(a) To Study the Nature & Size Of the Image Formed By a Convex lens On a Screen By Using a Candle & a Screen (For Different Distances Of the Candle From the lens)

Aim

To study the nature and size of the image formed by a convex lens on a screen by using a candle and a screen (for different distances of the candle from the lens).

Apparatus

An optical bench with three uprights, a convex lens with holder, a burning candle, a card-board screen.

Theory

From lens formula, $$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

when	$u = \infty$ (infinite),	$v = f$
when	$u = -2f$,	$v = 2f$
when	$u = -f$,	$v = \infty$ (infinite)
when	$u < (-f)$, v becomes negative, (image becomes virtual).	

As the object (burning candle) is moved from infinity towards the convex lens, its image (position of screen) moves from lens focus towards infinity.
For candle distance less than focal length, image becomes virtual and does not come on screen.

Diagram

Similar to Ray diagram (Experiment 3: Section B) having a burning candle in place of object needle and cardboard screen in place of image needle.

Procedure

Find rough focal length of the convex lens by usual method.
Mount the convex lens in holder in central upright and keep it in the middle of the optical bench. Mount the card-board screen on another upright and keep it at distance equal to rough focal length of the lens, from the central upright.

Mount the burning candle in third upright and keep it on the other side of the central upright and near the end of the optical bench. Adjust heights so that the inverted image of erect flame of burning candle is formed on screen. Move the screen to make the

image sharp. The screen will be nearly at the focus of the convex lens.
The image will be real inverted and much more diminished.
As the burning candle is moved towards the lens on one side, the screen has to be moved away from the lens on other side, for getting sharp flame image. The inverted image size increases. When the position of the candle is at distance 2f from the lens, the screen is also at same distance on the other side. The image size will be equal to the actual flame size.

Move the candle further nearer to the lens. The screen has to be moved away for getting an enlarged inverted real image on screen.
As the candle reaches the focus of the lens, the screen may not be able to get its image which will be at infinity i.e. beyond the ends of the optical bench.

Conclusion

This change in position, nature and size of the image is according to theoretical predictions.

(b) To study the nature and size of the image formed by a concave mirror on a screen by using a candle and a screen (for different distances of the candle from the mirror)

Aim

To study the nature and size of the image formed by a concave mirror on a screen by using a candle and a screen (for different distances of the candle from the mirror).

Apparatus

An optical bench with three uprights, a concave mirror with holder, a burning candle, a card-board screen.

Theory

From mirror formula, $\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$

when	$u = \infty$ (infinite),	$v = -f$
when	$u = -2f$,	$v = -2f'$
when	$u = -f$,	$v = \infty$ (infinite)
when	$u < (-f)$, v becomes positive, image becomes virtual.	

Hence as the object (burning candle) is moved from infinity towards the concave mirror, its image (position of screen) moves from mirror focus towards infinity. The two cross each other at distance 2f i.e., at the centre of curvature of the mirror.
For candle distance less than focal length, image becomes virtual and does not come on screen.

Diagram

Similar to ray diagram as shown in Experiment 1: Section B having a burning candle in place of object needle and card-board screen in place of image needle.

Procedure

Find rough focal length of the concave mirror by usual method.
Mount the concave mirror in holder in first upright and keep it near one end of the optical bench, keeping mirror face inward.
Mount the card-board screen on a second upright and keep it at distance equal to rough focal length of mirror, from first upright.
Mount the burning candle in third upright and keep it near other end of the optical bench.
Adjust heights so that the inverted image of erect flame of burning candle is formed on screen. Move the screen to make the image sharp. The screen will be nearly at the focus of the concave mirror.
The image will be real, inverted and much more diminished.
As the burning candle is moved towards the mirror, the screen has to be moved away

from it for getting a sharp flame image. The inverted image size increases.
When the position of the candle approaches centre of curvature of the mirror, the screen also approaches the same position. The image size will be equal to the actual flame size.
Now interchange the uprights. Bring candle upright nearer to mirror than the screen upright.
Move the candle further nearer. The screen has to be moved away for getting an enlarged inverted real image on screen.
As the candle reaches the focus of the mirror, the screen may not be able to get its image which will be formed at infinity i.e. beyond the length of the optical bench.

Conclusion

This change in position, nature and size of the image is according to theoretical predictions.