BUSIA COUNTY JOINT EXAMINATION
232/3
PHYSICS
Paper 3
(Practical)
July/August 2015
Time: 2½ Hours

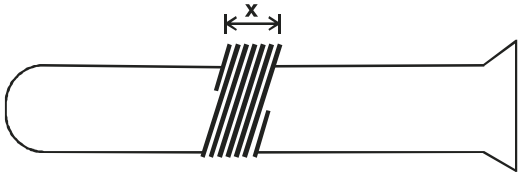
1. You are provided with the following apparatus :
- a copper wire
- a 50g mass
- a metre rule
- two pieces of wood
- a test tube
- a retort stand, boss and clamp
- a micrometer screw gauge

Proceed as follows :

a) i) Measure the length, L of the wire provided. (1 mark)

ii) Using a micrometer screw gauge measure the diameter d of the wire. (1 mark)

b) i) Wind the whole length of the wire tightly on the test tube making sure that the turns are as close as possible but not overlapping. Measure the length, x of the coil made.



x = ... cm (2 marks)

ii) Count and record the number, N, of the complete turns on the coils.

N = ... cm (1 mark)

c) Remove the coil from the test tube. Straighten the first and the last turns of coil. Bend one end to make a hook.

d) Count and record in the table below, the number, n, of complete turns remaining on the coil.

e) Measure and record in the table below, the distance, h_1 between the end turns of the coil as shown on the diagram below.

Number of turns n, remaining					
Distance, h_2 (cm)					
Distance, h_1 (cm)					
Extension, $e = h_2 - h_1$ (cm)					

f) Load a 20g mass on the coils as shown in figure 2 above. Measure and record in the table below, the distance h_2, between the end turns of the coil.

g) Remove the mass from the coil. Reduce the number of turns by straightening three turns of the coil from the upper end and adjust the point of suspension of the coil as shown in figure 2. Record the number of turns, n, remaining.

h) Measure and record the new distances, h_1, in the table below.

i) Load 50g mass on the coil. Measure and record the new h_2 in the table below.

j) Repeat the procedure (i) and (j) above so as to obtain four sets of readings for n, h_1 and h_2.
Calculate the corresponding extension and complete the table below.

k) Plot the graph of extension, e (y-axis) against the number of turns, n, on the grid provided. (5 marks)

m)

I. Determine the slope, s of the graph. (3marks)

II. Determine the constant, G, given that (2 marks)

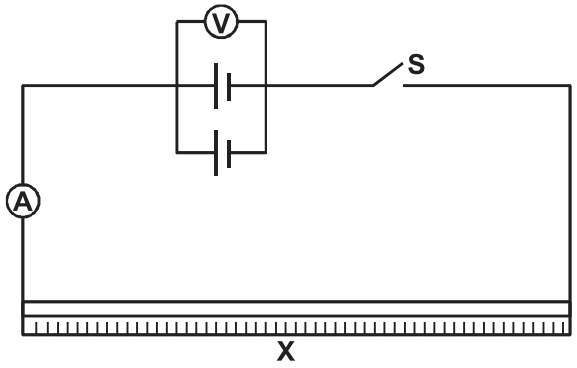
$$\ell = \frac{Gx}{d}n$$

2. You are provided with the following apparatus :
- two cells
- cell holder
- torch bulb fixed in bulb holder
- voltmeter (V)
- ammeter (A)
- switch (S)

- mounted wire (100cm) labelled X
- 7 connecting wires (4 with crocodile clips)

Proceed as follows :

a) Set up the circuit with the cells in parallel as shown in figure 4



b) With switch open, record the reading E of the voltmeter. (1 mark)

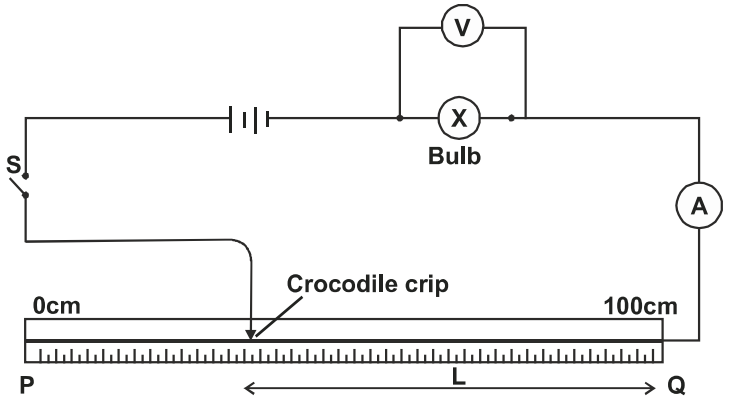
c) Close the switch. Record the current I flowing in the circuit and the potential difference V across the cells.

I = ... A (1 mark)

V = ... volts (1 mark)

d) Given that E = V + Ir and V = IX. Determine the internal resistance r of the combined cells and the resistance of the wire labelled X (2 mark)

Now set up the circuit as shown in figure 5 below.



e) With crocodile clip at P (i.e. L = 100cm) take the voltmeter reading (V) and the ammeter reading (I). Record the values of V and I in table 2 below.

f) Repeat the procedure (a) for the lengths L = 80, 60, 40, 20, 0cm respectively.

g) Complete the table for corresponding values of V^2 and R.

Length, L (cm)	100	80	60	40	20	0
Voltage, V (v)						
Current, I (A)						
V^2 (v^2)						
$R = \frac{V}{I} (\Omega)$						

(6 marks)

h) On the grid provided, plot a graph of V^2 (y-axis) against R. (5 marks)

(Graph paper provided on page 7)

i) Determine the slope of the graph at the point corresponding to L = 20cm. (3 marks)

j) What physical quantity is represented by the slope of the graph at any given point. (1 mark)

BUSIA COUNTY JOINT EVALUATION
PHYSICS
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MARKING SCHEME

1. a) L = 150cm (student value) ***1mk***
d = 0.75mm ***1mk***
b) X = 2.7cm (student value) ***1mk***
c) N = 28 1mk
k) Table

Number of turns n, remaining	26	23	20	17	14
Distance, h_2 (cm)	3.8	3.0	2.5	2.0	1.7
Distance, h_1 (cm)	6.0	4.5	3.9	3.2	2.6
Extension, $e = h_2 - h_1$ (cm)	2.2	1.5	1.4	1.2	0.9

1mk
±0.2 (2mks)
±0.2 (2mks)
1mk

m) I. slope = $\frac{1.9 - 0.85}{25 - 14}$ ✓1

$= \frac{1.05}{11}$ ✓1 = 0.09545 ✓1

II. $\ell = \frac{Gx}{d}n$

$\frac{Gx}{d}$ = slope

$\frac{G \times 2.7}{0.75} = 0.09545$ ✓1

$G = \frac{0.0945 \times 0.75}{2.7} = 0.0265$ ✓1

2. a) E = 1.75V ✓1
c) I = 0.04A ✓1
V = 1.7V ✓1

$r = \frac{1.75 - 1.7}{0.04} = 1.25\Omega$ ✓1

$X = \frac{1.7}{0.04} = 42.5\Omega$ ✓1

Length, L (cm)	100	80	60	40	20	0
Voltage, V (v)	0.09	0.10	0.12	0.14	0.18	0.20
Current, I (A)	0.2	0.2	0.3	0.5	1.0	1.7
V^2 (v^2)	0.04	0.04	0.09	0.25	1.00	2.89
$R = \frac{V}{I}(\Omega)$	0.4500	0.5000	0.4000	0.2800	0.1800	0.1176

i) At L = 20cm R = 0.18
gradient at R = 0.18
Tangent ✓1
Slope = $\frac{1.45 - 0.25}{0.15 - 0.23}$ ✓1
= -15 ✓1
j) Power ✓1