NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, Nnamdi Azikiwe Expressway, Plot 91, Cadastral Zone, Jabi, Abuja
FACULTY OF SCIENCES

Department of Pure and Applied Science

JANUARY 2018 EXAMINATION QUESTION

COURSE CODE: PHY492

COURSE TITLE: Laboratory Physics III

COURSE UNIT: 3 units

ANSWER QUESTIONS ONE AND ANY FOUR OTHER QUESTIONS

Q. 1 A student used the following apparatus: signal generator, capacitor, inductor, voltmeter, ammeter and oscilloscope to perform an experiment where the output voltage was kept constant at 10 V and the following readings were obtained:

Resistance, R (Ω)	Current, I (A)
10	8.50
20	7.50
30	6.50
40	6.00
50	5.50
60	5.00
70	4.50
80	4.20
90	4.00
100	3.50

a. Tabulate your readings

b. Evaluate: (i) $Z = \frac{V}{I}$ (ii) R^2 (iii) Z^2

c. Plot a graph of Z^2on the vertical axis and R^2on the horizontal axis.

d. Determine the slope, S of the graph.

e. Determine the intercept on the vertical axis.F

f. Find the error in the slope.

g. State two precautions taken to ensure accurate result.

Q.2 A student was provided with an illuminated object, converging lens, screen, meter-rule and screen to perform light experiment. The student made the following observations: size of the illuminated object, $h_o = 1.5cm$, object distances, u= 30cm, 35cm, 40cm, 45cm, and 50cm and size of the images, h = 2.2cm, 1.5cm, 1.2cm, 0.9cm and 0.7cm.

a. Tabulate your readings. 1 mark

b. Evaluate (i) $m = \frac{h}{h_0}$ 1 ***mark*** (ii) m^{-1} ***1 mark***

c. Plot a graph with m^{-1} on the vertical axis and u on the horizontal axis. ***4 marks***

d. Determine (i) the slope, S of the graph.

(ii) Intercept, C on the vertical axis. ***1 mark***

e. Determine the value of u for which $m^{-1} = 0$ ***2 marks***

f. State the precautions taken to obtain accurate results. ***1 mark***

g. Find the error in the slope. ***1 mark***

Q.3 In an experiment to determine the refractive index of a liquid by real and apparent depth method using a travelling microscope readings were obtained.

Microscope d_1 (mm)	Readings d_0 (mm)	Real depth d_1 (mm)
6.0	1.5	6.0
7.5	1.7	7.5
8.0	1.9	8.0
9.0	2.0	9.0
10.0	2.5	10.0

a. If real depth is d_1 and upward apparent displacement is d_0, Evaluate:

(i) Apparent depth, $d_2 = d_1 - d_0$ 2 marks

(ii) $n = \frac{Real\ depth}{Apparent}, \frac{d_1}{d_2}$ 2 marks

b. Calculate the mean of n. 2 marks

c. Find the standard error in the mean. 2 marks

d. Calculate the following : (i) fractional error 2 marks

(ii) Percentage error. 2 marks

Q. 4 To measure the focal length of a converging lens, a student made

the following observations.

S/N	u (cm)	V (cm)
1	16.50	51.00
2	20.00	34.00
3	28.00	23.00
4	45.00	17.50
5	60.00	15.50

a. Evaluate (i) $(u+v)\ cm$ 1 mark

(ii) $(uv)\ cm^2$ for each value and tabulate your readings. 1 mark

b. Plot a graph of $u+v$ against uv. 2 mark
c. Determine the slope of the graph, S. 1 mark
d. Evaluate $\frac{1}{S}$ 2 marks
e. Determine the error in the slope. 1 mark
f. Draw a ray diagram illustrating how a plane mirror can be used to determine the focal length of a diverging lens. 2 marks

Q.5 A student made the following observations in investigating the properties of a general series circuit.

V (v)	50	50	50	50	50	50	50	50	50	50
C (μF)	1	2	3	4	5	6	7	8	9	10
I (rms) A	4.0	8.0	20.0	26.0	30.0	24.0	18.0	10.0	7.0	5.0

a. Evaluate Z = $\frac{V}{I}$ and tabulate your readings. 3 mark
b. (i) Plot a graph with Z on the vertical axis and C on the horizontal axis. 2 mark
(ii)On the same axis plot a graph of I versus C 2 mark
c. Determine the value of C when I is maximum. 2 mark
d. Recall that at maximum current, $X_L = X_C$

$2\pi fl = \frac{1}{2\pi fc}$

Calculate the value of L from the graph. 3 mark

Q.6 In a light experiment, a careful student had the following readings.

S/N	d (cm)	L_1 (cm)	L_2 (cm)
1	100	79.8	59.5
2	85	63.6	20.3

3	75	51.6	23.6
4	65	38.3	21.6
5	55	33.5	26.5

a. Evaluate the following d_2, L= ($L_2 - L_1$), L^2 and D = ($d^2 - L^2$) and tabulate your readings. 3 marks
b. Plot a graph of D on the vertical axis and d on the horizontal axis. 3 marks
c. Determine the slope, S of the graph. 2 marks
d. Calculate the error in the slope. 2 marks
e. Evaluate $\frac{S}{4}$ 2 marks