

EXPERIMENT No : 2

Aim : To find the value of v for different values of u for a concave mirror and to find its focal length by plotting a graph between (i) u and v (ii) $\frac{1}{u}$ and $\frac{1}{v}$.

Apparatus : An optical bench with three uprights, concave mirror, mirror holder, two needles.

Theory : The relation between u , v and f for a mirror is given by :

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f} ; \quad \text{where } f - \text{focal length of the mirror,}$$

u - object distance and v - image distance.

Procedure :

- 1) To determine the rough focal length - Face the mirror towards a distant tree or a building. Obtain a clear image on the screen/wall. Measure the distance between the wall and the mirror. This will be the rough focal length of the mirror.
- 2) To set the mirror: Clamp the holder with the mirror in a fixed upright. Adjust the mirror such that its surface is perpendicular to the length of the optical bench. Fix the upright in this position throughout.
- 3) Object at $2F$: Take the thin optical needle(O)and mount it on a laterally movable upright at a distance approximately twice the rough focal length. With one eye closed see the inverted image of the object and adjust the tip of the image so that it touches the tip of the object and remove the parallax. Now the object and its image are at $2F$. Measure and record u and v .
- 4) Object between F and $2F$: Place the object needle between F and $2F$. With one eye closed see the inverted image of the object and adjust the tip of the image needle so that it touches the tip of the image. Move the eye to left or right and remove the parallax tip to tip. Measure and record u and v .
- 5) Repeat the above step to obtain 4 pair of values for u and v . Swap the values of u and v . Plot graph between $u - v$ and $\frac{1}{u} - \frac{1}{v}$.

Observations :

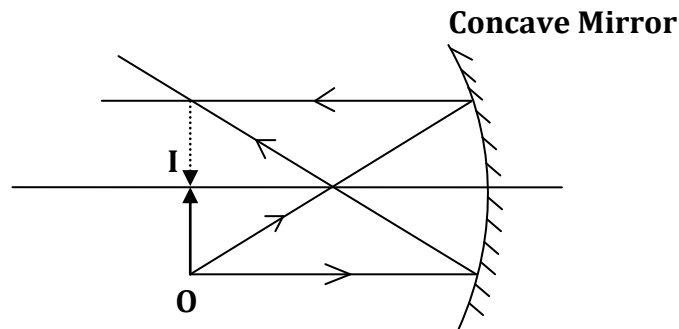
Rough focal length of the convex lens = _____ cm

- 1) From $u - v$ graph : Focal length of the convex lens = _____ cm
- 2) From $\frac{1}{u}$ vs $\frac{1}{v}$ graph : Focal length of the convex mirror = _____ cm

Result :

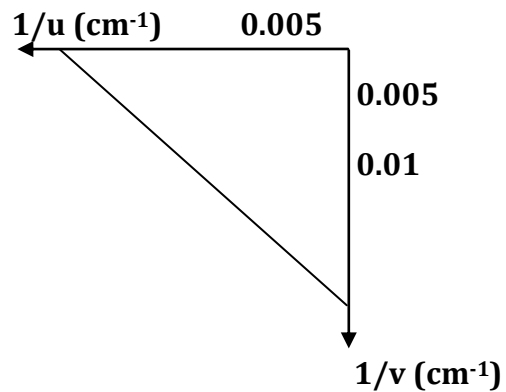
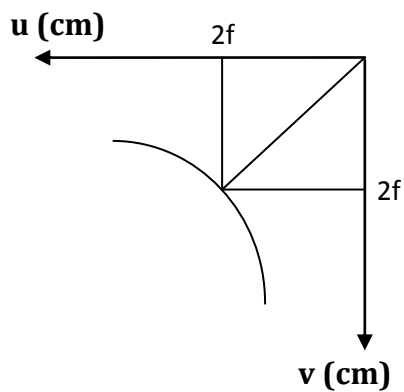
The focal length of the given convex mirror = _____ cm

Ray Diagram :



Sr. No	Object distance (u) (cm)	Image distance (v) (cm)	$\frac{1}{u}$ (cm ⁻¹)	$\frac{1}{v}$ (cm ⁻¹)	Focal length (f)
1					
2					
3					
4					
5					
6					
7					
8					

Graphs :



From u - v graph :

$2f = \text{_____ cm}$

$f = \text{_____ cm}$

From the $1/u - 1/v$ graph : $f = \text{_____ cm}$