

# Science

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(Chapter – 10) (Light – Reflection and Refraction)

(Class – X)

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## Question 1:

Define 1 dioptre of power of a lens.

## Answer 1:

Power of lens is defined as the reciprocal of its focal length. If  $P$  is the power of a lens of focal length  $F$  in metres, then

$$P = \frac{1}{f(\text{in metres})}$$

The S.I. unit of power of a lens is Dioptre. It is denoted by D.

1 dioptre is defined as the power of a lens of focal length 1 metre.

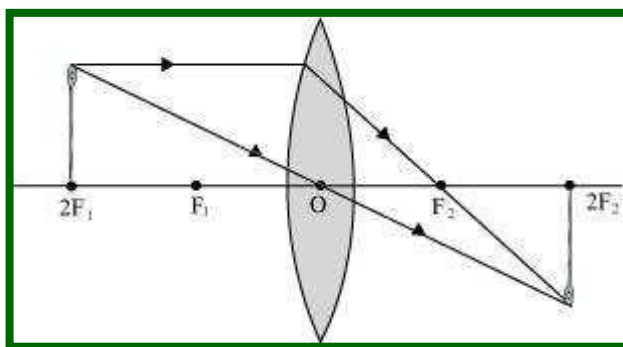
$$\therefore 1 \text{ D} = 1 \text{ m}^{-1}$$

## Question 2:

A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object? Also, find the power of the lens.

## Answer 2:

When an object is placed at the centre of curvature,  $2F_1$ , of a convex lens, its image is formed at the centre of curvature,  $2F_2$ , on the other side of the lens. The image formed is inverted and of the same size as the object, as shown in the given figure.



It is given that the image of the needle is formed at a distance of 50 cm from the convex lens. Hence, the needle is placed in front of the lens at a distance of 50 cm.

Object distance,  $u = -50$  cm

Image distance,  $v = 50$  cm

Focal length =  $f$

According to the lens formula,

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

$$\frac{1}{f} = \frac{1}{50} - \frac{1}{(-50)} = \frac{1}{50} + \frac{1}{50} = \frac{1}{25}$$

$$f = 25 \text{ cm} = 0.25 \text{ m}$$

$$\text{Power of the lens, } P = \frac{1}{f(\text{in meters})} = \frac{1}{0.25} = +4 \text{ D}$$

Hence, the power of the given lens is +4 D.

### Question 3:

Find the power of a concave lens of focal length 2 m.

### Answer 3:

Focal length of concave lens,  $f = 2 \text{ m}$

$$\text{Power of a lens, } P = \frac{1}{f(\text{in meters})} = \frac{1}{(-2)} = -0.5 \text{ D}$$

Here, negative sign arises due to the divergent nature of concave lens.

Hence, the power of the given concave lens is –0.5 D.