Yakeen neet 2.0 2026

Laws of Motion

Assignment-03
By: M.R. Sir

1. 100 balls each of mass m moving with speed v simultaneously strike a wall normally and are reflected back with the same speed, in time t s. The total force exerted by the balls on the wall is

[31 Jan, 2023 (Shift-I)]

(1) $\frac{100mv}{t}$ (2) $\frac{200mv}{t}$

(3) $200\ mvt$ (4) $\frac{mv}{100t}$

2. A block of mass M placed inside a box descends vertically with acceleration 'a'. The block exerts a force equal to one-fourth of its weight on the floor of the box. The value of 'a' will be:

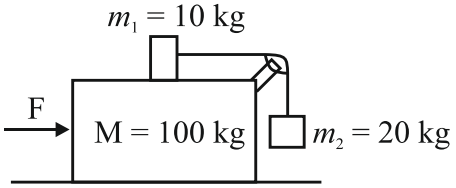
[29 June, 2022 (Shift-II)]

(1) $g/4$ (2) $g/2$

(3) $3g/4$ (4) g

3. Three masses M = 100 kg, m_1 = 10 kg and m_2 = 20 kg are arranged in a system as shown in figure. All the surfaces are frictionless and strings are inextensible and weightless. The pulleys are also weightless and frictionless. A force F is applied on the system so that the mass m_2 moves upward with an acceleration of 2 ms^2. The value of F is:

(Take g = 10 ms^{-2}) **[26 July, 2022 (Shift-I)]**



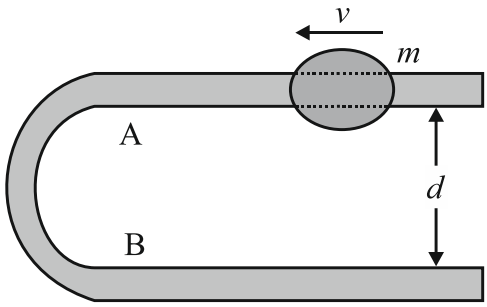
(1) 3360 N

(2) 3380 N

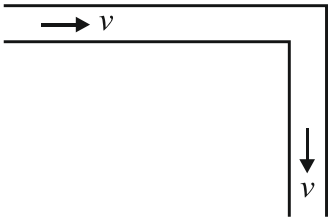
(3) 3120 N

(4) 3240 N

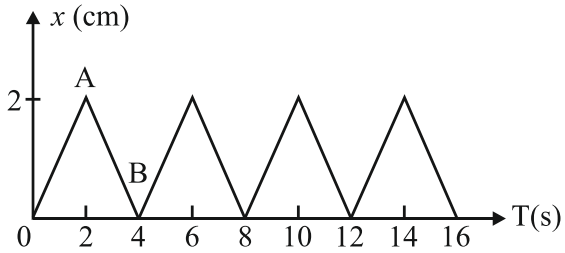
4. A U-shaped smooth wire has a semi-circular bending between A and B as shown in figure. A bead of mass m moving with uniform speed v through the wire enters the semicircular bend at A and leaves at B. Find the average force exerted by the bead on the part AB of the wire.



5. A liquid of density ρ is flowing with a speed v through a pipe of cross-sectional area A. The pipe is bent in the shape of a right angle as shown. What force should be exerted on the pipe at the corner to keep it fixed?

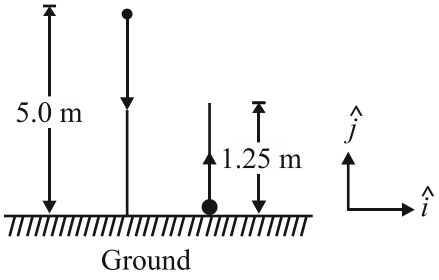


6. Figure shows the position-time graph of a particle of mass 0.04 kg. Suggest a suitable physical context for this motion. What is the time between two consecutive impulses received by the particle? What is the magnitude of each impulse?

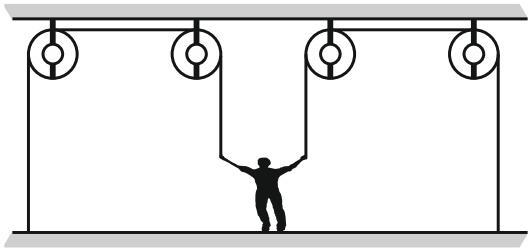


7. Wind with a velocity 100 km h^{-1} blows normally against one of the walls of a house with an area of 108 m^2 Calculate the force exerted on the wall if the air moves parallel to the wall after striking it and has a density of 1.2 kg m^{-3}.

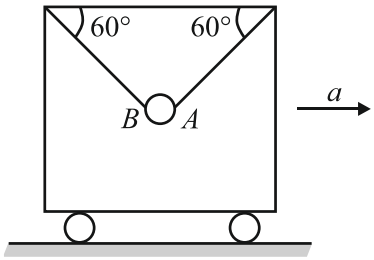
8. A rubber ball of mass 50 g falls from a height of 5 m and rebounds to a height of 1.25 m. Find the impulse and the average force between the ball and the ground if the time for which they are in contact was 0.1 s.



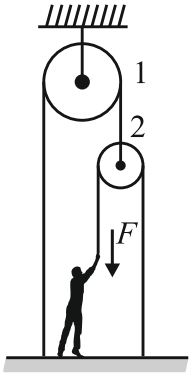
9. A painter of mass *M* stands on a platform of mass *m* and pulls himself up by two ropes which hang over pulley as shown in figure. He pulls each rope with force *F* and moves upward with uniform acceleration *a*. Find a (neglecting the fact that no one could do this for long time).



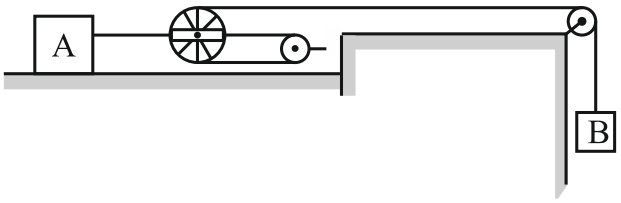
10. A steel ball is suspended from the ceiling of an accelerating carriage by means of two cords A and B. Determine the acceleration a of the carriage which will cause the tension in A to be twice that in B.



11. With what force F a man pull on a rope in order to support the platform on which he stands, if the mass of man is 60 kg and that at platform is 20 kg. With what force N does the man press the platforms? What is the maximum weight of the platform that the man can support?



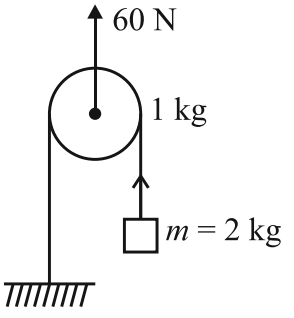
12. A block A has a velocity of 0.6 ms^{-1} to the right. Determine the velocity of cylinder B.



(1) 1.2 ms^{-1} (2) 2.4 ms^{-1}

(3) 1.8 ms^{-1} (4) 3.6 ms^{-1}

13. In following arrangement pulley is smooth and its mass is 1 kg. The mass of the block is 2 kg. If the pulley is pulled upward with constant force 60 N, then find the acceleration of the block



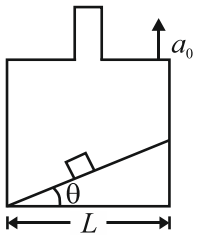
(1) $\frac{20}{9}$ m/s^2 (2) $\frac{10}{9}$ m/s^2

(3) 2 m/s^2 (4) 2.5 m/s^2

Paragraph for (Q.14 to 16)

A particle slides down a smooth inclined plane of elevation θ fixed in a elevator going up with an acceleration a_0. The base of incline has a length L.

14. The acceleration of particle with respect to the incline



(1) $g \sin\theta$ (2) $a_0 \sin\theta$

(3) $(g + a_0)\sin\theta$ (4) $(g\sin\theta + a_0\cos\theta)$

15. The time taken by the particle to reach the bottom:

(1) $\left(\frac{2L}{g\sin\theta}\right)^{1/2}$

(2) $\left(\frac{2L}{(g+a_0)\sin\theta\cos\theta}\right)^{1/2}$

(3) $\left(\frac{2L}{a_0\sin\theta}\right)^{1/2}$

(4) $\left(\frac{2L}{(g+a_0)\sin\theta}\right)^{1/2}$

16. If the elevator going up with constant velocity, the time taken by the particle to reach the bottom is:

(1) $\left(\frac{2L}{g\sin\theta\cos\theta}\right)^{1/2}$

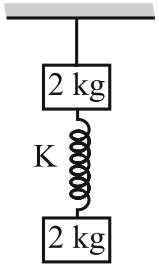
(2) $\left(\frac{2L}{g\sin\theta}\right)^{1/2}$

(3) $\left(\frac{2L}{g\cos\theta}\right)^{1/2}$

(4) None of these

17. Two blocks of mass 2 kg are connected by a massless ideal spring of spring constant K = 10 N/m. The upper block is suspended from roof by a light string. the system shown is in equilibrium. The string is now cut, the acceleration of upper block just after the string is cut will be:

(g = 10 m/s^2)



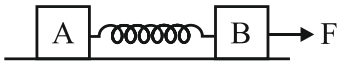
(1) 0 m/s^2

(2) 10 m/s^2

(3) 15 m/s^2

(4) 20 m/s^2

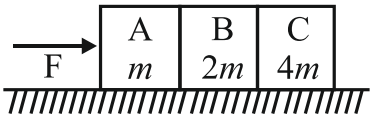
18. Initially the spring is undeformed. Now the force 'F' is applied to 'B' as shown in the figure. When the displacement of 'B' w.r.t. 'A' is 'x' towards right in some time than the relative acceleration of 'B' w.r.t. 'A' at that moment is:



(1) $\frac{F}{2m}$ (2) $\frac{F-kx}{m}$

(3) $\frac{F-2kx}{m}$ (4) None of these

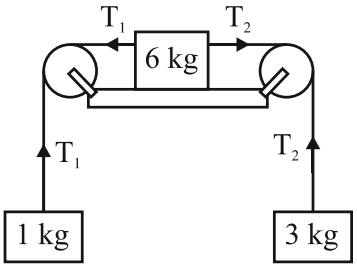
19. A force F is applied on block A as shown in figure. The contact force between the blocks A and B and between the blocks B and C respectively are (Assume frictionless surface)



(1) $\frac{F}{7}, \frac{2F}{7}$ (2) $\frac{6F}{7}, \frac{4F}{7}$

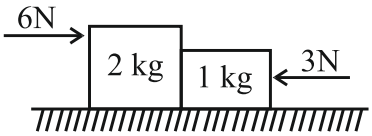
(3) $F, \frac{F}{2}$ (4) $\frac{4F}{7}, \frac{6F}{7}$

20. Three masses of 1 kg, 6 kg and 3 kg are connected to each other with threads and are placed on table as shown in figure. What is the acceleration with which the system is moving? Take $g = 10\ ms^{-2}$.



(1) Zero
(2) $1\ ms^{-2}$
(3) $2\ ms^{-2}$
(4) $3\ ms^{-2}$

21. Two forces of 6 N and 3 N are acting on the two blocks of 2 kg and 1 kg kept on frictionless floor. What is the force exerted on 2 kg block by 1 kg block?



(1) 1 N
(2) 2 N
(3) 4 N
(4) 5 N

ANSWER KEY

1. **(2)**
2. **(3)**
3. **(1)**
4. $\frac{4mv^2}{\pi d}$
5. $\sqrt{2}\rho A v^2$
6. **2s, 8×10^{-4} N/s**
7. **1×10^5 N**
8. **0.75 N-S; 7.5 N**
9. $\frac{4F-(M+m)g}{M+m}$
10. $\frac{g}{3\sqrt{3}}$
11. **400 N**
12. **(3)**
13. **(1)**
14. **(3)**
15. **(2)**
16. **(1)**
17. **(4)**
18. **(3)**
19. **(2)**
20. **(3)**
21. **(3)**