MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR
FIRST YEAR SECOND SEMESTER

SCHOOL OF PURE APPLIED AND HEALTH SCIENCES
BACHELOR OF SCIENCE IN PHYSICS

COURSE CODE: PHY 1206-1

COURSE TITLE: PHYSICS LABORATORY II

DATE: 15/5/2024 **TIME: 1430-1630 HRS**

INSTRUCTIONS TO CANDIDATES

- Answer Question **ONE** and any other two questions.
- Use of sketch diagrams where necessary and brief illustrations are encouraged.
- Read the instructions on the answer booklet keenly and adhere to them.

*This paper consists of **EIGHT** printed pages. Please turn over.*

QUESTION ONE[COMPULSORY] (20 MARKS)

An experiment was carried out to measure the refractive index of a substance. The experiment was repeated a number of times and the following data was recorded.

Table 1

i °	30	40	50	55	60	65	70
r °	19	26	30	33	36	38	40

a) Describe, with the aid of a diagram, how the student obtained the angle of refraction. **(4 marks)**

b) Why was the experiment repeated? **(1 mark)**

c) Using the recorded data, draw a suitable graph **(7 marks)**

d) Explain how your graph verifies Snell's law. **(2 marks)**

e) Using your graph, find the refractive index of the substance **(2 marks)**

f) Explain why using a single data point from the recorded data above would not give conclusive results of the refractive index **(2 marks)**

g) The student did not record any values of i below 30°, **explain** two reasons why? **(2 marks)**

QUESTION TWO (10 MARKS)

The following is part of a student's report of an experiment to measure the focal length of a converging lens.

"I found the approximate focal length of the lens to be 15 cm. I then placed an object at different positions in front of the lens so that a real image was formed in each case."

The table shows the measurements recorded by the student for the object distance u and the image distance v.

Table 2

u(cm)	20.0	25.0	35.0	45.0
v(cm)	66.4	40.6	27.6	23.2

(a) What was wrong with the student's report? **(1 mark)**

(b) How did the student find an approximate value for the focal length of the lens? **(2 marks)**

(c) Use a graph to determine the value for the focal length of the lens **(5 marks)**

(d) What difficulty would arise if the student placed the object 10 cm from the lens? **(1 mark)**

(e) Give **one** precaution that should be taken when measuring the image distance. **(1 mark)**

QUESTION THREE (10 MARKS)

In a certain experiment, you are given the following procedure:

1) Install a table rod with a rod clamp near its top. Suspend a helical spring from the clamp with the large end up.
2) Attach a 50 g weight hook with a 50g slot mass on it to the spring. Record the initial mass of 100 g as m_1. The parameter m will represent the total mass on the spring.
3) Place the meter rule vertically alongside the hanging mass. Measure the elongation of the spring and record it as x_1. Always be sure to measure starting at the same place, either on the table or on the clamp.
4) Add a 50g slot mass to the hook and record m_2 (150 g). Read the meter stick and record x_2. Repeat, finding x_3, x_4, x_5, and x_6 with total masses 200g, 250g, 300g, and 350g. Record all the masses and elongations on the form provided.

a) What was the likely aim of this experiment? **(1 mark)**

b) Prepare a data sheet to capture the required data **(2 marks)**

c) If you plot a graph using the likely data obtained as per the procedure, and you find that it is not a straight line, what does this tell you about the spring? **(2 marks)**

d) State **two** possible sources of error for the data points in this experiment? **(2 marks)**

e) State **one** application of this experiment in real life situations **(1 mark)**

f) Consider a set of two identical springs each of spring constant *k* connected in parallel (figure 1) to a single mass. What would you expect the total spring constant to be of the system? Why? (Hint: think about the spring force as a vector.) **(2 marks)**

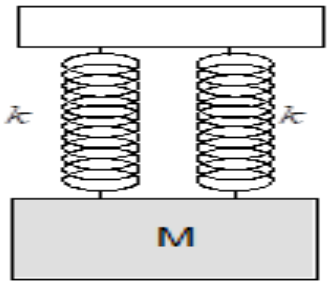


Figure 1

QUESTION FOUR (10 MARKS)

The set-up (figure 2) is an alternative approach for determination of the Young's Modulus.

(a) What is the name of the approach described in the figure above? **(1 mark)**

(b) Write a brief procedure on how you can determine the Young's Modulus using the above set-up **(5 marks)**

(c) Using the relevant equations, show the relationship between the Young's Modulus and Hooke's Law **(4 marks)**

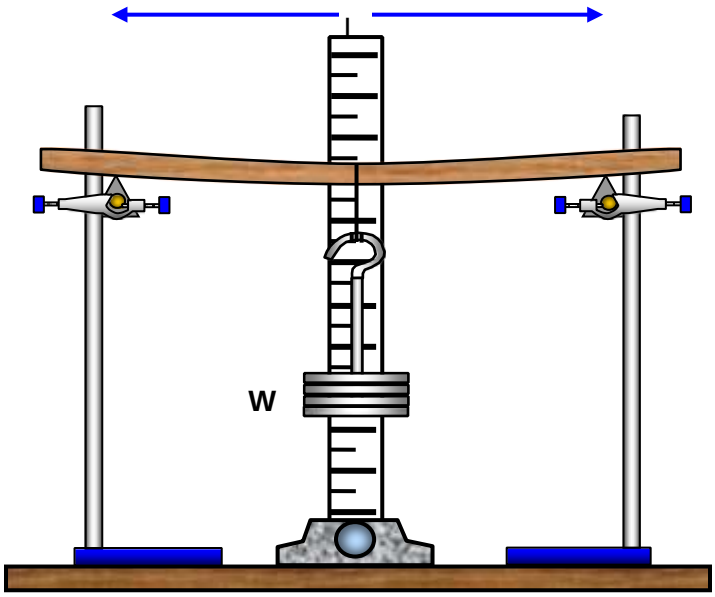
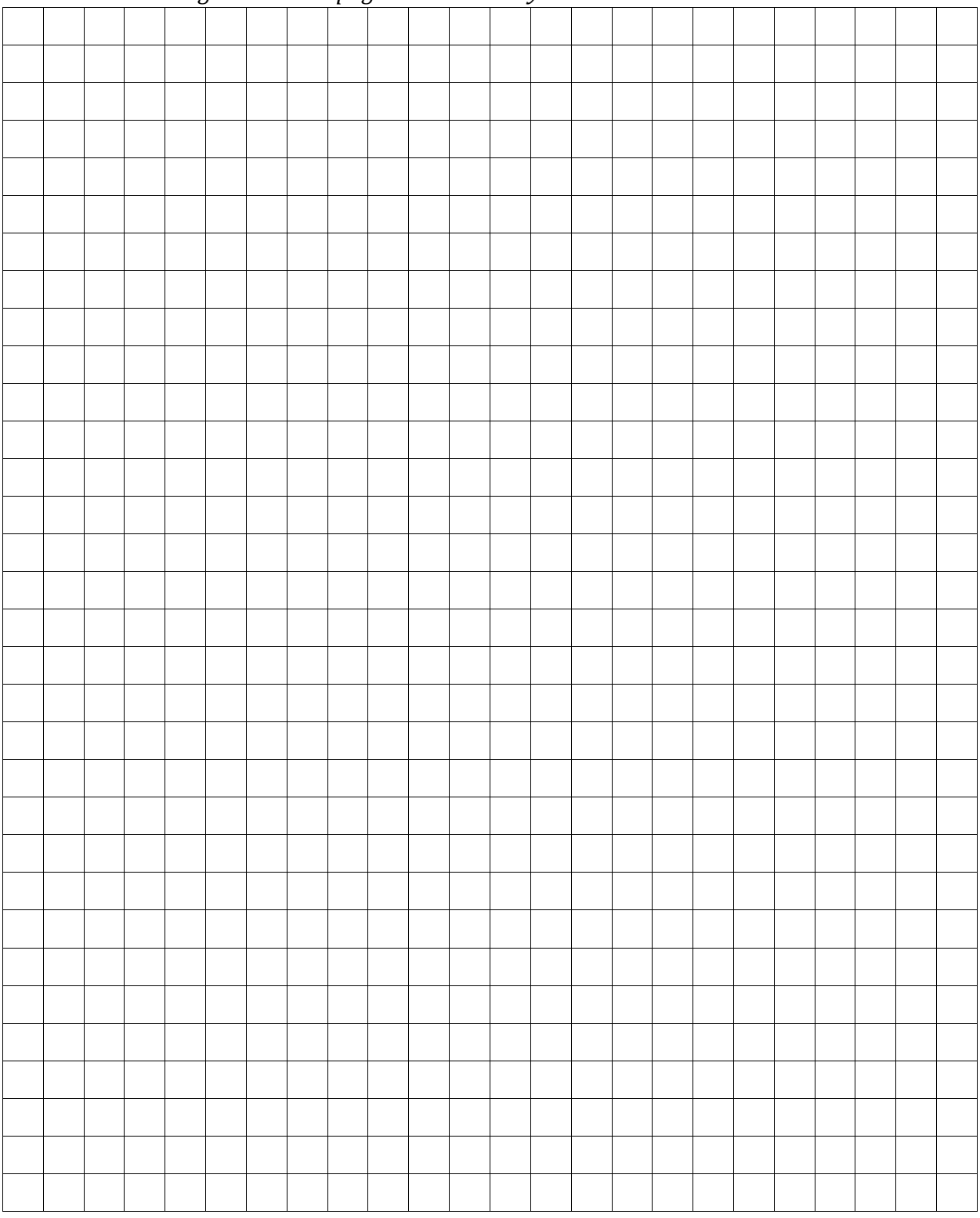


Figure 2

CANDIDATE'S REG. NUMBER:……

*Plot the graph **only** on this sheet and do your calculations in the answer booklet! After answering detach this page and insert in your answer booklet*



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