



**SIR ARTHUR LEWIS COMMUNITY COLLEGE
ACADEMIC YEAR (2024/2025) – SEMESTER TWO
END OF SEMESTER FINAL EXAMINATION
ALTERNATE**

COURSE CODE : PHY003

COURSE TITLE : ELEMENTARY PHYSICS II

LECTURER(S) : MR CECIL FEVRIER

DATE :

TIME :

DURATION : 2 HOURS

STUDENT ID # : _____

GENERAL INFORMATION AND INSTRUCTIONS

- Students must sign **IN** and **OUT** on the examination class list.
- Write your ID number on the question paper.
- This paper consists of **FIVE Questions**. Answer ALL questions

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

Instructions: Answer all 5 questions on the foolscap paper provided.

Ensure that units are included in all working and final answers *where appropriate*.

The use of a scientific calculator is permitted. No graphing calculators are allowed.

Constants:

The speed of sound in air = 340 ms^{-1}

1. In an experiment to investigate Charles’ Law, a Physics student used a fixed mass of dry air trapped in a glass capillary tube as seen in Fig. 1. The student recorded in Table 1 how the length of the air column varied with temperature.

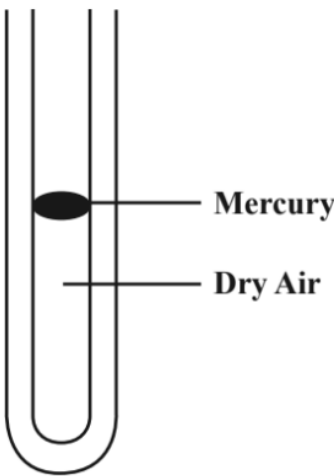


Fig. 1

Length of the air column, L/mm	152.0	158.0	163.0	170.0	179.0	182.0
Temperature, T / K	287	302	313	331	351	358

Table 1

- a. Use the readings from Table 1 to plot a graph of length of the air column (L/mm) against Temperature (T/K) on a graph sheet. Include a line of best fit. (4 marks)

Note: The L-axis should start at 140 mm and the T-axis should start at 270 K.

- b. From your graph, calculate the slope, S. Ensure that the points used to calculate the gradient are clearly stated. (4 marks)
- c. What information does the slope (gradient) of the graph provide? (1 mark)
- d. Use your graph to determine the value of the length of the air column at 273 K. (1 mark)

2.

- a. Distinguish between 'transverse' and 'longitudinal' waves giving one example of each. (2 marks)
- b. What is the relationship between velocity frequency and wavelength of a wave? (1 mark)
- c. A wave motion has a frequency of 770 Hz and a wavelength of 0.4 m. Calculate the speed of the wave. (2 marks)

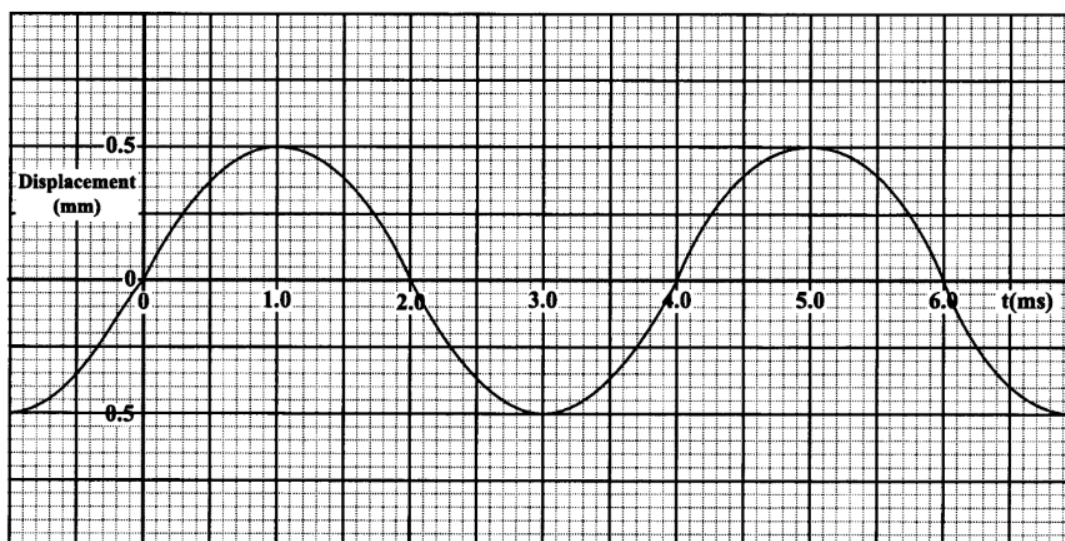


Fig. 1

- d. Fig. 1 shows a sinusoidal wave. Use Fig. 1 to determine the wave's:
 - i. amplitude (in metres) (1 marks)
 - ii. period (in seconds) (2 marks)
 - iii. frequency (in hertz) (2 marks)
3. a. Define the term *Magnetic Field* (1 mark)
- b. Explain why a compass needle points towards the Earth's magnetic north pole. (3 marks)
- c. With the aid of a diagram, describe how the field of a bar magnet is influenced by the Earth's magnetic field. (3 marks)
- d. A student investigates the strength of an electromagnet by changing the number of coils.
- i. What is the independent variable? (1 mark)
 - ii. What is the dependent variable? (1 marks)
 - iii. Suggest a control variable. (1 mark)

4. In order to separate the emissions from a radioactive source, they are subjected to a uniform magnetic field, perpendicular to their path.
- Describe the path of each of the three emissions (α , β and γ) when subjected to a uniform magnetic field directed at a 90-degree angle into your page while the emissions are projected up towards the top of your page.
(6 marks)
 - Protons and neutrons have masses of 1.673×10^{-28} Kg and 1.675×10^{-28} respectively. Determine the total rest mass of the nucleus of an alpha particle.
(2 mark)
 - Why is it that the mass that you have calculated would be expected to be somewhat greater than the actual rest mass of a real alpha particle nucleus.
(2 marks)
- 5
- Distinguish between the *terminal potential difference* and the *electromotive force* (EMF) of a cell when connected in a closed circuit.
(2 marks)
 - A **5 Ω** resistor and a **10 Ω** resistor are connected in **parallel**, and this combination is then connected in **series** with a **3 Ω** resistor across a **12 V** battery. Calculate:
 - The total resistance of the circuit.
(2 marks)
 - The current through the **3 Ω** resistor.
(1 marks)
 - The voltage drop across the **5 Ω** resistor.
(2 marks)
 - If a similar battery to the one used in this circuit had an internal resistance of 0.1Ω , what would be its terminal potential difference?
(3 marks)

END OF EXAMINATION