

Question

A spherical surface of radius of curvature R , separates air (refractive index 1.0) from glass (refractive index 1.5). The centre of curvature is in the glass. A point object P placed in air is found to have a real image Q in the glass. The line PQ cuts the surface at a point O and $PO = OQ$. The distance PO is equal to :

A $5R$

B $3R$

C $2R$

D $1.5R$

Solution

Correct option is A)

Given, $PO = OQ$

$$\Rightarrow u = v$$

We know

$$\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$$

$$\Rightarrow \frac{\mu_2}{v} - \frac{\mu_1}{-u} = \frac{\mu_2 - \mu_1}{R}$$

$$\Rightarrow \frac{\mu_2 + \mu_1}{v} = \frac{\mu_2 - \mu_1}{R}$$

$$\Rightarrow \frac{1.5 + 1}{v} = \frac{1.5 - 1}{R}$$

$$\Rightarrow \frac{2.5}{v} = \frac{0.5}{R}$$

$$\Rightarrow v = \frac{2.5R}{0.5}$$

$$v = 5R$$

$$OP = OQ = u = v = 5R$$