DPP

DAILY PRACTICE PROBLEMS

CLASS : XITH | **SUBJECT : PHYSICS**

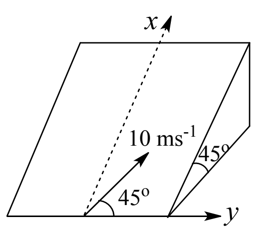
DATE : | **DPP NO. : 10**

Topic :- LAWS OF MOTION

1. A particle is moving in the x - y plane. At certain instant of time, the components of its velocity and acceleration are as follows $v_x = 3$ ms^{-1}, $v_y = 4$ ms^{-1}, $a_x = 2$ ms^{-2} and $a_y = 1$ ms^{-2}. The rate of change of speed at this moment is
a) $\sqrt{10}$ ms^{-1} b) 4 ms^{-2} c) $\sqrt{5}$ ms^{-2} d) 2 ms^{-2}

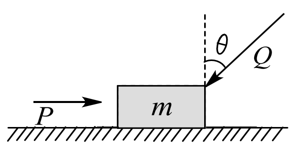
2. A particle moves in the X-Y plane under the influence of a force such that its linear momentum is $\mathbf{p}(t) = A[\hat{\mathbf{i}}\cos(kt) - \hat{\mathbf{j}}\sin(kt)]$ where A and k are constant. The angle between the force and the momentum is
a) 0° b) 30° c) 45° d) 90°

3. The small marble is projected with a velocity of 10 ms^{-1} in a direction 45° from the horizontal y -direction on the smooth inclined plane. Calculate the magnitude v of its velocity after 2 s



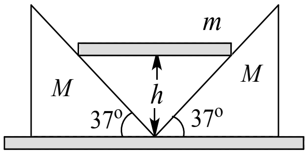
a) $10\sqrt{2}$ ms^{-1} b) 5 ms^{-1} c) 10 ms^{-1} d) $5\sqrt{2}$ ms^{-1}

4. A block of mass$m$, lying on a horizontal plane, is acted upon by a horizontal force P and another force$Q$, inclined at an angle θ to the vertical. The block will remain in equilibrium if the coefficient of friction between it and the surface is (assume $P > Q$)



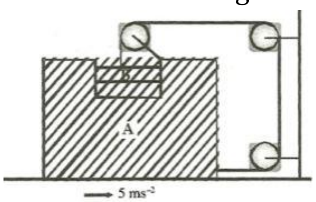
a) $(P\sin\theta - Q)/(mg - \cos\theta)$ b) $(P - Q\sin\theta)/(mg + Q\cos\theta)$
c) $(P\cos\theta + Q)/(mg - Q\cos\theta)$ d) $(P + Q\sin\theta)/(mg + Q\cos\theta)$

5. A body of mass m is held at rest at a height h on two smooth wedges of mass M each, which are themselves at rest on a horizontal frictionless surface. When the mass m is released, it moves down, pushing aside the wedges. The velocity with which the wedge recede from each other, when m reaches the ground, is



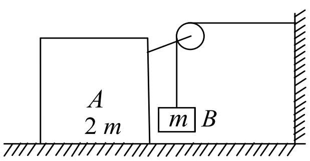
a) $\sqrt{\dfrac{8mgh}{m+2M}}$ b) $\sqrt{\dfrac{40mgh \times 4}{5m+6M}}$ c) $\sqrt{\dfrac{32mgh \times 4}{32M+9m}}$ d) None of these

6. If block A is moving with an acceleration of 5 ms^{-2}, the acceleration of B w.r.t. ground is



a) 5 ms^{-2} b) $5\sqrt{2}$ ms^{-2} c) $5\sqrt{5}$ ms^{-2} d) 10 ms^{-2}

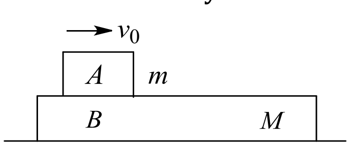
7. In the system shown all the surfaces are frictionless while pulley and string are massless. Mass of block A is 2 m and that of block B is m. Acceleration of block B immediately after system is released from rest is



a) g/2 b) G c) g/3 d) None of these

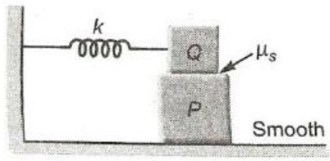
8. A horizontal force, just sufficient to move a body of mass 4 kg lying on a rough horizontal surface, is applied on it. The coefficient of static and kinetic friction between the body and the surface are 0.8 and 0.6, respectively. If the force continuous to act even after the block has started moving, the acceleration of the block in ms^{-2} is (g=10 ms^{-2})
a) 1/4 b) 1/2 c) 2 d) 4

9. The masses of the blocks A and B are m and$M$, respectively. Between A and B there is constant frictional force$F$, and B can slide frictionlessly on horizontal surface. A is set in motion with velocity while B is at rest. What is the distance moved by A relative to B before they move with the same velocity?



a) $\dfrac{mMv_0^2}{F(m-M)}$ b) $\dfrac{mMv_0^2}{2F(m-M)}$ c) $\dfrac{mMv_0^2}{F(m+M)}$ d) $\dfrac{mMv_0^2}{2F(m+M)}$

10. A block P of mass m is placed on a horizontal surface. Another block Q of same mass is kept on P and connected to the wall with the help of a spring of spring constant k as shown in the figure. μ_s is the coefficient of friction between P and Q. The blocks move together performing SHM of amplitude A. The maximum value of the friction force between P and Q is

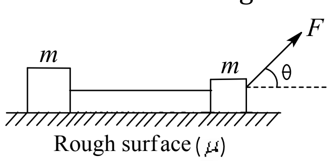


a) kA b) $\frac{kA}{2}$ c) Zero d) $\mu_s mg$

11. Consider a 14-tyre truck, whose only rear 8 wheels are power driven (means only these 8 wheels can produce acceleration). These 8 wheels are supporting approximately half of the entire load. If coefficient of friction between rod and each of the tyres is 0.6, then what could be the maximum attainable acceleration by this truck?
a) 6 ms^{-2} b) 24 ms^{-2} c) 3 ms^{-2} d) 10 ms^{-2}

12. A block of metal weighing 2 kg is resting on a frictionless plane. It is struck by a jet releasing water at a rate of 1 kgs^{-1} and a speed of5 ms^{-1}. The initial acceleration of the block will be
a) 2.5 ms^{-2} b) 5 ms^{-2} c) 10 ms^{-2} d) 20 ms^{-2}

13. Two blocks m and M tied together with an inextensible string are placed at rest on a rough horizontal surface with coefficient of frictionμ. The block m is pulled with a variable force F at a varying angle θ with the horizontal. The value of θ at which the least value of F is required to move the blocks is given by



a) $\theta = \tan^{-1}\mu$ b) $\theta > \tan^{-1}\mu$ c) $\theta < \tan^{-1}\mu$ d) Insufficient data

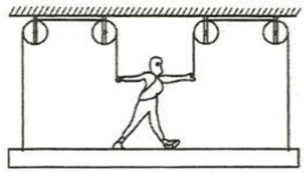
14. A circular table of radius 0.5 m has smooth diametrical groove. A ball of mass 90 g is placed inside the groove along with a spring of spring constant10^2 Ncm^{-1}. One end of the spring is tied to the edge of the table and the other end to the ball. The ball is at a distance of 0.1 m from the centre when the table is at rest. On rotating the table with a constant angular frequency of 10^2 rad s^{-1}, the ball moves away from the centre by a distance nearly equal to
a) 10^{-1}m b) 10^{-2}m c) 10^{-3}m d) 2×10^1 m

15. A small block slides without friction down an inclined plane starting from rest. Let s_n be the distance travelled from time $t = n - 1$ to $t = n$. Then

$\frac{s_n}{s_n + 1}$ is

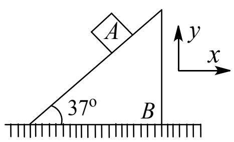
a) $\frac{2n - 1}{2n}$ b) $\frac{2n + 1}{2n - 1}$ c) $\frac{2n - 1}{2n + 1}$ d) $\frac{2n}{2n + 1}$

16. A painter of mass M stands on a platform of mass m and pulls himself up by ropes which hang over pulley as shown. He pulls each rope with force F and moves upward with a uniform acceleration$a$. Find a, neglecting the fact that no one could do this for long time



a) $\frac{4F + (2M + m)g}{M + 2m}$ b) $\frac{4F + (M + m)g}{M + 2m}$ c) $\frac{4F - (M + m)g}{M + m}$ d) $\frac{4F - (M + m)g}{2M + m}$

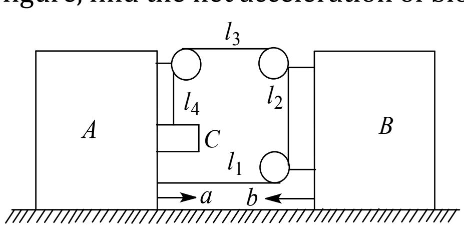
17. In the figure shown, the acceleration of A is $\vec{a}_A = 15\hat{i} + 15\hat{j}$, then the acceleration of B is (A remains in contact with B)



a) $6\hat{i}$ b) $-15\hat{i}$ c) $-10\hat{i}$ d) $-5\hat{i}$

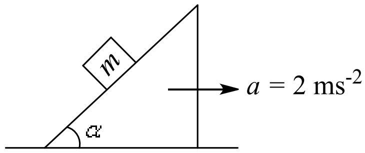
18. An object moving with a constant acceleration in a non-inertial frame
a) Must have non-zero net force acting on it
b) May have zero net force acting on it
c) May have no force acting on it
d) This situation is practically impossible. (The pseudo force acting on the object has also to be considered)

19. If the blocks A and B are moving towards each other with acceleration a and b as shown in the figure, find the net acceleration of block C



a) $a\hat{i} - 2(a + b)\hat{j}$ b) $-(a + b)\hat{j}$ c) $a\hat{i} - (a + b)\hat{j}$ d) None of these

20. A block of mass m is lying on a wedge having inclination angle $\alpha = \tan^{-1}\left(\frac{1}{5}\right)$. Wedge is moving with a constant acceleration $a = 2$ ms^{-2}. The minimum value of coefficient of friction μ so that m remains stationary w.r.t. wedge is



a) 2/9 b) 5/12 c) 1/5 d) 2/5