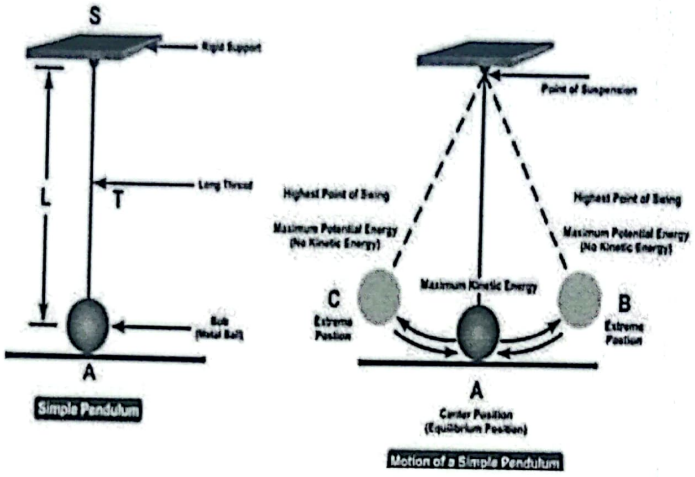
BOWEN UNIVERSITY, IWO, OSUN STATE, NIGERIA
COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCES
PHYSICS PROGRAMME

FIRST SEMESTER EXAMINATION 2022/2023 SESSION
COURSE TITLE: PRACTICAL PHYSICS AND TREATMENT OF DATA I
COURSE CODE: PHY 391
DATE: FEBRUARY 13, 2023 TIME: 3:30-6:30PM
INSTRUCTION: Answer question one and any other two

Question One

To determine the acceleration due to gravity of a simple pendulum, use the setup in the figure below to obtain various data.



From theory, the period of oscillation of a simple pendulum is related to length and acceleration due to gravity as in the equation,

$$T = 2\pi\sqrt{\left(\frac{L}{g}\right)} \qquad (1)$$

The length (L=100cm) is measured as the total length from the rigid support to the equilibrium position. Record a total of eight (8) measurements of length = 90cm, 80cm, 70cm, 60cm, 50cm, 40cm, 30cm, and 20cm.

Tabulate your results as shown in table 1 below.

Take: $\pi = 3.142$

Table 1

S/N	L(cm)	Time for 20 Oscillations	Period T(s)	$T^2(s^2)$

(i) Plot a suitable graph from the relation of equation above.

(ii) Determine the slope and the value of 'g' in m/ s^2

(iii) What is the acceleration due to gravity in a region where a simple pendulum having a length 75.00cm has a period of 1. 7375s?

(iv) State five (5) apparatus used to perform this experiment.

(v) State two (2) precautions taken when performing the experiment.

30 marks

Question Two

The equation below is suggested for the evaluation of the dependent and independent quantity 'x' and 'y'.

$$y = Ax^n$$

where A and n are constants respectively.

The data in table 2 were obtained while performing the experiment in the laboratory.

Table 2

x	1.60	2.50	4.00	6.40	10.00	15.90	25.10
y	1.86	2.50	3.16	4.07	5.37	6.61	8.71

a) Obtain and tabulate the values of functions of x and y to be plotted against each other.
b) Plot a suitable graph, obtain the slope and intercept.
c) Hence, determine the values of A and n.

20 marks

Question Three

a) The following readings in the table 3 were obtained in an experiment to determine the relationship between the load and extension using a spiral spring.

Table 3

Load W (kg)	50.00	100.00	150.00	200.00	250.00
Extension (cm)	5.10	10.40	15.50	20.60	26.00

Using an appropriate scale, plot a suitable graph to estimate the value of the force constant. Also, obtain the slope of the graph.

i) What is Hooke's law?

b) What is the difference between standard error and limiting error?

20 marks

Question Four

(a) The relationship between 'U' and 'e' is of the form U= ae^b (Assume all parameters are unitless)

The corresponding values of 'U' and 'e' obtained in an experiment were given in the table below:

Table 4

U	1.86	2.45	3.16	4.07	5.37	6.61	8.71
e	1.60	2.50	4.00	6.40	10.00	15.90	25.10

(i) Linearize the expression U= ae^b

(ii) Using the above linearization result, plot a suitable graph to determine the values of 'a' 'b'.

(b) Differentiate between relative error and zero error.

20 marks