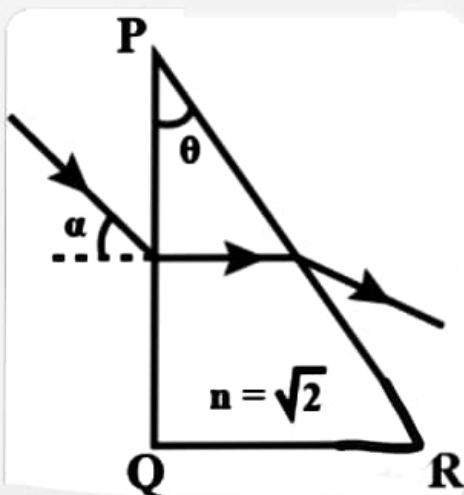


Question

A parallel beam of light is incident from air at an angle α on the side PQ of a right angled triangular prism of refractive index $n = \sqrt{2}$. Light undergoes total internal reflection in the prism at the face PR when α has a minimum value of 45° . The angle θ of the prism is



- A 15°
- B 22.5°
- C 30°
- D 45°

Solution

Correct option is A)

According to Snell's law at the face PQ,

$$\therefore 1 \times \sin\alpha = n \times \sin\beta$$

Where, β be angle of refraction at the face PQ.

Given, at $\alpha = 45^\circ$, RI of prism $n = \sqrt{2}$

$$\text{In this case, } \sin\beta = \frac{\sin 45^\circ}{n} = \frac{1}{2}$$

$$\therefore \beta = 30^\circ$$

$$\gamma = 90^\circ - (180^\circ - (90^\circ + \theta + \beta))$$

Now, according to Snell's law at the face PR

$$\sqrt{2}\sin\gamma = 1$$

$$\therefore \sin(\theta + \beta) = 1/\sqrt{2}$$

$$\text{Or, } \theta + 30^\circ = 45^\circ$$

$$\therefore \theta = 15^\circ$$

Therefore, the correct option is - (A) 15°