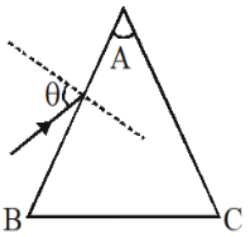
Q. Monochromatic light is incident on a glass prism of angle A. If the refractive index of the material of the prism is μ, a ray, incident at an angle θ, on the face AB would get transmitted through the face AC of the prism provided :



(1) $\theta > \cos^{-1}\left[\mu \sin\left(A + \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$ (2) $\theta < \cos^{-1}\left[\mu \sin\left(A + \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$ (3) $\theta > \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$ (4) $\theta < \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

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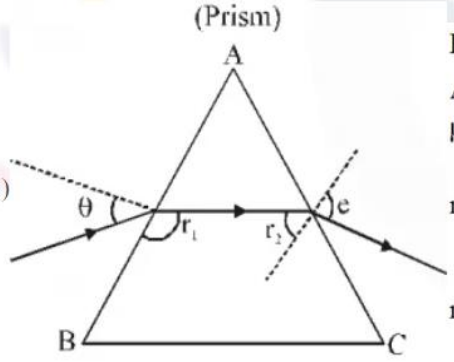
Sol-

Sol. (3)



For all light to come out from face AC angle of emergence $\boxed{e = 90}$

Apply Snell's Law at face AC

$\mu \sin r_2 = 1 \sin e$

$r_2 = \sin^{-1}\left(\frac{1}{\mu}\right)$ (if e = 90)

$r_1 = A - \sin^{-1}\left(\frac{1}{\mu}\right)$ $(\because r_1 + r_2 = A)$

Apply Snell's law at face AB $1 \sin\theta = \mu \sin(r_1) \theta = \sin^{-1}\left(\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right.$ for all light transmitted through AC, $e < 90°$

$\Rightarrow \theta > \sin^{-1}\left(\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right)$