AL MUSTAQBAL UNIVERSTY.

Medical physics sciences.

Optics laboratory.

second Stage.

بصريات عملي

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Finding the focal length by using a convex lens in a direct way

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Finding the focal length by using a convex lens in a direct way

Aim:-

Finding the focal length by using a convex lens in a direct way

❖ Used equipment:-

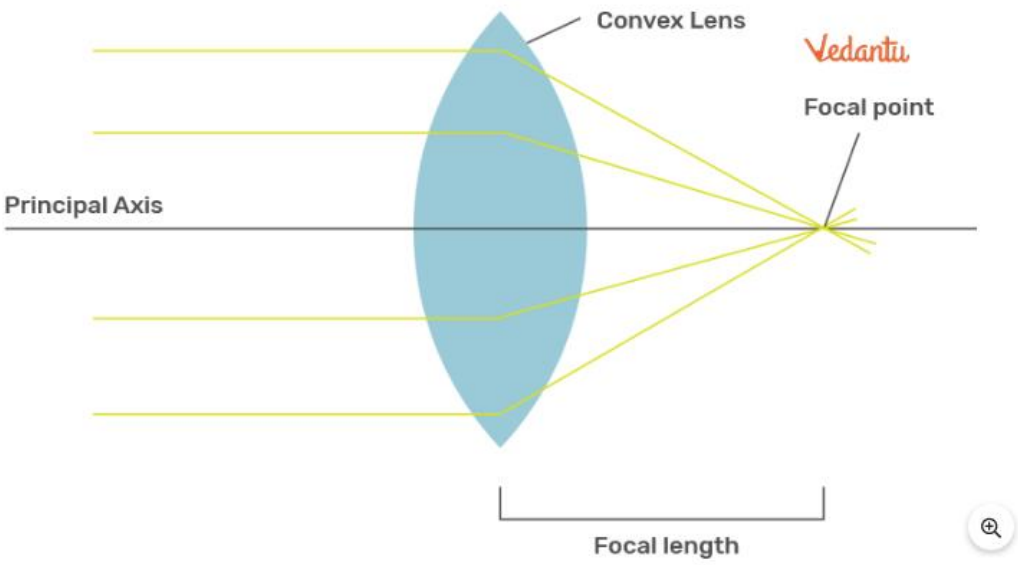
A lens mounted on a body holder,

a light source,

a metric ruler.

❖ Theory

- **The convex lens is a lens that converges rays of light that convey parallel to its principal axis (i.e. converges the incident rays towards the principal axis) which is relatively thick across the middle and thin at the lower and upper edges. The edges are curved outward rather than inward. It is used in front of the eye to bend the incoming light sharply so the focal point shortens and the light focuses properly on the retina.**



Focal Length:

This is the distance between the center of a convex lens where parallel rays converge.

Principal Axis:

A line passing through the center of the surface of a lens and through the centers of curvature of all segments of the lens

Real Image and Virtual Image for Convex Lens Real Image:

A convex lens can be used to produce a real image, and this occurs if the object is located at a position of more than one focal length from the lens. It is projected in front of the lens and can be captured on a screen. It is used in movie theaters, projector etc.

Virtual Image: A convex lens will produce a virtual image if the object is located in front of the focal point. It is used in eyeglasses to give clear images.

Types of Convex Lens

1. Plano-convex Lens:

It is curved outwards from one side and the other side. It has positive focal length elements that have one spherical surface and one flat surface. These lenses are designed for infinite parallel light use in non-critical applications. These optical lenses are for all-purpose focusing elements. It is used in pharmaceuticals, defense, robots etc.

2. Double Convex Lens:

It is curved outwards from both sides. It is also known as the Biconvex lens or just convex. They have a shorter focal length than Plano-convex lenses of equal diameter and surface radius. So many optical devices require longer focal lengths. Hence, the double convex lenses are more preferred. It is used for the projector, monocular, Telescope, cameras etc. It produced the virtual image for the human eye and the real image for photography, an optical sensor and also used in burning glass

3. Concave-convex Lens:

It is curved inwards from one side and outwards from one side. It can be used to balance out the spherical aberrations caused by other lenses. It is used to control the laser beam. It is a combination of a lens with one convex lens and one concave lens side that is concave-convex lens or meniscus

Uses of the Convex Lens:

There are following uses:

1-It is used as Hypermetropia i.e., to correct far-sightedness.

2-It is used in microscopes, telescopes and magnifying glasses to subject all the light to a specific object.

3-It is used in camera lenses because they focus light for a clear picture.

4-It is used in front of the eye to bend the incoming light sharply so the focal point shortens and the light focuses properly on the retina.

5- It is also used in projectors, binoculars, optical microscopes, and even in the peep holes that are present in the doors of our houses

❖ The Method Of Work :-

1. Finding the approximate value of the focal length of the lens by finding the clearest picture of the laboratory window on the White paper.

2.(The object is placed at a distance greater than 100 cm from the lens and then find the position of the clearest image for the body on the screen.

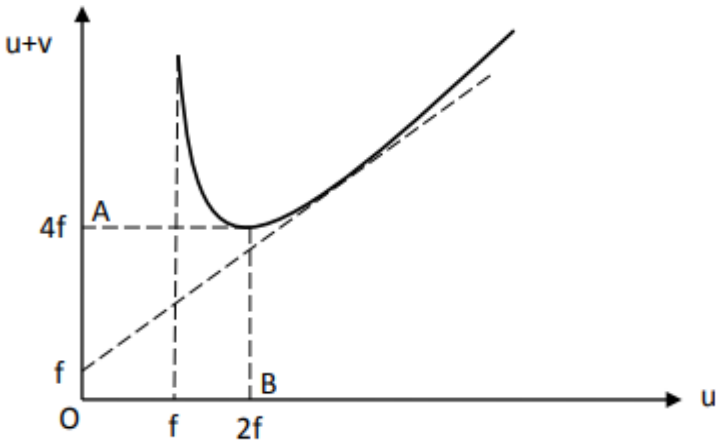
3. Measure the distance between the object and the lens (u) as well as the distance between the lens and the image (v.)

4 .Approximate the lens towards the object O with successive distances, each of which is 2 cm in value, after which the value of v is found Corresponding to each case and when the value of v approaches twice the focal length of the lens is preferred. The distances at which the lens is close to the object are 1cm.

5.The values of u and v are recorded in the table below

u	v	u + v

6. The graph is drawn between u on the x-axis and v + u on the y-axis, as Indicated for extra parts.



7. Plot the alignments so that the hyperbola cuts the x and y axes at two value points each f.

8.calculated from the above figure both OB and OA.

9.The value of f is calculated from the following relation:-

$$f = \frac{1}{4}OA \qquad f = \frac{1}{2}OB$$

❖ Discussion

1. **Why is Convex Lens Called a Converging Lens?**
2. **Distinction Between Convex and Concave Lens**

GOOD LUCK

Ruqayah Saleh