# ISLAMIC UNIVERSITY OF TECHNOLOGY

# PHYSICS LAB REPORT

# Experiment No. 07 Group/Batch No.: 03

# Student No.:

# Course Number: 4142

# Name of the Experiment:

# DETERMINATION OF THE FOCAL LENGTH AND HENCE THE POWER OF A CONCAVE LENS BY USING AN AUXILIARY CONVEX LENS

# Date of Performance: 25 March, 2019 Name:

# Date of Submission: 25 March, 2019 Department: C.S.E.

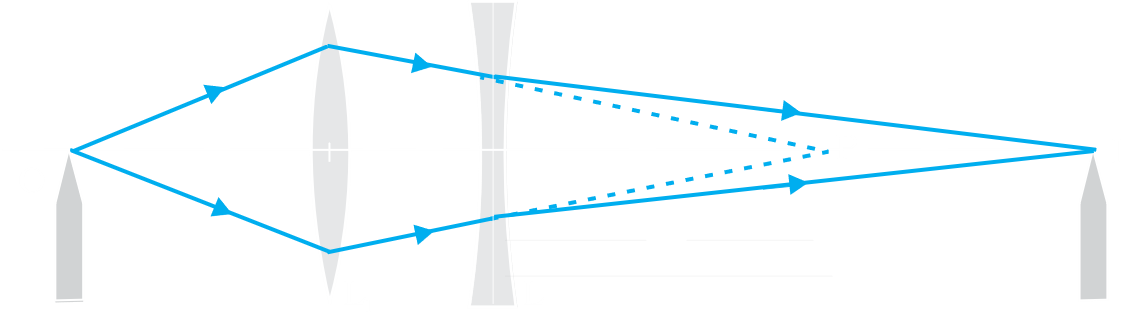
# Section:

Partner’s ID No.:

Theory:

A concave lens cannot produce a real image of a real object, but it can produce a real image of a virtual object. This property can be used to find the focal length of the lens.

Fist, a convex lens is used to create a real image of a real object. Then a concave lens is placed between the image and the convex lens. The image now acts as a virtual object for the concave lens. Using this method means that the focal length of the convex lens does not need to be smaller that that of the concave lens, so any pair of concave and convex lenses can be used. The best results are, however, achieved when the two lenses have similar focal lengths.



In the figure, convex lens , forms an image of at . The concave lens is placed so its distance from is less than its focal length. The real image at acts as a virtual object for lens , which forms a real image at .

If and ,

or

- (i)

If , then is negative.

The power of the concave lens, , is given by:

- (ii)

Apparatus:

Optical Bench, Convex Lens, Concave Lens, Screen, Index Rod, etc.

Procedure:

1. Convex and concave lenses of focal lengths of the same order were selected.
2. The object, convex lens and screen were mounted. The object was a cross-wire illuminated from behind. The screen was placed from the object, where is the focal length of the convex lens. This could be determined since before this point, there was no image, and after this point, there were images for two positions of the lens. The convex lens was placed between the object and lens and small adjustments made so a sharply focused image was formed for only one position of the lens.
3. The positions of the object, lens and screen were noted. Three readings were taken for the position of the image and the mean value used in calculations. The object and lens were not touched for the rest of the experiment. The position of the screen is the point , where the virtual object for the concave lens lies.
4. The screen was shifted and the concave lens placed between the convex lens () and the screen (). The concave lens was adjusted until a sharp image was formed on the screen. This was done thrice, and the man value used in calculations.
5. The screen was shifted twice more and step iv repeated each time.
6. The index of correction between the concave lens and screen was determined to find the corrected values of and . From this, was calculated for each observation. The mean value of was used to calculate the power of the lens.

Data Collection:

Data for index error () between concave lens and screen:

|  |  |  |
| --- | --- | --- |
| Length of index rod in () | Difference of bench – scale readings when two ends of the index rod touch the concave lens and screen () | Index correction in |
|  |  |  |

Table for and :

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Observation Number | | 01 | 02 | 03 |
| Positions of | Object () |  | | |
| Convex Lens () |  | | |
| Image with Convex Lens () |  | | |
| Concave Lens () |  |  |  |
| Image with Combination () |  |  |  |
| Apparent Object Distance | |  |  |  |
| Apparent Image Distance | |  |  |  |
|  | |  |  |  |
|  | |  |  |  |

Table for :

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Obs. No. | Object Distance  () | Image Distance  () | Focal Length | Mean Focal Length () in | Power  () |
| 01 |  |  |  |  |  |
| 02 |  |  |  |  |  |
| 03 |  |  |  |  |  |

Results:

Focal Length of Concave Lens

Power of Concave Lens

Discussions:

1. To focus the image on the screen, the concave lens was shifted and not the screen. This was done since the focused condition of the image did not change within an appreciable range of movement of the screen.
2. If is equal to the focal length of the concave lens, light emerged from the lens parallel to the axis, so no image was formed.