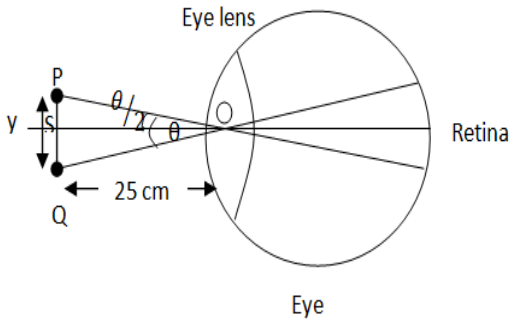
26. Assuming human pupil to have a radius of 0.25 cm and a comfortable viewing distance of 25 cm, the minimum separation between two objects that human eye can resolve at 500 nm wavelength is :

(1) 1 µm (2) 30 µm (3) 100 µm (4) 300 µm

Answer:



Minimum distance of separation P and Q of two points which can be distinctly seen by eye lens is resolving power. Let PQ makes an angle θ.

D= diameter of aperture= $0.25 \times 2 \times 10^{-2} m$

Then we know that

$$\theta = 1.22\frac{\lambda}{D} = 1.22\frac{500 \times 10^{-9}}{0.25 \times 2 \times 10^{-2}} \rightarrow (1)$$

In ΔPOS :$tan\frac{\theta}{2} = \frac{y/_2}{0.25} = \frac{y}{2\times 0.25}$,

$\theta\ being\ small, tan\frac{\theta}{2} \approx \frac{\theta}{2} = \frac{y}{2 \times 0.25}$

$or\ \theta = \frac{y}{0.25}$

$putting\ value\ from\ (1)$:

$$\frac{1.22 \times 500 \times 10^{-9}}{0.25 \times 2 \times 10^{-2}} = \frac{y}{0.25}$$

$or\ y = 305 \times 10^{-7} m \approx 30\mu m$

Correct option is (2) $30\mu m$.