



# **MAASAI MARA UNIVERSITY**

## **REGULAR UNIVERSITY EXAMINATIONS**

**2018/2019 ACADEMIC YEAR**

***FIRST YEAR SECOND SEMESTER***

**SCHOOL OF SCIENCE**

**BACHELOR OF SCIENCE IN PHYSICS**

**COURSE CODE: PHY 1206**

**COURSE TITLE: LABORATORY II**

**DATE:**

**TIME:**

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### **INSTRUCTIONS TO CANDIDATES**

- Answer Question **ONE** and any other **TWO**.
- 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 **seven** 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

$i^\circ$	30	40	50	55	60	65	70
$r^\circ$	19	26	30	33	36	38	40

- Describe, with the aid of a diagram, how the student obtained the angle of refraction. **(4 marks)**
- Why was the experiment repeated? **(1 mark)**
- Using the recorded data, draw a suitable graph **(7 marks)**
- Explain how your graph verifies Snell's law. **(2 marks)**
- Using your graph, find the refractive index of the substance **(2 marks)**
- Explain why using a single data point from the recorded data above would not give conclusive results of the refractive index **(2 marks)**
- The student did not record any values of  $i$  below  $30^\circ$ , **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)**

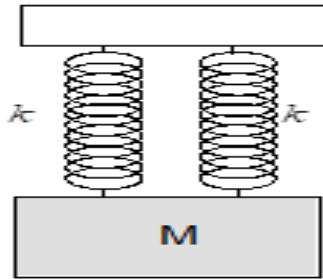


Figure 1

#### 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)**

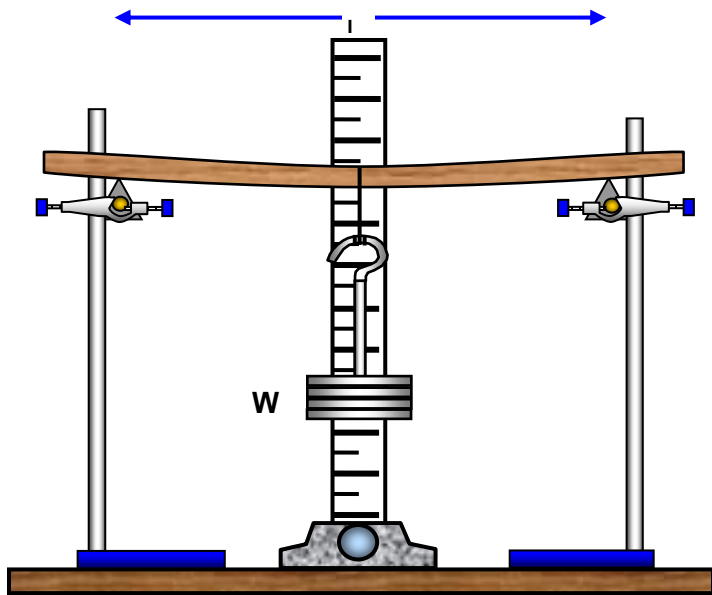
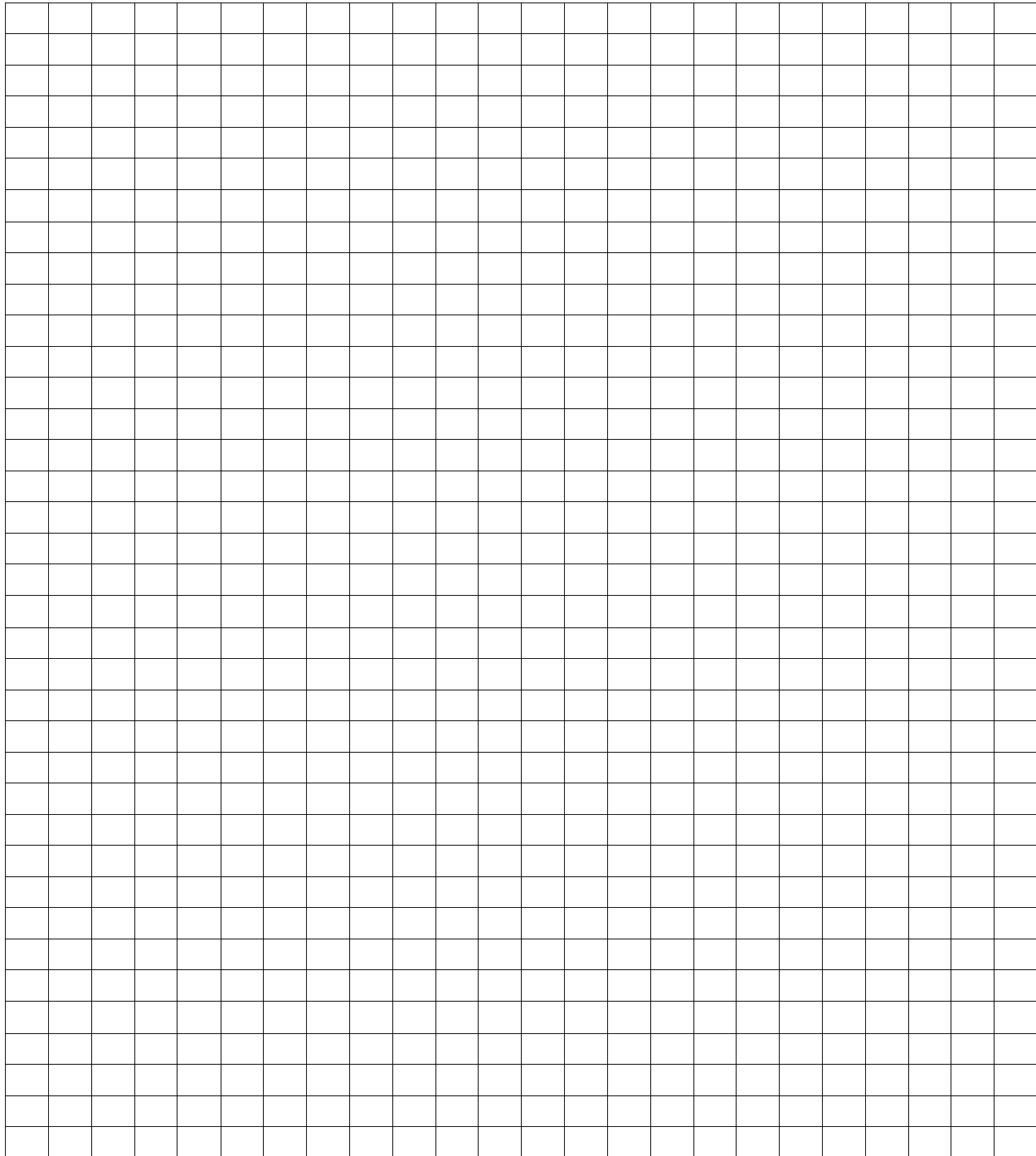


Figure 2

**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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