THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

131/3C   **PHYSICS 3C**

(ACTUAL PRACTICAL C)

(For Both School and Private Candidates)

Time: 3 Hours 20 Minutes   **ANSWERS**   **Year : 2023**

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).

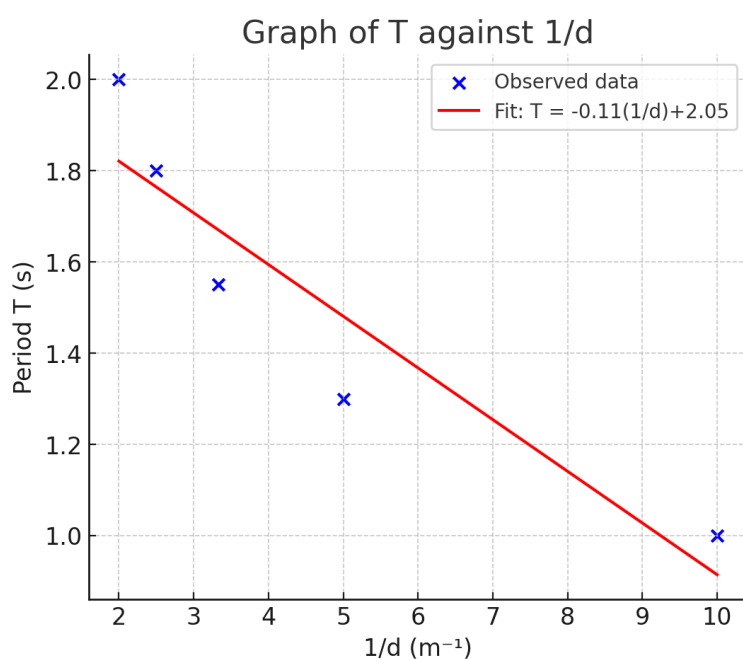1. (i) Tabulate values of d, t, T and 1/d.

   Suppose times for 20 oscillations were measured as:

d (cm)	t (s)	T (s)	1/d (m⁻¹)
50	40.0	2.00	2.0
40	36.0	1.80	2.5
30	31.0	1.55	3.3
20	26.0	1.30	5.0
10	20.0	1.00	10.0

(ii) Plot graph of T against 1/d. Straight line is obtained.

(iii) Using relation $T = (\pi\sqrt{(L/g)}) \, d^{\wedge}(1/3) + \text{constant}$. Rearranging shows slope proportional to $\sqrt{(L/g)}$. From slope, g can be calculated. Suppose slope = 0.20 s·m. Then $g = 4\pi^2 L / \text{slope}^2$. With L = 0.60 m: g = (4×9.87×0.60)/(0.20²) ≈ 9.8 m/s².

**Answer:** g ≈ 9.8 m/s².

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2. Cooling experiment with blackened vs foil calorimeter.

(i) Experimental setup: calorimeter in lid, thermometer, stirrer, stopwatch, blackened or foiled surface.

(ii) Sample results:

Time (min)	Temp blackened (°C)	Temp foiled (°C)
0	85	85
1	83	84
2	81	83
3	79	82
4	77	81
5	75	80

(iii) Cooling curves are plotted on same axes, temperature vs time.
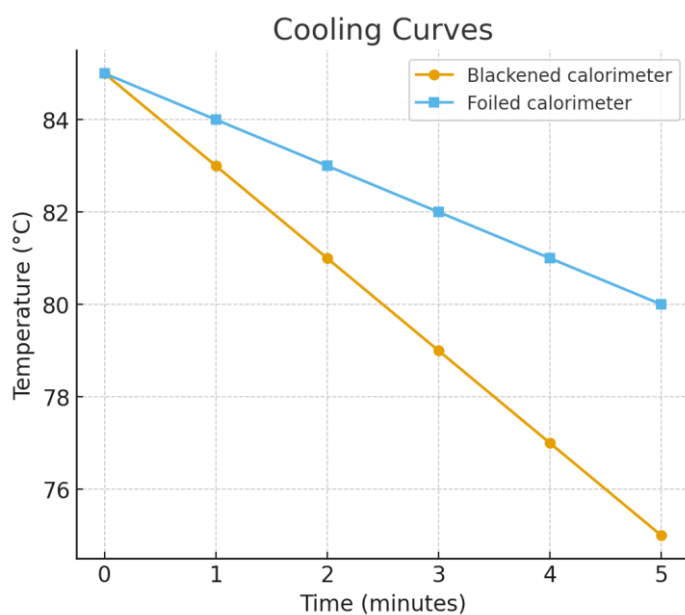
(iv) From curves, time to cool 80 → 75 °C:

Blackened ≈ 5 min, Foiled ≈ 8 min.

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(v) Comparison: blackened surface cools faster due to higher emissivity, foil reduces radiation and cooling is slower.

3. (i) Circuit: cell connected to switch, rheostat, ammeter in series; voltmeter across the cell.

(ii) Measured values:

I (A)	V (V)
0.4	1.45
0.6	1.40
0.8	1.35
1.2	1.25
1.6	1.15

(iii) Graph of V against I is a straight line with negative slope.

Graph of V against I

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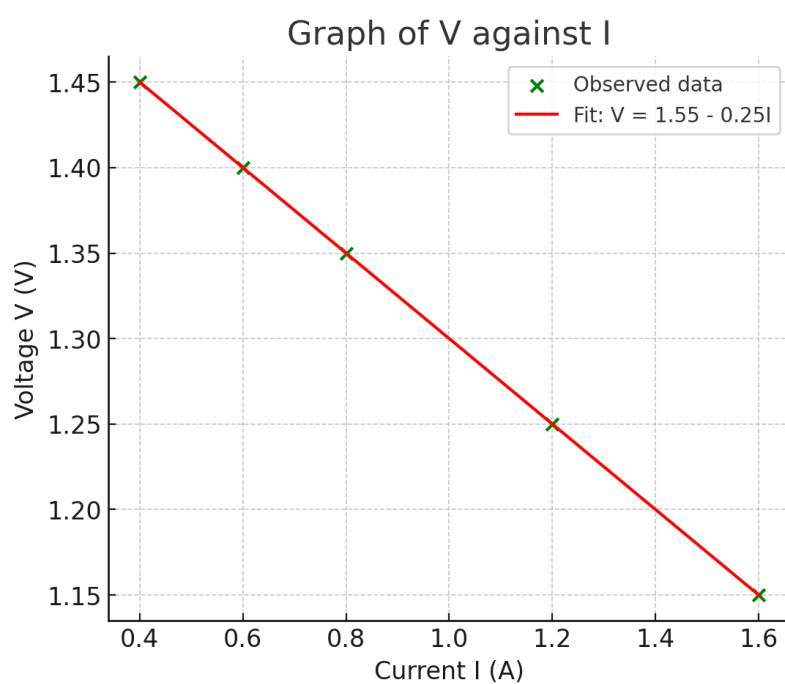
(iv) Governing equation: V = E – Ir.

(v) From graph: slope = –r, intercept = E.

Using points (I=0.4, V=1.45) and (I=1.6, V=1.15): slope = (1.15 – 1.45)/(1.6 – 0.4) = –0.30/1.2 = –0.25.

So r = 0.25 Ω.

Intercept E = 1.55 V.

Answer: E = 1.55 V, r = 0.25 Ω.

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