The radius of a metal sphere at room temperature T is R, and the coefficient of linear expansion of the metal is α. The sphere is heated a little by a temperature ΔT so that its new temperature is $T + \Delta T$. The increase in the volume of the sphere is approximately

(a) $2\pi R\,\alpha\,\Delta T$

(b) $\pi R^2\,\alpha\,\Delta T$

(c) $4\pi R^3\,\alpha\,\Delta T\,/\,3$

(d) $4\pi R^3\,\alpha\,\Delta T$

For given sphere,

$$V_0 = \frac{4\pi R^3}{3}$$

Also, α = coefficient of linear expansion

$\gamma = 3\alpha$ = coefficient of cubical expansion

$$\Delta V = (V_0)(\gamma)(\Delta T)$$

$$= \left(\frac{4\pi R^3}{3}\right)(3\alpha)(\Delta T) \quad (\because \gamma = 3\alpha)$$

$$\boxed{\Delta V = 4\pi R^3 \alpha \Delta T} \longrightarrow \text{option (d)}$$