96	4.34
T^2 (S^2)	4.04	6.92	9.73	10.89	15.68	19.84

(e) Graph.



(f) Gradient = $\frac{20}{16}\ cm/s^2$

= $\frac{0.20}{16}\ cm/s^2$

= 0.015625 ms^{-2}

(g) l_N = 20 cm = 0.2 m

(i) t_N = 52.0

(ii) T_N = 5.2

(iii) $T_N^2 = 27.04$

$$H = \frac{0.2}{27.04} = 0.007396$$

(iv) $$\frac{H}{S} = \frac{0.007396}{0.015625}$$

$$= 0.4737$$

ADVICE TO TEACHERS

- Candidates must be advised to follow instructions in the practical paper and use the recorded data appropriately.
- Practical lessons must be carried out as is required in the syllabus to have learners master the concepts.
- During teaching learners must be made to relate the concepts to real life experiences. The Physics behind every concept must be clearly explained during the teaching / learning process and key learning points emphasized.
- Logical analysis of concepts and critical thinking must be encouraged during the teaching / learning process.

The graph below shows clearly the performance trends in physics since 2006.