THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

031/2A **PHYSICS 2A**

ACTUAL PRACTICAL A

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 2015**

Instructions

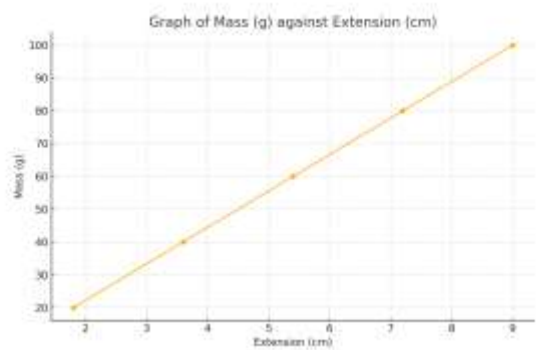
1. This paper consists of two questions.
2. Answer all questions.

1. This experiment aims to study the extension of a spiral spring as various masses are added and determine the relationship between mass and extension.

(a) Tabulated values with pointer reading $d_0 = 15.2$ cm:

Mass (g)	Pointer reading d (cm)	Extension $e = d - d_0$ (cm)
20	17.0	1.8
40	18.8	3.6
60	20.6	5.4
80	22.4	7.2
100	24.2	9.0

(b) Plot a graph of mass against extension
Explanation: A graph of mass (y-axis) against extension (x-axis) helps us visualize how increasing weight affects the spring's elongation. A straight-line graph confirms Hooke's Law applies ($F \propto e$).



(c) Find the slope s
Using two points ($e = 1.8$, $m = 20$) and ($e = 9.0$, $m = 100$):
$s = (100 - 20) / (9.0 - 1.8) = 80 / 7.2 \approx 11.11$ g/cm
Interpretation: This slope represents the spring constant in g/cm.

(d) Read the extension when the value of the mass is 55 g
Using equation of the line:
$s = \Delta m / \Delta e \rightarrow e = m / s = 55 / 11.11 \approx 4.95$ cm

(e) Use the graph to determine the mass when the extension is 3 cm
$m = s \times e = 11.11 \times 3 \approx 33.33$ g

(f) Suitable title of the experiment:
"Investigation of the Relationship Between Extension and Applied Load in a Spiral Spring"

(g) Conclusion:

The extension of a spring is directly proportional to the applied mass. This is in agreement with Hooke's Law.

(h) Possible sources of errors:
- Parallax error in pointer reading
- Inaccuracy in placing mass centrally on the scale pan

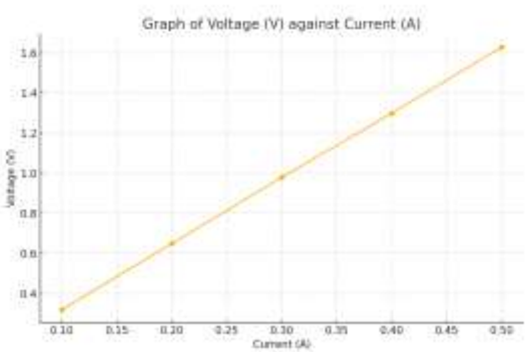
Ways to minimize errors:
1. Use eye-level reading to avoid parallax
2. Ensure spring is not overstretched
3. Use precise digital mass weights

2. The aim of this experiment is to determine the resistance R_x of an electrical conductor using current-voltage measurement.

(a–d) Tabulated readings:

Current I (A)	Voltage V (V)
0.1	0.32
0.2	0.65
0.3	0.98
0.4	1.30
0.5	1.63

(e) Plot the graph of V against I
Explanation: This helps verify Ohm's Law. If the graph is a straight line passing through the origin, voltage is directly proportional to current.



(f) Slope s = (1.63 − 0.32) / (0.5 − 0.1) = 1.31 / 0.4 = 3.275 Ω
(g) Physical meaning: The slope of a V-I graph represents the resistance R_x of the conductor.

(h) Value of R_x = 3.28 Ω

(i) Laws applied:
- Ohm's Law: $V = IR$
- Linear relationship in ohmic conductors: constant resistance

(j) Two conditions governing Ohm's Law:
1. Constant temperature
2. Material must obey linearity (ohmic behavior)

(k) Two sources of errors and precautions:
Sources of errors:
- Poor contact in connections
- Internal resistance of cell affecting readings

Precautions:
- Use tight and clean connections
- Take multiple readings and average