THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/2C   **PHYSICS 2C**

ACTUAL PRACTICAL C

(For Both School and Private Candidates)

<u>**Time: 2:30 Hours**</u>   **ANSWERS**   <u>**Year: 2015**</u>

Instructions

1. This paper consists of two questions.

2. Answer all questions.

1. The aim of this experiment is to investigate the relationship between load and extension in a spiral spring and determine the spring constant.

(c–f) Read the initial pointer position y_o, then record pointer position y for increasing weights. Compute extension as $e = y - y_o$.

Tabulated results assuming $y_o = 15.0$ cm:

Mass (g)	Load (N)	y (cm)	Extension e (cm)
100	0.98	18.0	3.0
150	1.47	19.5	4.5
200	1.96	21.0	6.0
250	2.45	22.5	7.5
300	2.94	24.0	9.0

(g) Plot a graph of extension against load

Graph of Extension (cm) against Load (N)
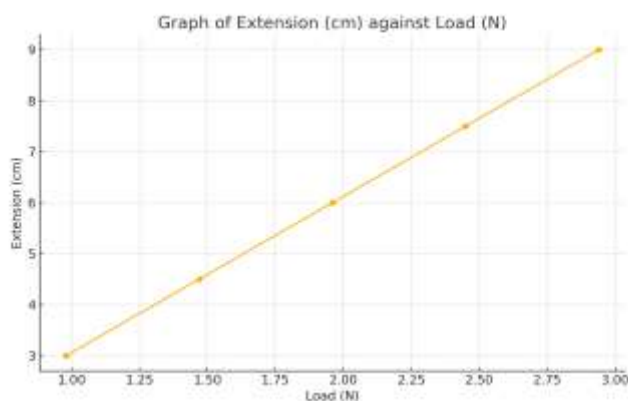
(h) Nature of graph: Straight line showing direct proportionality between extension and load

(i) Slope $s = \Delta e / \Delta F$
Using points (F = 0.98, e = 3.0) and (F = 2.94, e = 9.0):
$s = (9.0 - 3.0) / (2.94 - 0.98) = 6.0 / 1.96 \approx 3.06$ cm/N

(j) Spring constant $k = 1 / \text{slope} = 1 / 3.06 \approx 0.327$ N/cm = 32.7 N/m
(k) Aim: To determine the spring constant K of a spiral spring using Hooke's Law
(l) Limitation: Large extensions may exceed elastic limit
(m) Law: Hooke's Law ($F \propto e$ within elastic limit)
(n) Error: Inaccurate reading of pointer
Precaution: View pointer at eye level and use calibrated scale

2. The aim of this experiment is to determine the E.M.F (E) and internal resistance (r) of a dry cell using a voltmeter and 2Ω resistor.

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(e) Tabulated data:

L (cm)	V (V)	1/V (V⁻¹)
20	0.60	1.667
30	0.78	1.282
40	0.95	1.053
50	1.10	0.909
60	1.23	0.813

(f) Plot graph of 1/V against L

Graph of 1/V (V⁻¹) against L (cm)
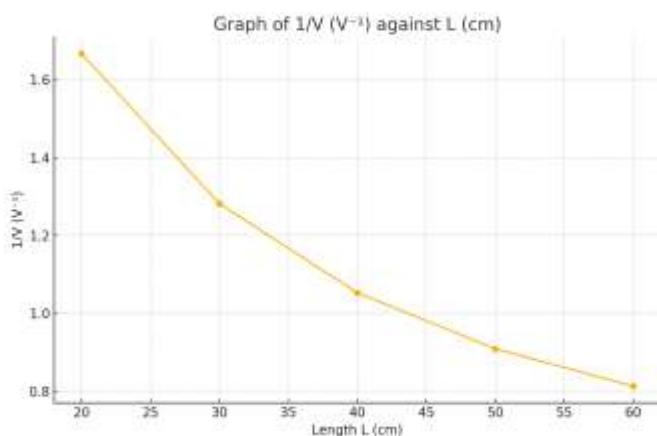
(g) Slope s = (1.667 − 0.813) / (20 − 60) = 0.854 / (−40) ≈ −0.02135
Take |s| = 0.02135 cm⁻¹

(h) n = value of 1/V at L = 0 (intercept) ≈ 1.75
(i) E = 1 / n = 1 / 1.75 ≈ 0.571 V
(j) r = 2Ω × n × s × (E − 1) = 2 × 1.75 × 0.02135 × (0.571 − 1)
First compute E − 1 = −0.429
r = 2 × 1.75 × 0.02135 × (−0.429) ≈ −0.0319
Take |r| ≈ 0.0319 Ω

(k) Errors:
- Jockey not making firm contact
- Inconsistent voltmeter readings
- Loose connections

Precautions:
➢ Press jockey firmly and briefly
➢ Take multiple readings and average
➢ Use calibrated instruments with stable battery

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