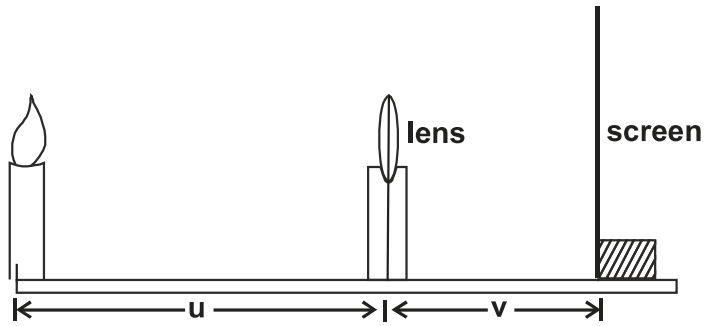
GEM SUB-COUNTY JOINT EVALUATION EXAMS 2015
232/3
PHYSICS
Paper 3
(Practical)
July/August 2015

1. You are provided with the following apparatus :
- a biconvex lens labelled A
- a candle
- a lens holder
- a metre rule
- a piece of plasticine

Proceed as follows

a) Arrange the candle, lens, screen and metre rule as shown. Ensure that the flame of the candle is at the same level as the centre of the lens, L. This may be done by raising the candle with a piece of plasticine as it gets shorter.



b) With the lens placed 20cm from the candle, adjust the position of the screen till a sharp image of the candle is formed on it . Read and record the value of V.

c) Increase U in steps of 5cm and obtain the corresponding values of V. Complete the table.

U (cm)	20	25	30	35	40	45	50
V (cm)							
$\frac{U}{V}$							

(8 marks)

d) i) Plot a graph of object distance, u (y-axis) against the ratio $^{U}/_{V}$ (5 marks)

ii) Determine the slope, S of the graph. (2 marks)

iii) Find the value of u intercept. (1 mark)

iv) Compare the value of S and that of u intercept. (1 mark)

e) i) Move the screen till it is 80cm from the candle.

ii) Starting from very near the screen, move the lens slowly towards the candle and note the two positions P and R where sharp images of the candle are obtained on the screen. Measure d, the distance between P and R.

d = ... (1 mark)

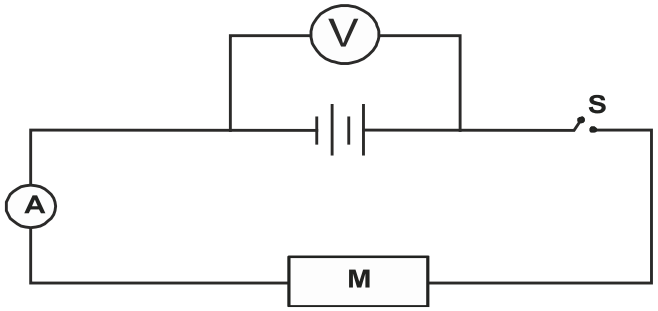
iii) Calculate the quantity Z from (2 marks)

$$Z = \frac{80^2 - d^2}{320}$$

2. You are provided with the following apparatus :
- two dry cells
- a cell holder
- ammeter
- voltmeter
- Eight connecting wires each with crocodile clip at one end
- six 10 ohm carbon resistors
- a switch

Proceed as follows :

a) Set up the apparatus as shown in figure 4 below. M is one of the 10 ohm carbon resistors.



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

c) Now remove the voltmeter. Close the switch and record in table 2 the current I flowing in the circuit. Open the switch S.

d) Remove the resistor M. Using carbon resistors provided, make suitable combinations of the resistors to obtain effective resistance R shown in the table 2. For each value of R, record the current I flowing in the circuit. Complete the table. (Resistors should be arranged in parallel)

R (ohms)	10.0	5.0	3.3	2.25	2.0	1.7
I (Amperes)						
$\frac{I}{A}(A^{-})$						

e) Plot a graph of $^{1}/_{I}$ (y-axis) against R. (5 marks)

f) Determine the slope of the graph M. (2 marks)

g) Evaluate the value of the constants. (1 mark)

i) $K = \frac{1}{M}$

ii) $P = \frac{E_o K}{4r}$ where r is the value of the R axis intercept. (4 marks)

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MARKING SCHEME

1. c)

U (cm)	20	25	30	35	40	45	50
V (cm)	28.0	24.0	22.0	19.5	18.5	18.3	17.4
$\frac{U}{V}$	0.7142	1.042	1.364	1.786	2.162	2.459	2.8736

8mks

d) i) Graph
For f = 10cm

u	20	25	30	35	40	45	50
v	19.5	15.8	15.5	14.3	13.3	12.3	12.1

d = 68.7 - 68.5
= 0.2cm

ii) slope, $S = \frac{\Delta u}{\Delta {}^{u}/v}$
$= \frac{(38 - 15)cm}{(2 - 0.35)}$
= 13.94cm

iii) $^{u}/v$ intercept = 10cm

iv) Equal to or almost equal or difference is 3.94cm

e) ii) d = 67.8 - 67.5
= 0.3cm

iii) $z = \frac{80^2 - d^2}{320}$

$= \frac{80^2 - 0.3^2}{320}$
$= 19.99cm^2$

2. b) E_o = 3.0 volts 1mk

d)

R (ohms)	10.0	5.0	3.3	2.25	2.0	1.7
I (Amperes)	0.30	0.60	0.91	1.33	1.50	1.76
$\frac{I}{A}(A^{-})$	3.33	1.67	1.10	0.75	0.67	0.57

f) Slope $M = \frac{2.5 - 1.25}{7.6 - 3.8}$
$= \frac{1.25}{3.8}$
$= 0.3289A^{-1}\Omega^{-1}$

g) i) $K = \frac{1}{0.3289}$ $= 3.04\Omega A$ or $3.04V$ ***1mk***

ii) $P = \frac{3.0 \times 3.04}{4 \times 0.05}$

$= 45.6\Omega^3A^2$
or $45.6V^2\Omega$ ***4mks***