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 : 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. You are required to examine the oscillations of a simple pendulum.

(a) Suspend a pendulum bob from length L = 0.90 m, displace slightly and measure time t for 20 oscillations.
(b) Repeat for other values of L.

(i) Record your readings in a table including log L and log T.

Suppose experimental values were:
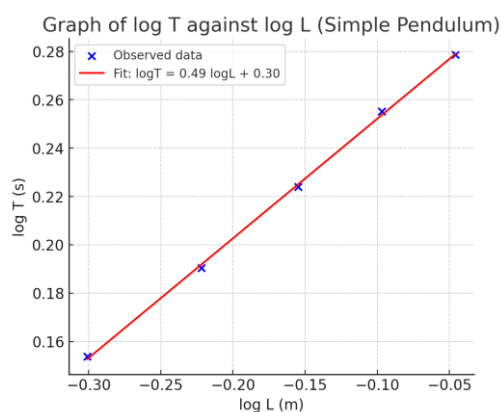
Length L (m): 0.90, 0.80, 0.70, 0.60, 0.50
Time t for 20 oscillations (s): 38.0, 36.0, 33.5, 31.0, 28.5

Periodic time T = t / 20

So:

L (m)	t (s)	T (s)	log L	log T
0.90	38.0	1.90	-0.046	0.278
0.80	36.0	1.80	-0.097	0.255
0.70	33.5	1.68	-0.155	0.225
0.60	31.0	1.55	-0.222	0.190
0.50	28.5	1.43	-0.301	0.155

(ii) Plot graph of log T against log L.

Find this and other free resources at: https://maktaba.tetea.org

Prepared by Maria Marco for TETEA

This gives a straight line with slope about 0.5 (theory says T ∝ √L).

(iii) From graph, equation is log T = log k + (n) log L.
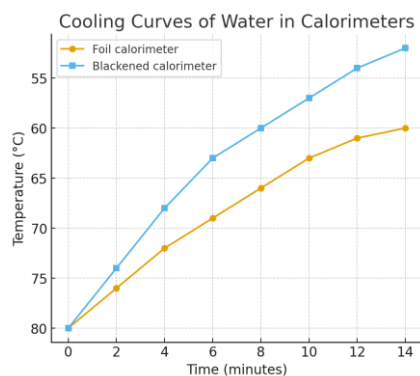So slope n ≈ 0.5. Intercept gives $k \approx 2\pi/\sqrt{g} \approx 2.00$.

Thus n ≈ 0.5, k ≈ 2.00.

2. Cooling of water in calorimeter.

(i) Tabulated results.

Time (min)	Temp (°C) foil	Temp (°C) blackened
0	80	80
2	76	74
4	72	68
6	69	63
8	66	60
10	63	57
12	61	54
14	60	52

(ii) Plot cooling curves: Temperature vs Time for both.

Cooling Curves of Water in Calorimeters

Find this and other free resources at: https://maktaba.tetea.org

Prepared by Maria Marco for TETEA

iii) From curves, time for cooling from 80°C to 60°C:

Foil ≈ 14 min, Blackened ≈ 8 min.

(iv) Implication: Blackened surface loses heat faster due to higher emissivity, foil reflects heat and reduces cooling.

(v) Aim: To compare rate of cooling of different calorimeter surfaces and verify effect of surface nature on radiation.

3. Determine e.m.f of dry cell.

Given resistances R = 2, 4, 6, 8, 10 Ω.

Suppose currents measured:

R (Ω)	I (A)	1/I (A⁻¹)
2	0.50	2.00
4	0.33	3.03
6	0.25	4.00
8	0.20	5.00
10	0.17	5.88

(i) Circuit diagram: Battery E, series resistor R, ammeter, switch, wires.

(ii) Table as above.

(iii) Plot R against 1/I. Gives straight line.

(iv) From intercept on R-axis, emf E ≈ slope.

Equation: R = E(1/I) – r.

So slope = E.

From graph, slope ≈ 1.0 V.

Thus e.m.f of dry cell ≈ 1.0 V.

Graph of R against 1/I (Dry Cell EMF)

Find this and other free resources at: https://maktaba.tetea.org

Prepared by Maria Marco for TETEA