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Batch : S3
M.M. : 20

IIT PHYSICS CENTRE

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1. A block A is released from the top of smooth inclined plane and slides down the plane. Another block B is dropped from the same point and falls vertically downwards. Which one of the following statements will be true if the friction offered by air is negligible
(A) Both blocks will reach the ground at the same time
(B) Block A reaches the ground earlier than block B
(C) Both blocks will reach the ground with the same speed
(D) Block B reaches the ground with a higher speed than block A.

2. A body of mass 200 g is moving with a velocity of 5 ms^{-1} along the positive x-direction. At time t = 0, when the body is at x = 0, a constant force of 0.4 N directed along the negative x-direction is applied to the body for 10s. What is the position (x) of the body at t = 2.5 s ?
(A) x = 1.0 m (B) x = 1.25 m
(C) x = 1.5 m (D) x = 1.75 m

3. A helicopter of mass M is rising vertically upwards with a uniform acceleration a. If the mass of the persons in the helicopter is m, what is the megnitude and direction of the force exerted by the persons on the force of the helicopter ?
(A) m(g + a) vertically downwards
(B) m(g – a) vertically upwards
(C) m(g + a) vertically upwards
(D) m(g – a) vertically downwards

4. Two blocks of equal masses $m_1 = m_3 = 3$ kg, connected by a light string, are placed on a horizontal surface which is not frictionless. If a force of 20 N is applied in the horizontal direction on a block, the acceleration of each block is 0.5 ms^{-2}. Assuming that the frictional forces on the two blocks are equal, the tension in the string will be
(A) 10 N (B) 20 N
(C) 40 N (D) 60 N

5. A block of mass 5 kg is lying on a rough horizontal surface. The coefficients of static and kinetic friction between the block and the surface respectively are 0.7 and 0.5. A horizontal force just sufficient to move the block is applied to it. If the force continues to act even after the block has started moving, the acceleration of block will be (take g = 10 ms^{-2})
(A) 1 ms^{-2} (B) 2 ms^{-2}
(C) 3 ms^{-2} (D) 4 ms^{-2}

6. A block of mass 4 kg is kept over a rough horizontal surface. The coefficient of static friction between the block and the surface is 0.1. At t = 0, $3\hat{i}$ m/s, velocity is imparted to the block and simultaneously $-2\hat{i}$ N force starts acting on it. Its displacement in first 5 second is (g = 10 m/s^2)
(A) $8\hat{i}$ (B) $-8\hat{i}$
(C) $3\hat{i}$ (D) $-3\hat{i}$

7. A man of mass m slides down a rope attached to the ceiling of an elevator with acceleration 'a' relative to the rope. If elevator is going upward with an acceleration 'a' relative to the ground then tension in the rope is
(A) mg (B) m(g + 2a)
(C) m (g + a) (D) none of these

8. A projectile is thrown with a velocity of 18 m/s at an angle of 60° with horizontal. The interval between the moments when speed of the projectile is 15 m/s is (g = 10 m/s^2)
(A) 2/3 sec (B) 12 / 5 sec
(C) 2/5 sec (D) 1/10 sec

9. Rain is falling with a speed of 4 m/s in a direction making an angle of 30° with vertical towards south, What should be the magnitude & direction of velocity of cyclist to hold his umbrella exactly vertical, so that rain does not wet him :
(A) 2 m/s towards north (B) 4 m/s towards south
(C) 2 m/s towards south (D) 4m/s towards north

10. A stationary body of mass m is slowly lowered onto a massive platform of mass M (M >> m) moving at a speed $v_0 = 4$ m/s. How much will the body slide with respect to the platform ($\mu = 0.2$ and g = 10 m/s^2)
(A) 4m
(B) 6 m
(C) 12 m
(D) 8 m