Question 77978

Two bodies A and B of masses mA = 1 kg and mB = 2 kg are initially at rest at the same height y0 = 80 cm above a horizontal plane. At t = 0 they are both released. A slides along a plane inclined by an angle θ = 45° while B falls vertically. Let tA and tB be the time required for A and B to reach the horizontal plane, vA and vB are the corresponding speed at tA and tB. Which of the following results is correct? (Assume g = 10 m/s2)

A: vA = 1/2 vB and tA = tB = 0.4 s

B: vA = 2 vB and tA = tB = 0.4 s

C: vA = vB = 4 m/s and tA = √2tB

D: vA = vB = 4 m/s and tA = 1/2tB = 0.8 s

E: vA = vB = 4 m/s and tA = 1/√2tB

Solution

For body A $v_a = g \times sin\alpha \times t_a$, for body B $v_b = g \times t_b$, so $\frac{v_a}{v_b} = \frac{g \times sin\alpha \times t_a}{g \times t_b} = \frac{sin\alpha \times t_a}{t_b}$. The correct answer is C, because when $v_a = v_b$, $sin\alpha \times t_a = t_b$, so $t_a = \frac{t_b}{sin\alpha} = \frac{t_b}{\frac{\sqrt{2}}{2}} = \sqrt{2}t_b$.

Answer

Result C is correct, all other are incorrect