

A particle performs simple harmonic motion with amplitude  $A$ . Its speed is trebled at the instant that it is at a distance  $\frac{2A}{3}$  from equilibrium position. The new amplitude of the motion is :

(1)  $\frac{A}{3}\sqrt{41}$

(2)  $3A$

(3)  $A\sqrt{3}$

(4)  $\frac{7A}{3}$

$$v \propto \sqrt{A^2 - x^2}$$

$$\text{So, } \frac{v'}{v} = \frac{\sqrt{A'^2 - x^2}}{\sqrt{A^2 - x^2}}$$

$$\therefore \frac{(3v)^2}{v^2} = \frac{A'^2 - \left(\frac{2A}{3}\right)^2}{A^2 - \left(\frac{2A}{3}\right)^2}$$

$$\therefore 9 = \frac{A'^2 - \frac{4A^2}{9}}{\frac{5A^2}{9}} \quad \text{Or } 5A^2 = A'^2 - \frac{4A^2}{9}$$

$$\therefore A'^2 = \frac{49A^2}{9} \quad \text{Or } A' = \frac{7A}{3}$$

Hence, Option (4).

Based on JEE Main 2016

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