If the temperature of a uniform rod is slightly increased by Δt, its moment of inertia I about a perpendicular

bisector increases by
(a) zero   (b) $\alpha I \Delta t$ (c) $2\alpha I \Delta t$ (d) $3\alpha I \Delta t$.

M.O.I of rod about a ⊥ bisector is:-

$$I = \frac{ML^2}{12}$$

⇒ On differentiating both sides w.r.t. L

⇒ $\frac{dI}{dL} = \left(\frac{M}{12}\right)(2L)$

⇒ $dI = \left(\frac{ML}{6}\right)dL$

⇒ $\Delta I = \left(\frac{ML}{6}\right)\Delta L$

$= \left(\frac{ML}{6}\right)(L\alpha\Delta T)$ $(\because \Delta L = L\alpha\Delta T)$

$= \left(\frac{ML^2}{6}\right)\alpha\Delta T$

$= (2I)\alpha\Delta T$

⇒ $\boxed{\Delta I = 2I\alpha\Delta T}$