DPP

DAILY PRACTICE PROBLEMS

CLASS : XIth **SUBJECT : PHYSICS**

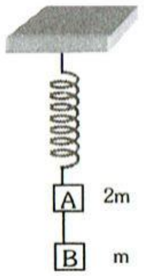
Date : **DPP No. : 5**

Topic :- LAWS OF MOTION

1. A monkey of mass 40 kg climbs on a massless rope of breaking strength 600 N. The rope will break if the monkey

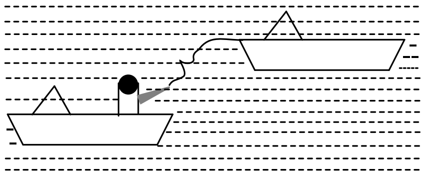
a) Climbs up with a uniform speed of 5 ms^{-1}
b) Climbs up with an acceleration of 6 ms^{-2}
c) Climbs down with an acceleration of 4 ms^{-2}
d) Climbs down with a uniform speed of 5 m s^{-2}

2. Two blocks A and B of masses $2m$ and m, respectively, are connected by a massless and inextensible string. The whole system is suspended by a massless spring as shown in the figure. The magnitudes of acceleration of A and B , immediately after the spring is cut, are respectively



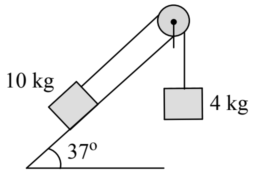
a) $g, g/2$
b) $g/2, g$
c) g, g
d) $g/2, g/2$

3. A rope is stretched between two boats at rest. A sailor in the first boat pulls the rope with a constant force of 100 N. first boat with the sailor has a mass of 250 kg whereas the mass of second boat is double of this mass. If the initial distance between the boats was 100 m, the time taken for two boats to meet each other is (neglect water resistance between boats and water)



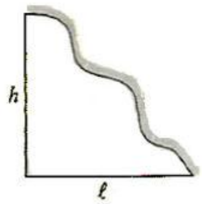
a) 13.8 s
b) 18.3 s
c) 3.18 s
d) 31.8 s

4. A system of two blocks, a light string, and a light and frictionless pulley is arranged as shown in the figure. The coefficient of friction between fixed incline and 10 kg block is given by $\mu_s = 0.27$ and $\mu_k = 0.20$. If the system is released from rest, then find the acceleration of 10 kg block



a) Zero b) 0.114 ms^{-2} c) 0.228 ms^{-2} d) 2.97 ms^{-2}

5. A uniform chain is placed at rest on a rough surface of base length l and height h on an irregular as shown. Then, the minimum coefficient of friction between the chain and the surface must be equal to



a) $\mu = \frac{h}{2\ell}$ b) $\mu = \frac{h}{\ell}$ c) $\mu = \frac{3h}{2\ell}$ d) $\mu = \frac{2h}{3\ell}$

6. A particle of small mass m is joined to a very heavy body by a light string passing over a light pulley. Both bodies are free to move. The total downward force on the pulley is

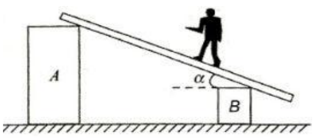
a) $>> mg$ b) $4\,mg$ c) $2\,mg$ d) mg

7. A wooden block of mass M resting on a rough horizontal floor is pulled with a force F at an angle ϕ with the horizontal. If μ is the coefficient of kinetic friction between the block and the surface, then the acceleration of the block is

a) $\frac{F}{M}(\cos\phi - \mu\sin\phi) - \mu g$ b) $\frac{\mu F}{M}\cos\phi$

c) $\frac{F}{M}(\cos\phi + \mu\sin\phi) - \mu g$ d) $\frac{F}{M}\sin\phi$

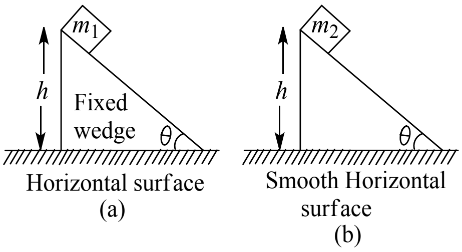
8. A plank is held at an angle α to the horizontal on two fixed supports A and B. The plank can slide against the supports (without friction) because of the weight $Mg\sin\alpha$. Acceleration and direction in which a man of mass m should move so that the plank does not move are



a) $g\sin\alpha\left(1 + \frac{m}{M}\right)$ down the incline b) $g\sin\alpha\left(1 + \frac{M}{m}\right)$ down the incline

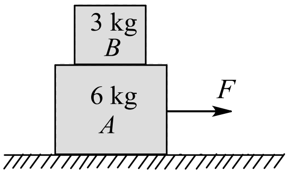
c) $g\sin\alpha\left(1 + \frac{m}{M}\right)$ up the incline d) $g\sin\alpha\left(1 + \frac{M}{m}\right)$ up the incline

9. A block of mass m_1 lies on the top of fixed wedge as shown in figure (a) and another block of mass m_2 lies on top of wedge which is free to move as shown in figure (b). At time $t = 0$, both the blocks are released from rest from a vertical height h above the respective horizontal surface on which the wedge is placed as shown. There is no friction between block and wedge in both the figures. Let T_1 and T_2 be the time taken by the blocks, respectively, to just reach the horizontal surface



a) $T_1 > T_2$ b) $T_1 < T_2$ c) $T_1 = T_2$ d) Data insufficient

10. Two blocks A and B of masses 6 kg and 3 kg rest on a smooth horizontal surface as shown in the figure. If coefficient of friction between A and B is 0.4, the maximum horizontal force which can make them move without separation is

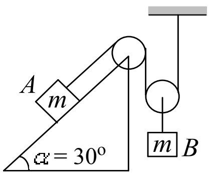


a) 72 N b) 40 N c) 36 N d) 20 N

11. Two persons are holding a rope of negligible weight tightly at its ends so that it is horizontal. A 15 kg weight is attached to the rope at the midpoint which now no longer remains horizontal. The minimum tension required to completely straighten the rope is

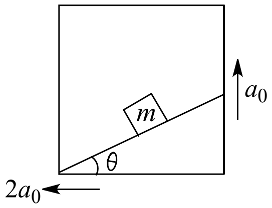
a) 15 kg b) 12/2 kg c) 5 kg d) Infinitely large

12. In an arrangement shown below, the acceleration of block A an B are



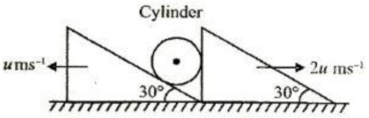
a) g/3, g/6 b) g/6, g/3 c) g/2, g/2 d) 0, 0

13. For the situation shown in figure, the block is stationary w.r.t. incline fixed in an elevator. The elevator is having an acceleration of $\sqrt{5}a_0$ whose components are shown in the figure. The surface is rough and coefficient of static friction between the incline and block isμ_s. Determine the magnitude of force exerted by incline on the block. (take $a_0 = \frac{g}{2}$ and $\theta = 37°$, $\mu_s = 0.2$)



a) $\frac{mg}{10}$ b) $\frac{9mg}{25}$ c) $\frac{3mg}{25} \times \sqrt{41}$ d) $\frac{\sqrt{13}\,mg}{2}$

14. A system is shown in the figure. Assume that cylinder remains in contact with the two wedge, then the velocity of cylinder is



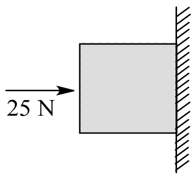
a) $\sqrt{19 - 4\sqrt{3}}$ ms^{-1} b) $\frac{\sqrt{13}u}{2}$ ms^{-1} c) $\sqrt{3}$ u ms^{-1} d) $\sqrt{7}$ ms^{-1}

15. If the resultant of all the external forces acting on a system of particles is zero, then form an inertial frame, one can surely say that
a) Linear momentum of the system does not change in time
b) Kinetic energy of the system does not change in time
c) Angular momentum of the system does not change in time
d) Potential energy of the system does not change in time

16. The upper half of an inclined plane with inclination ϕ is perfectly smooth while the lower half is rough. A body starting from rest at the top will again come to rest at the bottom if the coefficient of friction for the lower half is given by

a) $2 \tan \phi$ b) $\tan \phi$ c) $2 \sin \phi$ d) $2 \cos \phi$

17. A horizontal force of 25 N is necessary to just hold a block stationary against a wall. The coefficient of friction between the block and the wall is 0.4. The weight of the block is

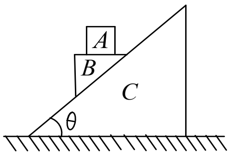


a) 2.5 N b) 20 N c) 10 N d) 5 N

18. Inside a horizontally moving box, an experimenter finds that when an object is placed on a smooth horizontal table and is released, it moves with an acceleration of10 ms^{-2}. In this box if 1 kg body is suspended with a light string the tension in the string in equilibrium position. (w.r.t experimenter) will be (Take g = 10 ms^{-2})

a) 10 ms^{-2} b) $10\sqrt{2}$ ms^{-2} c) 20 ms^{-2} d) Zero

19. In the figure shown, all blocks are of equal mass$m$. All surfaces are smooth, the acceleration of B w.r.t. ground is



a) $\frac{2g\sin\theta}{1+3\sin^2\theta}$ b) $\frac{4g\sin\theta}{1+3\sin^2\theta}$ c) $\frac{2g\sin\theta}{\sqrt{1+3\sin^2\theta}}$ d) $\frac{4g\sin\theta}{\sqrt{1+3\sin^2\theta}}$

20. A piece of wire is bent in the shape of a parabola $y = kx^2$ (y-axis vertical) with a bead of mass m on it. The bead can slide on the wire without friction. It stays at the lowest point of the parabola when the wire is at rest. The wire is now accelerated parallel to the x-axis with a constant acceleration a. The distance of the new equilibrium position of the bead, where the bead can stays at rest with respect to the wire, from the y-axis is

a) $\frac{a}{gk}$ b) $\frac{a}{2gk}$ c) $\frac{2a}{gk}$ d) $\frac{a}{4gk}$