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EXPERIMENT-5

OBJECT: To determine the focal length of a convex lens by one pin method using an optical bench.

APPARATUS: An optical bench, one plane mirror, one pin and the given convex lens.

THEORY: If an object is kept at the focus of a convex lens, the light rays incident from the object on the lens after refraction, become parallel to the principal axis. These refracted rays if fall normally on a plane mirror, get reflected back along the same path which on refraction from the lens retrace their path and form the image on the object itself.

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METHOD:

1. Mount the plane mirror, convex lens and the pin on the vertical stands and put them on the optical bench as shown in figure.
2. Adjust the height of the pin and the optical centre of the lens at the same level.
3. Move the pin stand on the optical bench such that on looking through the lens, its inverted image is seen. Thereafter adjust its position so that the parallax between the tip of the pin and its image (inverted) is removed.
4. Note the position of the lens stand say x_1 cm and that of pin stand, x_2 cm. Calculate focal length of the lens by finding the distance of pin from the lens i.e. $f = x_2 - x_1$.
5. Repeat the experiment by gradually moving the pin stand from one end of the optical bench and also by gradually moving it away from the lens, so as to get five sets of observations in all.

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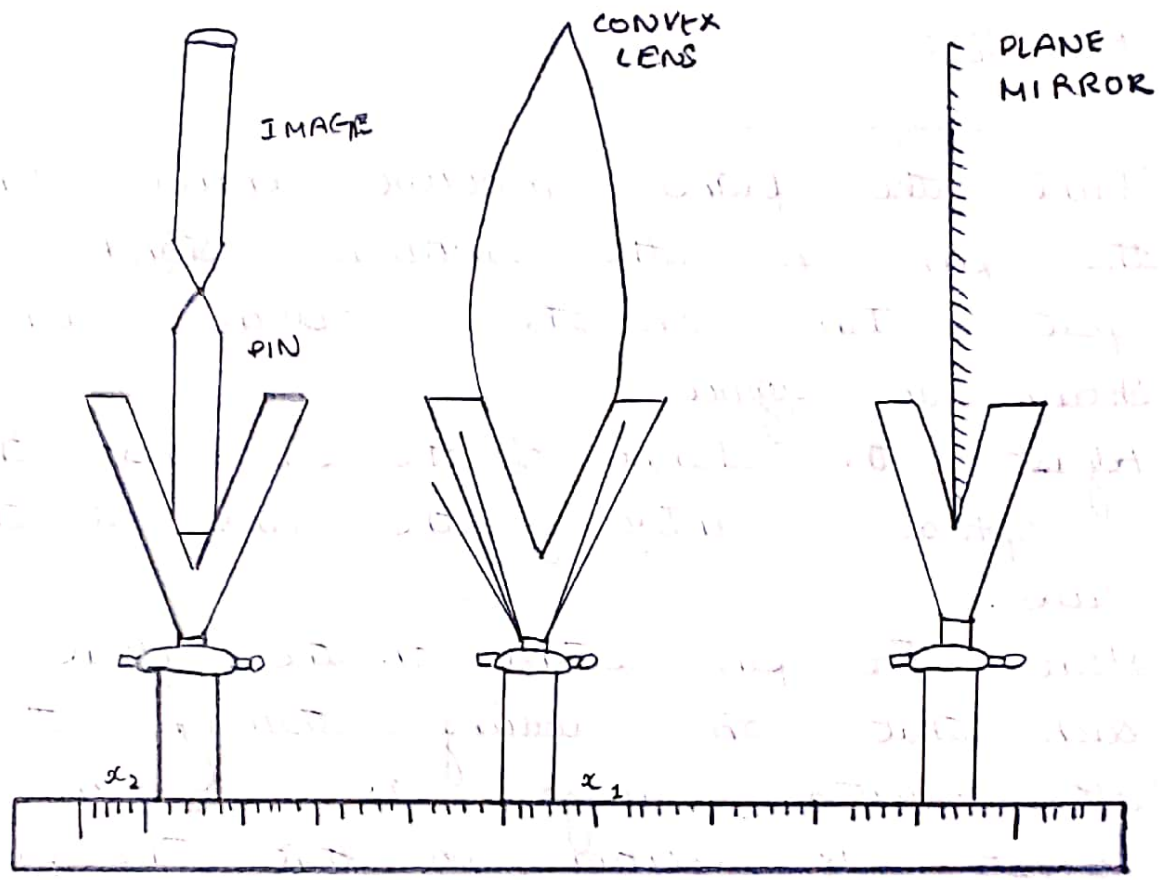

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OBSERVATION:

No of observations	Position of lens x_1 cm	Position of pin x_2 cm	Focal length $f = (x_2 - x_1$ cm)
1	25 cm	44.2 cm	19.2 cm
2	30 cm	49.6 cm	19.6 cm
3	35 cm	54.8 cm	19.8 cm
4	40 cm	60.4 cm	20.4 cm
5	45 cm	65 cm	20 cm

Mean value f = 20 cm

RESULT The focal length of the given convex lens f = 20 cm

PRECAUTIONS:

1. The tip of the pin and the optical center of the lens must be at the same level.
2. There should be no parallax between because the tip of the pin and its inverted image.

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