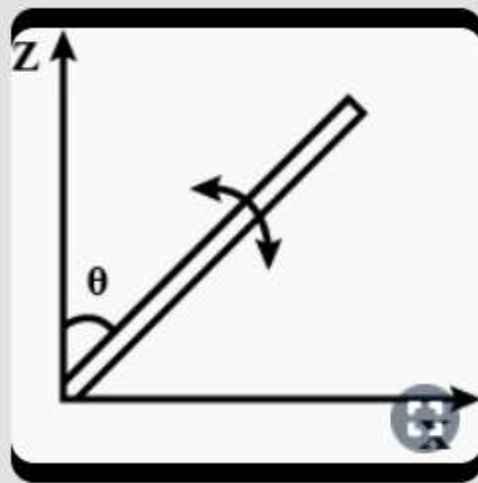A slender uniform rod of mass M and length l is pivoted at one end so that it can rotate in a vertical plane (see figure). There is negligible friction at the pivot. The free end is held vertically above the pivot and then released. The angular acceleration of the rod when it makes an angle θ with vertical is

A $\dfrac{3g}{2l} \cos\theta$

B $\dfrac{2g}{3l} \cos\theta$

C $\dfrac{3g}{2l} \sin\theta$

D $\dfrac{2g}{3l} \sin\theta$

Correct option is C)

By taking torque equation about A

$$\tau = \vec{F} \times \vec{r};$$

$$\tau = I\alpha$$

$$Mgsin\theta \quad \times \quad l/2 \quad = Ml^2/3 \quad \times \quad \alpha$$

$$\alpha = 3gsin\theta/2l$$