

CHUKA



UNIVERSITY

## UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF  
SCIENCE IN PHYSICS

## GPHY 223: GEOPHYSICS PRACTICAL III

STREAMS: BSc. PHYS

TIME: 2 HOURS

DAY/DATE: TUESDAY 19/12/2023

11.30 A.M. – 1.30 P.M.

## INSTRUCTIONS

- Answer ALL the questions.

## QUESTION 1 (20 marks)

Aims: To study the harmonics and their relation to the tension of a vibrating string  
To calculate the wavelength of the waves on vibrating string.

You are provided with the following:

- A string,
- masses of 150 g, 20 g, 10 g, 2g and 1 g

Proceed as follows:

(i) Set up the apparatus as shown in Fig 1

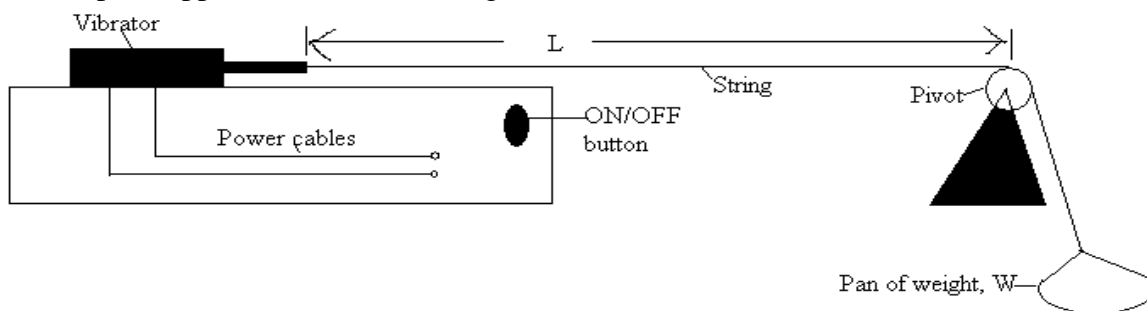


Figure 1: Vibrating string of length  $L$

- (ii) Before switching the power ON, fix the string and measure its length  $L = 98.0$  cm  
 (iii) Place a mass of 150 g on the pan and switch ON the power.  
 (iv) Record the type of harmonic observed in table 1 and the number of nodes. Switch OFF the power

- (v) Replace the mass of 150 g with 30 g plus big and small circular masses provided.
- (vi) Switch ON the power and record the type of harmonic observed in table 1 and the number of nodes. Switch OFF the power.
- (vii) Replace the mass of 30 g with 10 g plus big and small circular masses provided.
- (viii) Switch ON the power and record the type of harmonic observed in table 1 and the number of nodes. Switch OFF the power
- (ix) Use the big and small circular masses provided on the pan. Switch ON the power and record the type of harmonic observed in table 1 and the number of nodes. Switch OFF the power

Table 1: Harmonics of a vibrating string

Mass on the string (g)	Type of Harmonic	Number of Nodes	Tension on the string (N)
150			

- (a) Complete table 1. [10 marks]
- (b) Calculate the wavelength for each harmonic observed [4marks]
- (c) What is the relationship between the tension on the string and the harmonics of a vibrating string? [2marks]
- (d) What other factors affect the harmonics of a vibrating string? [2marks]
- (e) Compare the wavelength of the first overtone with that of other harmonics [2marks]

**QUESTION TWO (20 marks)**

Aim: To measure the potential difference and time interval by use of an oscilloscope

In an experiment to determine the potential difference and periodic time an a.c signal the trace shown in figure 2 was obtained on the screen of a C.R.O.

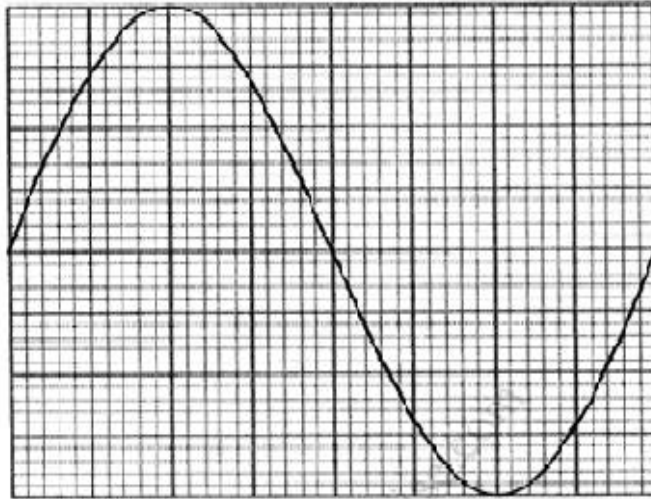


Fig2: Sinusoidal Waveform of an a.c signal

If the time base control is set at 10ms/division and y-gain sensitivity at 120v/division.

Determine

- (i) The period of the a.c signal. [ 2 marks]
- (ii) The frequency of the input signal. [3marks]
- (iii) Explain how the calculated value of frequency compare with the actual value for any a.c signal? [2 marks]
- (iv) The peak to peak voltage of the a.c signal. [3 marks]
- (v) The peak voltage of the input signal. [2 marks]
- b) Explain briefly the working principle of a Cathode Ray Oscilloscope. [4 marks]
- c) State two advantages of a CRO as a voltmeter over the moving coilmeter. [2 marks]
- d) Name any two applications of a CRO. [2 marks]

### QUESTION 3 (20Marks)

You are provided with the following

- Moving coil voltmeter
- Dc power source equal to the maximum voltmeter reading
- Variable resistance box with 5000 ohms
- Circuit switch

### Procedure

- (i) Set up the apparatus as shown in figure 3

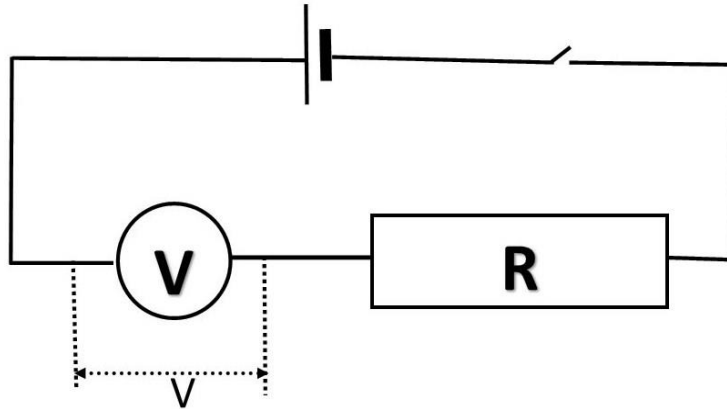


Figure 3

- (ii) Insert the circuit switch and take out a resistance from R (say 200 ohms)
- (iii) Note the reading on the voltmeter.
- (iv) Increase the resistance taken from R by suitable steps and note the voltmeter reading in each case.
- (v) Record your results in the table 2.

R. Ohms	Voltmeter reading $\mathcal{V}$ volts	$1/\mathcal{V}$

- (a) complete the table. [10 marks]
- (b) Plot a graph of  $1/\mathcal{V}$  against R. [5 marks]
- (c) From the graph determine the value of E. [2 marks]
- (d) Determine the value of  $R_v$ . [3 marks]