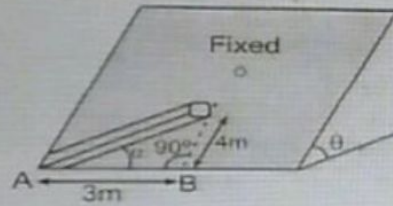


There is an inclined surface of inclination  $\theta = 30^\circ$ . A smooth groove is cut into it forming angle  $\alpha$  with AB. A steel ball is free to slide along the groove. If the ball is released from the point O at top end of the groove, the speed when it comes to A is: [  $g = 10 \text{ m/s}^2$  ]



(1)  $\sqrt{40} \text{ m/s}$

(2)  $\sqrt{20} \text{ m/s}$

(3)  $\sqrt{10} \text{ m/s}$

(4)  $\sqrt{15} \text{ m/s}$

Correct Answer - A

$$\text{length of groove} = \sqrt{3^2 + 4^2} = 5m$$

$$\text{acceleration along the incline} = g \sin \theta = g \sin 30^\circ = g/2$$

acceleration along the groove =

$$g/2 \cos(90 - \alpha) = g/2 \sin \alpha = \frac{g}{2} \times \frac{4}{5} = 4m/s^2$$

$$v^2 = 2as$$

$$v = \sqrt{2 \times 4 \times 5} = \sqrt{40}m/sec$$

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