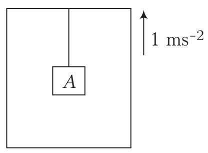
Module-Test-7
(Physics-NEET)

December 24, 2022

1 A metre scale is moving with uniform velocity. This implies
(a) the force acting on the scale is zero, but a torque about the centre of mass can act on the scale
(b) the force acting on the scale is zero and the torque acting about centre of mass of the scale is also zero
(c) the total force acting on it need not be zero but the torque on it is zero
(d) Neither the force nor the torque need to be zero

2 Conservation of momentum in a collision between particles can be understood from
(a) conservation of energy
(b) Newton's first law only
(c) Newton's second law only
(d) Both Newton's second and third law

3 If the elevator in the shown figure is moving upwards with constant acceleration $1\ \text{ms}^{-2}$, the tension in the string connected to block A of mass 6 kg would be
(Take, $g = 10\ \text{ms}^{-2}$)



(a) 60 N (b) 66 N
(c) 54 N (d) 42 N

4 A block is placed on the top of a smooth inclined plane of inclination θ kept on the floor of a lift. When the lift is descending with a retardation a, the block is released. The acceleration of the block relative to the incline is
(a) $g \sin\theta$ (b) $a \sin\theta$
(c) $(g - a)\sin\theta$ (d) $(g + a)\sin\theta$

5 A cricket ball of mass 150 g has an initial velocity $\mathbf{u} = (3\hat{\mathbf{i}} + 4\hat{\mathbf{j}})\ \text{ms}^{-1}$ and a final velocity $\mathbf{v} = -(3\hat{\mathbf{i}} + 4\hat{\mathbf{j}})\ \text{ms}^{-1}$, after being hit. The change in momentum (final momentum − initial momentum) is (in kg-ms^{-1})
(a) zero (b) $-(0.45\hat{\mathbf{i}} + 0.6\hat{\mathbf{j}})$
(c) $-(0.9\hat{\mathbf{i}} + 1.2\hat{\mathbf{j}})$ (d) $-5(\hat{\mathbf{i}} + \hat{\mathbf{j}})\hat{\mathbf{i}}$

6 In the previous question (5), the magnitude of the momentum transferred during the hit is
(a) zero (b) $0.75\ \text{kg-ms}^{-1}$
(c) $1.5\ \text{kg-ms}^{-1}$ (d) $14\ \text{kg-ms}^{-1}$

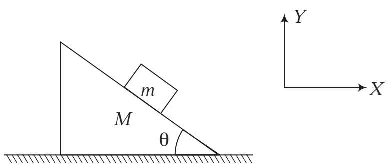
7 A block of mass m is placed on a smooth plane inclined at an angle θ with the horizontal. The force exerted by the plane on the block has a magnitude
(a) mg (b) $mg \sec\theta$ (c) $mg\cos\theta$ (d) $mg \sin\theta$

8. A block has been placed on an inclined plane. The slope angle θ of the plane is such that the block slides down the plane at a constant speed. The coefficient of kinetic friction is equal to
(a) $\sin\theta$ (b) $\cos\theta$ (c) g (d) $\tan\theta$

9 A body is projected up a 45Ÿrough incline. If the coefficient of friction is 0.5, then the retardation of the block is
(a) $\frac{g}{2\sqrt{2}}$ (b) $\frac{g}{\sqrt{2}}$ (c) $\frac{3g}{2\sqrt{2}}$ (d) $\frac{g}{2}$

10 A rope of length L and mass M is hanging from a rigid support. The tension in the rope at a distance x from the rigid support is
(a) Mg (b) $\left(\frac{L-x}{L}\right) Mg$ (c) $\left(\frac{L}{L-x}\right) Mg$ (d) $\frac{x}{L} Mg$

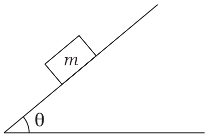
11 Consider the shown arrangement. Assume all surfaces to be smooth. If N represents magnitudes of normal reaction between block and wedge, then acceleration of M along horizontal is equal to



(a) $\frac{N\sin\theta}{M}$ along + ve X-axis
(b) $\frac{N\cos\theta}{M}$ along − ve X-axis
(c) $\frac{N\sin\theta}{M}$ along − ve X-axis
(d) $\frac{N\sin\theta}{m+M}$ along − ve X-axis

12 In the above problem, normal reaction between ground and wedge will have magnitude equal to
(a) $N\cos\theta + Mg$ (b) $N\cos\theta + Mg + mg$
(c) $N\cos\theta - Mg$ (d) $N\sin\theta + Mg + mg$

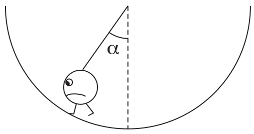
13 A block of mass m is at rest on an inclined plane which is making angle θ with the horizontal. The coefficient of friction between the block and plane is $\propto$. Then, frictional force acting between the surfaces is



(a) $\propto mg$ (b) $\propto mg \sin\theta$
(c) $\propto (mg \sin\theta - mg \cos\theta)$ (d) $mg \sin\theta$

14 If a body loses half of its velocity on penetrating 3 cm in a wooden block, then how much will it penetrate more before coming to rest?
(a) 1cm (b) 2 cm
(c) 3 cm (d) 4 cm

15 An insect crawls up a hemispherical surface very slowly (see the figure). The coefficient of friction between the insect and the surface is 1/3. If the line joining the centre of the hemispherical surface to the insect makes an angle α with the vertical, the maximum possible value of α is given by

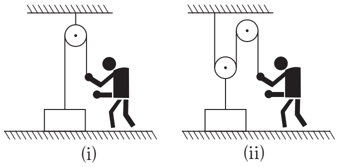


(a) $\cot\alpha = 3$ (b) $\tan\alpha = 3$
(c) $\sec\alpha = 3$ (d) $\operatorname{cosec}\alpha = 3$

16 A hockey player is moving northward and suddenly turns westward with the same speed to avoid an opponent. The force that acts on the player is
(a) frictional force along westward
(b) muscle force along southward
(c) frictional force along south-west
(d) muscle force along south-west

17 A car of mass m starts from rest and acquires a velocity along east $\mathbf{v} = v\hat{\mathbf{i}} (v > 0)$ in two seconds. Assuming the car moves with uniform acceleration, the force exerted on the car is
(a) $\frac{mv}{2}$ eastward and is exerted by the car engine
(b) $\frac{mv}{2}$ eastward and is due to the friction on the tyres exerted by the road
(c) more than $\frac{mv}{2}$ eastward exerted due to the engine and overcomes the friction of the road
(d) $\frac{mv}{2}$ exerted by the engine

18 In the figure shown, a person wants to raise a block lying on the ground to a height h. In both the cases, if time required is the same, then in which case, he has to exert more force. (Assume pulleys and strings are light)



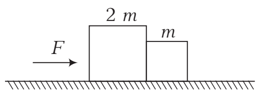
(a) (i) (b) (ii)
(c) Same in both (d) Cannot be determined

19 A body of mass 2kg travels according to the relation $x(t) = pt + qt^2 + rt^3$, where $q = 4\,\text{ms}^{-2}, p = 3\,\text{ms}^{-1}$ and $r = 5\,\text{ms}^{-3}$. The force acting on the body at $t = 2$ s is
(a) 136 N (b) 134 N (c) 158 N (d) 68 N

20 A body with mass 5 kg is acted upon by a force $\mathbf{F} = (-3\hat{\mathbf{i}} + 4\hat{\mathbf{j}})$ N. If its initial velocity at $t = 0$ is $\mathbf{u} = (6\hat{\mathbf{i}} - 12\hat{\mathbf{j}})\,\text{ms}^{-1}$, the time at which it will just have a velocity along the Y-axis is
(a) zero (b) 10 s (c) 2 s (d) 15 s

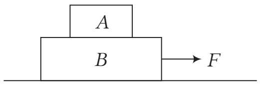
21 A 5000 kg rocket is set for vertical firing. The exhaust speed is 800 ms^{-1}. To give an initial upward acceleration of 20 ms^{-2}, the amount of gas ejected per second to supply the needed thrust will be (Take, $g = 10\ \text{ms}^{-2}$)
(a) 127.5 kgs^{-1} (b) 187.5 kgs^{-1}
(c) 185.5 kgs^{-1} (d) 137.5 kgs^{-1}

22 Two blocks are in contact on a frictionless table. One has mass m and the other $2m$. A force F is applied on $2m$ as shown in the figure. Now, the same force F is applied from the right on m. In the two cases, the ratio of force of contact between the two blocks will be



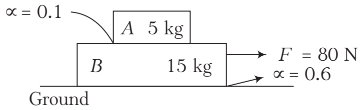
(a) same (b) 1: 2 (c) 2 : 1 (d) 1 : 3

23 A 4 kg block A is placed on the top of 8 kg block B which rests on a smooth table.



A just slips on B when a force of 12 N is applied on A. Then, the maximum horizontal force F applied on B to make both A and B move together, is
(a) 12 N (b) 24 N (c) 36 N (d) 48 N

24 Find the value of friction forces between the blocks A and B; and between B and ground. (Take, $g = 10\ \text{ms}^{-2}$)

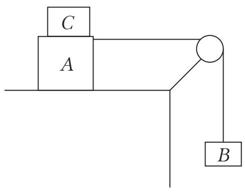


(a) 90 N, 5 N (b) 5 N, 90 N (c) 5 N, 75 N (d) 0 N, 80 N

25 A block of mass 5 kg is kept on a horizontal floor having coefficient of friction 0.09. Two mutually perpendicular horizontal forces of 3 N and 4 N act on this block. The acceleration of the block is (Take, $g = 10\ \text{ms}^{-2}$)

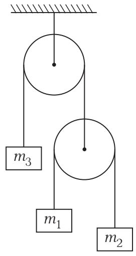
(a) zero (b) $0.1\ \text{ms}^{-2}$ (c) $0.2\ \text{ms}^{-2}$ (d) $0.3\ \text{ms}^{-2}$

26 Two masses A and B of 10 kg and 5 kg respectively are connected with a string passing over a frictionless pulley fixed at the corner of a table as shown in figure. The coefficient of friction of A with the table is 0.2. The minimum mass of C that may be placed on A to prevent it from moving is equal to



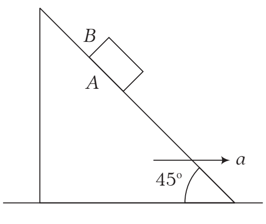
(a) 15 kg (b) 10 kg
(c) 5 kg (d) 20 kg

27 In the figure, pulleys are smooth and strings are massless, $m_1 = 1\text{kg}$ and $m_2 = \frac{1}{3}$ kg. To keep m_3 at rest, mass m_3 should be



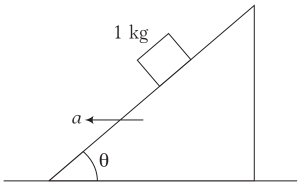
(a) 1 kg (b) $\frac{2}{3}$ kg
(c) $\frac{1}{4}$ kg (d) 2 kg

28 If the coefficient of friction between A and B is $\propto$, the maximum acceleration of the wedge A for which B will remain at rest with respect to the wedge is



(a) $\propto g$ (b) $g\left(\frac{1+\propto}{1-\propto}\right)$ (c) $g\left(\frac{1-\propto}{1+\propto}\right)$ (d) $\frac{g}{\propto}$

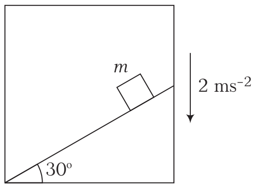
29 A block of mass 1 kg is at rest relative to a smooth wedge moving leftwards with constant acceleration $a = 5\ \text{ms}^{-2}$.



Let N be the normal reaction between the block and the wedge. Then, (Take, $g = 10\ \text{ms}^{-2}$)

(a) $N = 5\sqrt{5}$ N (b) $N = 15$ N
(c) $\tan\theta = \frac{1}{3}$ (d) $\tan\theta = 2$

30 A block of mass m is kept on an inclined plane of a lift moving down with acceleration of $2\ \text{ms}^{-2}$. What should be the coefficient of friction to let the block move down with constant velocity relative to lift?



(a) $\propto = \frac{1}{\sqrt{3}}$ (b) $\propto = 0.4$ (c) $\propto = 0.8$ (d) $\propto = \frac{\sqrt{3}}{2}$

31 Two blocks of mass 5 kg and 3 kg are attached to the ends of a string passing over a smooth pulley fixed to the ceiling of an elevator. The elevator is accelerated upwards. If the acceleration of the blocks is $\frac{9}{32}g$, the acceleration of the elevator is

(a) $\frac{g}{3}$ (b) $\frac{g}{4}$ (c) $\frac{g}{8}$ (d) $\frac{g}{6}$

32 A balloon of weight w is falling vertically downward with a constant acceleration a ($< g$). The magnitude of the air resistance is

(a) w (b) $w\left(1+\frac{a}{g}\right)$
(c) $w\left(1-\frac{a}{g}\right)$ (d) $w\frac{a}{g}$

33 A smooth inclined plane of length L, having an inclination θ with horizontal is inside a lift which is moving down with retardation a. The time taken by a block to slide down the inclined plane from rest will be

(a) $\sqrt{\dfrac{2L}{\sqrt{a\sin\theta}}}$ (b) $\sqrt{\dfrac{2L}{g\sin\theta}}$

(c) $\sqrt{\dfrac{2L}{(g-a)\sin\theta}}$ (d) $\sqrt{\dfrac{2L}{(g+a)\sin\theta}}$

34 A body of mass M at rest explodes into three pieces, two of which of mass $M/4$ each are thrown off in perpendicular directions with velocities of 3 ms^{-1} and 4 ms^{-1}, respectively. The third piece will be thrown off with a velocity of

(a) 1.5 ms^{-1} (b) 2 ms^{-1} (c) 2.5 ms^{-1} (d) 3 ms^{-1}

35 A wooden box of mass 8 kg slides down an inclined plane of inclination 30Υ to the horizontal with a constant acceleration of 0.4 ms^{-2}. What is the force of friction between the box and inclined plane? (Take, $g = 10\ \text{ms}^{-2}$)

(a) 36.8 N (b) 76.8 N

(c) 65.6 N (d) None of these

36 A mass of 3 kg descending vertically downwards supports a mass of 2 kg by means of a light string passing over a pulley. At the end of 5 s, the string breaks . How much high from now the 2 kg mass will go? (Take, $g = 9.8\ \text{ms}^{-2}$)

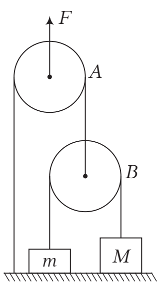
(a) 4.9 m (b) 9.8 m (c) 19.6 m (d) 2.45 m

37 The rear side of a truck is open and a box of mass 20 kg is placed on the truck 4 m away from the open end ($\propto = 0.15$ and $g = 10\ \text{ms}^{-2}$). The truck starts from rest with an acceleration of $2\ \text{ms}^{-2}$ on a straight road. The box will fall off the truck when it is at a distance from the starting point equal to

(a) 4 m (b) 8 m

(c) 16 m (d) 32 m

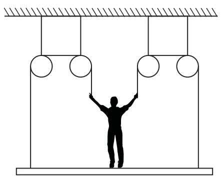
38 Two blocks of masses $m = 5$ kg and $M = 10$ kg are connected by a string passing over a pulley B as shown. Another string connects the centre of pulley B to the floor and passes over another pulley A as shown. An upward force F is applied at the centre of pulley A. Both the pulleys are massless. The accelerations of blocks m and M, if F is 300 N are (Take, $g = 10\ \text{ms}^{-2}$)



(a) 5 ms^{-2}, zero (b) zero, 5 ms^{-2}

(c) zero, zero (d) 5 ms^{-2}, 5 ms^{-2}

39 A man of mass m stands on a platform of equal mass m and pulls himself by two ropes passing over pulleys as shown in figure. If he pulls each rope with a force equal to half his weight, his upward acceleration would be



(a) $\dfrac{g}{2}$ (b) $\dfrac{g}{4}$

(c) g (d) zero

40 A 40 N block supported by two ropes. One rope is horizontal and the other makes an angle of 30Υ with the ceiling. The tension in the rope attached to the ceiling is approximately

(a) 80 N (b) 40 N

(c) $40\sqrt{3}$ N (d) $\dfrac{40}{\sqrt{3}}$ N

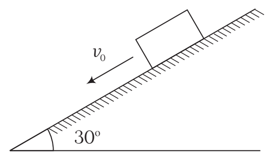
41 Starting from rest, a body slides down a 45Υinclined plane in twice the time, it takes to slide down the same distance in the absence of friction. The coefficient of friction between the body and the inclined plane is

(a) 0.2 (b) 0.25 (c) 0.75 (d) 0.5

42 A block of mass 0.1 kg is held against a wall applying a horizontal force of 5 N on the block. If the coefficient of friction between the block and the wall is 0.5, the magnitude of the frictional force acting the block is

(a) 2.5 N (b) 0.98 N (c) 4.9 N (d) 0.49 N

43 A block of mass m is given an initial downward velocity v_0 and left on an inclined plane (coefficient of friction = 0.6). The block will



(a) continue of move down the plane with constant velocity v_0
(b) accelerate downward
(c) decelerate and come to rest
(d) first accelerate downward then decelerate

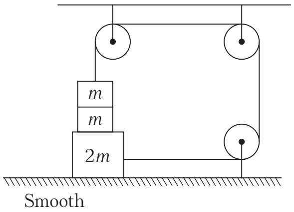
44 Pushing force making an angle θ to the horizontal is applied on a block of weight w placed on a horizontal table. If the angle of friction is ϕ, the magnitude of force required to move the body is equal to

(a) $\dfrac{w\cos\phi}{\cos(\theta-\phi)}$ (b) $\dfrac{w\sin\phi}{\cos(\theta+\phi)}$

(c) $\dfrac{w\tan\phi}{\sin(\theta-\phi)}$ (d) $\dfrac{w\sin\phi}{\tan(\theta-\phi)}$

45 In the arrangement shown in figure, there is a friction force between the blocks of masses m and $2m$ kept on a smooth horizontal surface. The mass of the suspended block is m. The block of mass m is stationary with respect to block of mass 2 m.

The minimum value of coefficient of friction between m and 2 m is



(a) $\frac{1}{2}$ (b) $\frac{1}{\sqrt{2}}$ (c) $\frac{1}{4}$ (d) $\frac{1}{3}$

A.N.S.W.E.R.

1. (b)	2. (d)
3. (b)	4. (c)
5. (c)	6. (c)
7. (c)	8. (d)
9. (c)	10. (b)
11. (c)	12. (a)
13. (d)	14. (a)
15. (a)	16. (d)
17. (b)	18. (a)
19. (a)	20. (b)
21. (b)	22. (b)
23. (b)	24. (d)
25. (b)	26. (a)
27. (a)	28. (b)
29. (a)	30. (a)
31. (c)	32. (c)
33. (d)	34. (c)
35. (a)	36. (a)
37. (a)	38. (a)
39. (d)	40. (a)
41. (c)	42. (b)
43. (c)	44. (b)
45. (c)	