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)

Time: 2:30 Hours **ANSWERS** **Year: 2011**

Instructions

1. This paper consists of two questions.

2. Answer all questions.

1. The aim of this experiment is to determine the relationship between tension and extension using a spiral spring.

1 (a) Arrange the apparatus as shown in Figure 1.
Fix the spiral spring on the retort stand and suspend a pan from its lower end. Position a pointer to show displacement along a vertical metre rule.

1 (b) Read and record the position of the pointer shown from the metre rule when the pan is empty, call it T_0.
Let $T_0 = 10.0$ cm

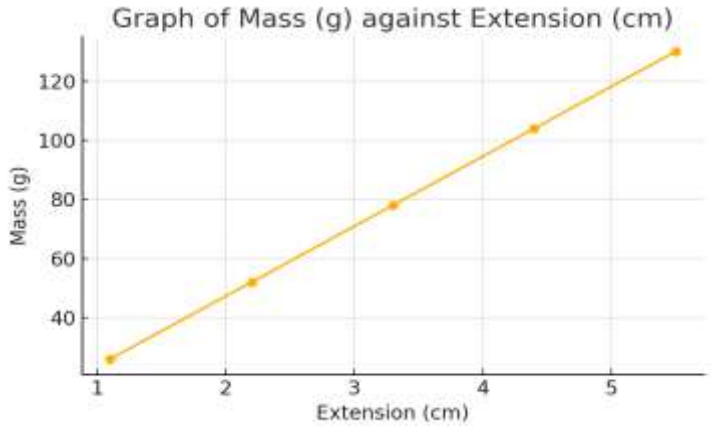
1 (c) Put a 26 g weight on the pan and read the new length from the metre rule, call it T. Find the extension $e = T - T_0$.
T = 11.1 cm
e = 11.1 - 10.0 = 1.1 cm

1 (d) Repeat the procedure in (c) above using weights of 52 g, 78 g, 104 g, and 130 g.
Complete table:

Mass on pan (g)	Pointer reading (cm)	Extension $e = T - T_0$ (cm)
26	11.1	1.1
52	12.2	2.2
78	13.3	3.3
104	14.4	4.4
130	15.5	5.5

1 (e) Complete the table of results.
See above.

1 (f) Plot a graph of mass against extension.



1 (g) Determine the slope of your graph.
Using two points: (5.5, 130) and (1.1, 26)
Slope = Δmass / Δextension = (130 - 26) / (5.5 - 1.1) = 104 / 4.4 = 23.64 g/cm

1 (h) What is the physical significance of the slope obtained in (g) above?
It represents the spring constant in g/cm: the amount of mass needed to stretch the spring by 1 cm.

1 (i) From the graph, determine the extension when the mass is 65 g.
Use y = 23.64 x
65 = 23.64 e
e = 65 / 23.64 = 2.75 cm

1 (j) Write the equation governing this experiment.
F = ke, where F is the force (tension), k is the spring constant, and e is the extension.

1 (k) Does the spring obey Hook's law? Give reason for your answer.
Yes, because the graph of mass against extension is a straight line through the origin, indicating proportionality between force and extension.

1 (l) State the law in (k) above.
Hook's Law: The extension of an elastic object is directly proportional to the applied force provided the elastic limit is not exceeded.

1 (m) What will happen when the load greater than elastic limit is added on the scale pan?
The spring will stretch beyond its elastic limit and may not return to its original length or may become permanently deformed.

1 (n) State a source of error in this experiment and show how it can be minimized.
Error: Inaccurate pointer reading due to parallax.
Minimization: Ensure eyes are level with the pointer when taking readings.

2. You are provided with a Battery, E, Rheostat, Rh, Switch, S, Ammeter, A, Voltmeter, V and Resistor, R.

2 (a) Connect the Battery, Rheostat, Switch, Ammeter and Resistor in series as shown in Figure 2. The Voltmeter must be connected across R.
Connect the battery to a rheostat, then in series with switch, ammeter, and resistor. Connect the voltmeter in parallel across the resistor.

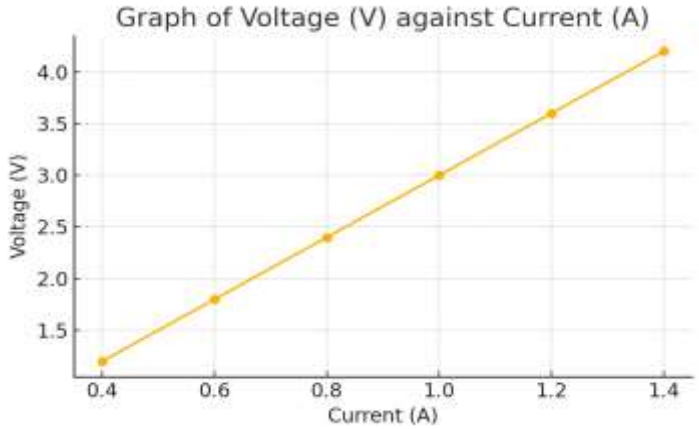
2 (b) Switch on the current and adjust the Rheostat to obtain six (6) different values of Voltmeter readings (V) and corresponding values of Ammeter reading (A).
Tabulate:

V (V)	I (A)	V/I (Ω)
1.2	0.40	3.00
1.8	0.60	3.00
2.4	0.80	3.00
3.0	1.00	3.00
3.6	1.20	3.00
4.2	1.40	3.00

2 (c) Tabulate your results including the value of V/I.
See table above.

2 (d) Deduce the aim of the experiment.
To determine the resistance of a resistor using Ohm's Law.

2 (e) Draw a graph of Voltage (V) against current I.



(f) Determine the slope of your graph.
Slope = $\Delta V / \Delta I = (4.2 - 1.2) / (1.4 - 0.4) = 3.0 / 1.0 = 3.00\ \Omega$
(g) Calculate the average value of R.
Average R = sum of V/I values / number of values = $(3 + 3 + 3 + 3 + 3 + 3)/6 = 3.00\ \Omega$
(h) Comment on the values obtained in (f) and (g).
The slope of the V-I graph and the average V/I both give the same resistance value, confirming consistency.
(i) State the law governing this experiment.
Ohm's Law: The current through a conductor is directly proportional to the potential difference across it, provided temperature and other physical conditions remain constant.

2 (j) Give a limitation of the law stated in (i).
Ohm's Law is not valid for non-ohmic materials, such as diodes and filament lamps, where the resistance changes with voltage or temperature.