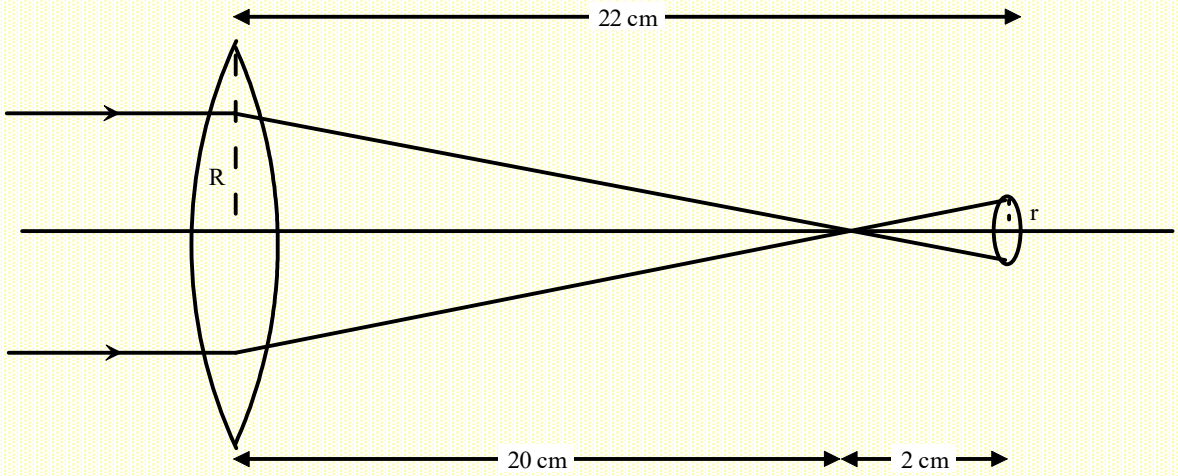
Sunlight of intensity $1.3 kWm^{-2}$ is incident normally on a thin convex lens of focal length 20 cm. Ignore the energy loss of light due to the lens and assume that the lens aperture size is much smaller than its focal length. The average intensity of light, in kWm^{-2}, at a distance 22 cm from the lens on the other side is _____.

Solution



Incident power on the lens = Intensity $\times$ Cross-sectional area of lens = $I.\pi R^2$

Since, there is no energy loss, the same power is received at 22 cm distance.

$\therefore I.\pi R^2 = I'.\pi r^2$ where I' is the intensity at 22 cm distance.

$$\therefore I' = I.\left(\frac{R}{r}\right)^2$$

From similar triangles, $\frac{R}{r} = \frac{20}{2} = 10$

$\therefore I' = 1.3 \times 10^2 = 130 kWm^{-2}$ [Based on JEE Adv. 2018 - 123IITJEE]