

GPHY122

CHUKA

UNIVERSITY



UNIVERSITY EXAMINATIONS

**FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE
OF BACHELOR OF SCIENCE IN PHYSICS**

GPHY 122: GEOPHYSICS PRACTICAL 2

STREAM: EB17

TIME: 2 HOURS

DAY/DATE:

TIME

INSTRUCTIONS: Answer ALL the questions.

QUESTION 1(20marks)

Aim: determination of the focal length of a convex lens by plotting magnification against image distance.

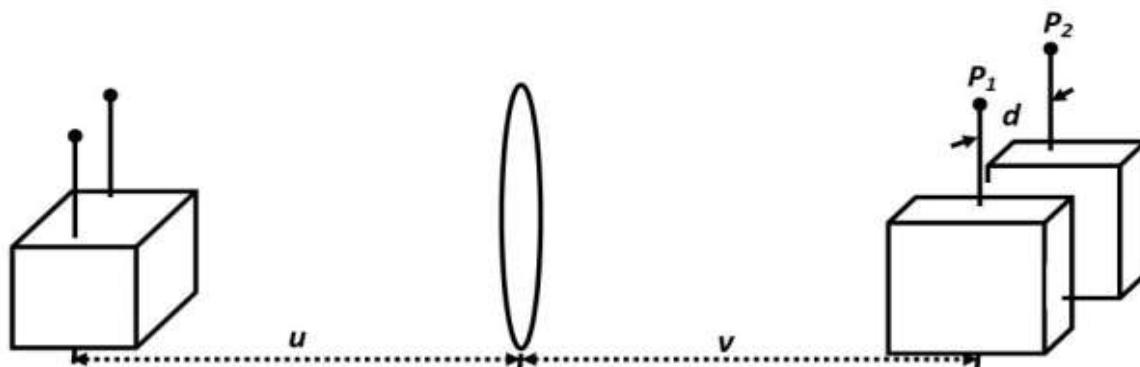
You are provided with the following:

- Convex Lens
- Lens stand
- Metre rule
- A piece of wood with two pins 2cm apart
- Two pieces of wood with pins
- Retort stands with clamps

Proceed as follows:

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

Fig 1



(ii) Place the object pins at a distance $u = 90$ cm from the lens.

(iii) Locate the images of the two pins using pins **P_1** and **P_2**

(iv) Measure the distance (**d**) between the pins **P_1** and **P_2** and also their distance (**v**) from the lens.

(v) Repeat the above steps for $u = 80, 70, 60$ and 50 cm.

(a) Complete table1.

(12 marks)

Table1

U(cm)	90	80	70	60
V(cm)				
d(cm)				
M(magnification)				

a) Plot a graph of magnification as ordinates against image distances as Abscissa.

(5 marks)

b) From the graph, determine the value of the focal length of the lens

(3marks)

QUESTION TWO (20 marks)

Aim: To find the refractive index of Liquid paraffin using a concave mirror

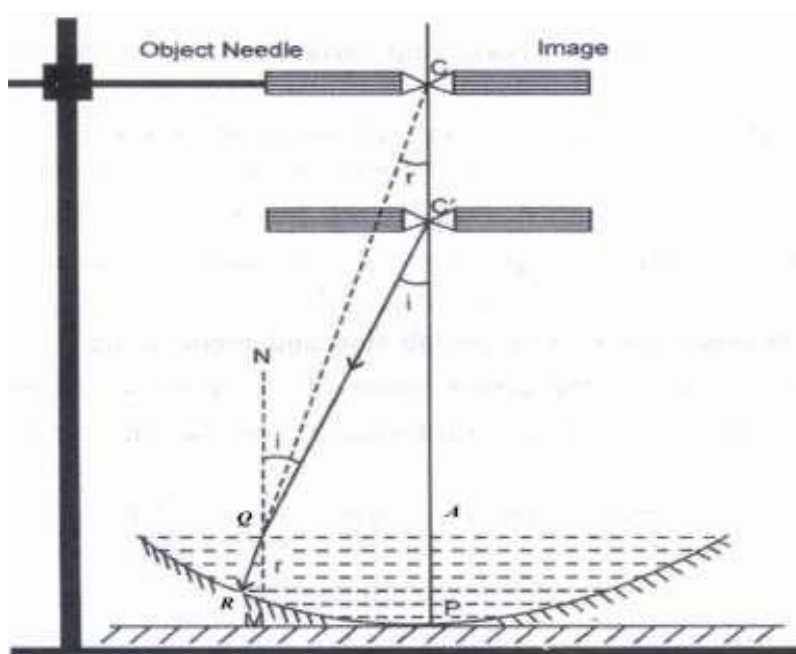
You are provided with the following apparatus

- A concave spherical mirror,
- Liquid paraffin, an optical pin,
- a clamp and stand,
- one metre rule,
- Protractor (student to carry their own protractor),
- 1m cotton thread.

Proceed as follows:

- Set the apparatus as shown in Fig2

Fig 2



- Place the concave mirror on a horizontal surface so that the principle axis is along the vertical.
- Hold the optical needle horizontally in a clamp and stand so that its tip lies just above the pole 'P' and at a distance equal to $2f$ (f is focal length) as shown in figure 2 above.
- Remove the parallax between the needle and its image
- Mark the real and inverted image of the optical needle in the mirror. Note the reading of this image.
- Measure the distance PC using metre rule.
- This measured distance is the actual radius of curvature of the concave mirror.

- viii. Now add small amount of liquid paraffin to the concave mirror which will change the position of the image needle.
- ix. Adjust the screw to upper or lower the needle and adjust its position from 'C' to C' to remove parallax between the needle and its shifted image is seen.
- x. Measure the distance (PC') which is the apparent radius of curvature of the concave mirror.
- xi. Repeatedly do the experiment for four to five times and record the readings
- a. Fill in table 2 and determine the refractive index of paraffin.

(12marks)

S No	Actual radius of curvature(R)	Apparent radius of curvature(R')	$n = \frac{R}{R'}$	Mean n
1.				
2.				
3.				
4.				
5.				

- b. Given the refractive index of paraffin is 1.4, perform the error analysis of the mean value of n obtained in (a) above. (4marks)
- c. State any two sources of error that may have caused the difference and how to mitigate the errors (4marks)

QUESTION 3 (20marks)**Aim: To measure acceleration due to gravity 'g' by compound pendulum.**

In an experiment in a laboratory a student obtained the following data.

At the top	Hole no.	Distance L (cm) of the hole from one end (cm)	Time for 10 oscillations (sec)	Mean time for 10 oscillations (____)	Period T(____)
	1	5	i. 15.75 ii. 15.84 iii. 15.87		
End A	2	10	iv. 15.56 v. 15.44 vi. 15.56		
	3	15	i. 15.25 ii. 15.28 iii. 15.31		
	4	20	i. 15.16 ii. 15.14 iii. 15.20		
	5	25	i. 15.07 ii. 15.10 iii. 15.01		
	6	30	i. 15.53 ii. 15.41 iii. 15.44		
	7	35	i. 16.66 ii. 16.47 iii. 16.53		
	8	40	i. 19.09 ii. 19.22 iii. 18.99		
	9	45	i. 26.19 ii. 26.24 iii. 26.15		
End B	1	95	i. 15.60 ii. 15.66 iii. 15.79		
	2	90	i. 15.28 ii. 15.28 iii. 15.22		
	3	85	i. 14.97 ii. 15.10 iii. 15.07		
	4	80	i. 14.96 ii. 14.86 iii. 14.97		
	5	75	i. 15.22 ii. 15.25 iii. 15.25		

	6	70	i. 15.60 ii. 15.72 iii. 15.88		
	7	65	i. 16.84 ii. 16.94 iii. 16.91		
	8	60	i. 19.41 ii. 19.31 iii. 19.34		
	9	55	i. 26.84 ii. 26.71 iii. 26.72		

- Complete the table indicating the SI Units where possible. (5marks)
- Plot a graph of L as abscissa and T as ordinate (6marks)
- Using the graph determine the value of 'g' (4marks)
- The value of acceleration due to gravity on earth is 9.81ms^{-2} , perform the error analysis for this experiment (2marks)
- Precautions when carrying out the experiment. (3marks)