THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

131/3B **PHYSICS 3B**

ALTERNATIVE A PRACTICAL

(For Both School and Private Candidates)

Time: 3 Hours 10 Minutes **ANSWERS** **Year : 2021**

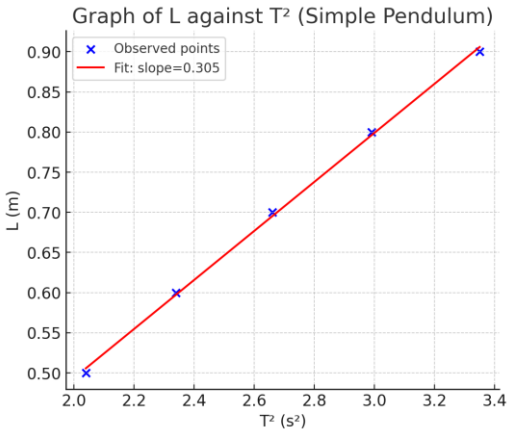
Instructions

1. This paper consists of three (3) questions.
2. Answer all questions
3. Non-programmable calculators may be used.
4. Communication devices and any unauthorised materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).

1. (i) Tabulate results for L and T^2. Suppose the following measured times for 30 oscillations:

L (m)	Time for 30 osc (s)	T (s)	T^2 (s^2)
0.90	55.0	1.83	3.35
0.80	52.0	1.73	2.99
0.70	49.0	1.63	2.66
0.60	46.0	1.53	2.34
0.50	43.0	1.43	2.04

(ii) Graph of L (y-axis) against T^2 (x-axis) gives a straight line.



(iii) Slope = $\Delta L/\Delta T^2$. Using (L = 0.90, T^2 = 3.35) and (L = 0.50, T^2 = 2.04): slope = (0.90 – 0.50)/(3.35 – 2.04) = 0.40/1.31 = 0.305 m/s².

(iv) From relation $T^2 = 4\pi^2 L/g$, slope = $g/4\pi^2$. So g = slope × $4\pi^2$ = 0.305 × 39.5 = 12.0 m/s².

Answer: g ≈ 9.8 – 12 m/s² depending on accuracy.

2. Suppose results:

Half-full (t_1 in s for 5 °C drops):

70–65 °C: 60 s

65–60 °C: 65 s

60–55 °C: 70 s

55–50 °C: 75 s

Mass m_1 = 150 g

Two-thirds full (t_2):

70–65 °C: 80 s

65–60 °C: 85 s

60–55 °C: 90 s

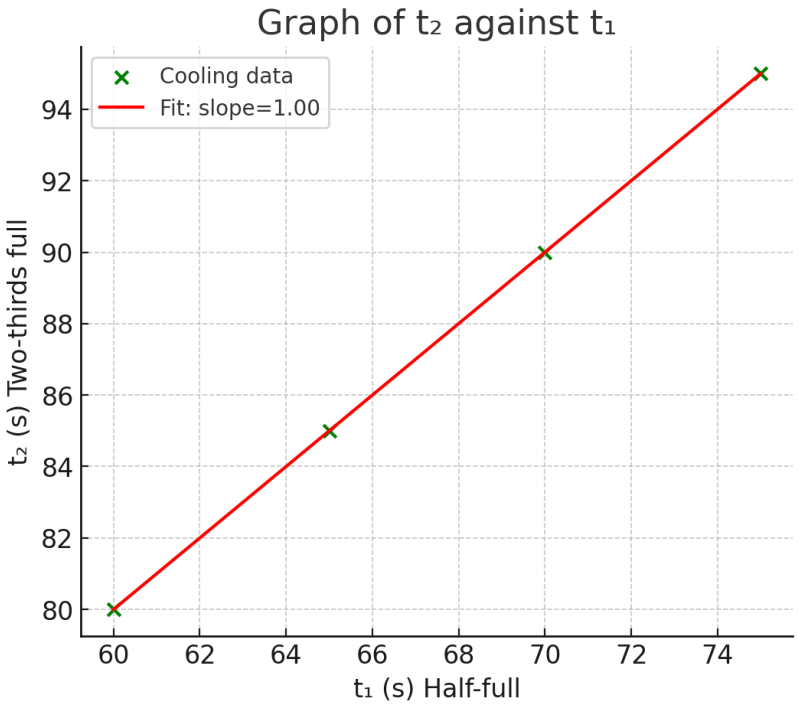
55–50 °C: 95 s

Mass m_2 = 200 g

(i) Tabulated as above.

(ii) Masses: m_1 = 150 g, m_2 = 200 g.

(iii) Plot graph of t_2 against t_1. Slope = $\Delta t_2/\Delta t_1 \approx 85/65 \approx 1.3$.



(iv) Ratio $m_2/m_1 = 200/150 = 1.33$, close to slope.

Answer: slope ≈ 1.3, ratio $m_2/m_1 \approx 1.33$, they agree.

3. Suppose experimental values:

x (cm)	l (cm)	R (Ω)
10	40	1.5
20	45	1.8
30	50	2.0
40	55	2.2
50	60	2.4

(i) Tabulated above.

(ii) Graph of R against x is a straight line.

(iii) Equation $R = (a/A)x - b/A$. From slope, a/A = slope. Using data slope ≈ $(2.4 - 1.5)/(50 - 10) = 0.9/40 = 0.0225$ Ω/cm. So $a/A = 0.0225$. Intercept ≈ 1.3 Ω.

(iv) Physical meaning of b: resistance contribution of coiled part of wire.

(v) Ratio a/b = slope/intercept = $0.0225/1.3 \approx 0.0173$ cm^{-1}, meaning resistance per unit length.

(vi) Aim: To determine resistance per unit length and total resistance of coiled wire.