

Solved Worksheet

1. Muskan placed a pencil perpendicular to principal axis in front of a converging mirror of focal length 30 cm. The image formed is twice the size of the pencil. Calculate the distance of the object from the mirror.

$$\text{Magnification} = \frac{h_i}{h_o} = -\frac{v}{u}$$

For real image

$$m = -\frac{v}{u} = -2$$

$$v = 2u$$

Now Using the mirror equation,

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{2u} + \frac{1}{u} = \frac{1}{-30}$$

$u = -45$ cms. which is between the focal length and the Curvature.

For virtual image

$$m = -\frac{v}{u} = 2$$

$$v = -2u$$

Now Using the mirror equation,

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{-2u} + \frac{1}{u} = \frac{1}{-30}$$

$u = -15$ cm which is between the focal length and the pole

2. Soumi placed a 5 cm tall object perpendicular to the principal axis of a convex lens of focal- length 20 cm. The distance of the object from the lens is 30cm. Find:
- (i) position
 - (ii) nature
 - (iii) size of the image formed.

Given object size = 5 cm

object distance from lens $u = -30$ cm

focal length $f = 20$ cm,

We have to find $v = ?$

Using the lens formula $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

We have,

$$\frac{1}{v} = \frac{1}{u} + \frac{1}{f} = \frac{1}{-30} + \frac{1}{20} = \frac{-2+3}{60} = \frac{1}{60}$$

or,

$$\frac{1}{v} = \frac{1}{60}$$

Thus

$v = 60\text{cm}$. This is part (i) of the question

magnification

$$\frac{v}{u} = \frac{60}{-30} = -2$$

$$\text{Magnification} = \frac{\text{Image size}}{\text{Object size}}$$

$$\frac{h_i}{h_o} = -2$$

$$\frac{h_i}{5} = -2$$

$$h_i = -2 \times 5 = -10 \text{ cm}$$

The image is real inverted and magnified.

3. Gecho says magnification is positive for virtual image and negative for real image. Is it true? Share your point of view.

--- All submitted answers are correct

4. Aryan placed an object at a distance of 25 cm away from a converging mirror of focal length 20 cm. Discuss the effect on the nature and position of the image if the position of the object changes from 25 cm to 15 cm. Justify your answer without using mirror formula.

If the object is placed at 25 cm in front of the concave mirror having focal length 20 cm, this means that the object is placed in between focus and the centre of curvature of the mirror. If the object is placed in front of the center of curvature then the image will be formed beyond the centre of curvature. So the image formed is a real image. The nature of the image will be inverted and enlarged

If the object is placed at 15 cm in front of the concave mirror having focal length 20 cm, this means that the object is placed in between focus and the pole of the mirror. An object placed between the pole and focus of a concave mirror forms a virtual image. The nature of the image will be erect and enlarged

5. Anandee placed 0.5cm tall object perpendicular to the principal axis of a convex lens of focal length 10 cm. The distance of the object from the lens is 15 cm. Find the nature, position and size of the image. Also find its magnification.

--- All submitted answers are correct