

## Question

A plano-convex lens is made of a material of refractive index  $n$ . When a small object is placed 30 cm away in front of the curved surface of the lens, an image of double the size of the object is produced. Due to reflection from the convex surface of the lens, another faint image is observed at a distance of 10 cm away from the lens. Which of the following statement (s) is (are) true?

This question has multiple correct options

**A** The refractive index of the lens is 2.5

**B** The radius of curvature of the convex surface is 45 cm

**C** The faint image is erect and real

**D** The focal length of the lens is 20 cm

## Solution

Correct options are A) and D)

Case I,

$$\frac{1}{60} + \frac{1}{30} = \frac{1}{f_1}$$

$$f_1 = 20\text{cm}$$

Case II,

$$\frac{1}{10} - \frac{1}{30} = \frac{1}{f_2}$$

$$f_2 = 15 = \frac{R}{2}$$

$$R = 30 \text{ cm}$$

From case I,

$$f_1 = \frac{R}{n-1} = 20$$

$$\text{Thus, } n = 2.5$$

Radius of curvature is 30 cm

Focal length of lens is  $f_1 = 20 \text{ cm}$

Answer is option A and D.