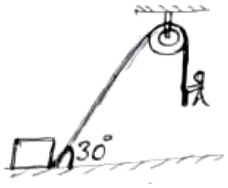
Single Correct Answer Type:

1. In order to raise a mass of 100 kg a man of mass 60 kg fastens a rope to it and passes the rope over a smooth pulley. He climbs the rope with an acceleration 5 g/4 relative to rope. The tension in the rope is $\left(g = 10\ ms^{-2}\right)$

(A) 1432 N (B) 928 N (C) 1218 N (D) 642 N

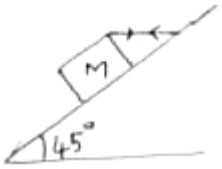
2. A light string fixed at one end to a clamp on ground passes over a fixed pulley and hangs at the other side. It makes an angle $30°$ with the ground. A monkey of mass 5 kg climbs up the rope. The clamp can tolerate a vertical force of 40 N only. The maximum acceleration in upward direction with which the monkey can climb safely is _____



(A) $2\ ms^{-2}$ (B) $4\ ms^{-2}$

(C) $6\ ms^{-2}$ (D) $8\ ms^{-2}$

3. A block of mass 15 kg is resting on a rough inclined plane as shown fig. The block is tied up by a horizontal string which has a tension of 50 N. The coefficient of friction between the surfaces of contact is



(A) 1/2 (B) 2/3

(C) 3/4 (D) 1/4

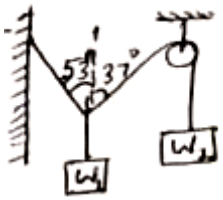
4. A particle moves in the xy-plane under the action of a force F such that the components of its linear momentum 'P' at any time 't' are $P_x = 2\cos t$, $P_y = 2\sin t$. The angle between F and P at time 't' is

(A) 90° (B) 0° (C) 180° (D) 30°

5. A body of mass 2 kg has an initial velocity of 3 m/s along OE and it is subjected to a force of 4N in a direction perpendicular to OE. The distance of the body from 'O' after 4 sec will be

(A) 12 m (B) 20 m (C) 8 m (D) 48 m

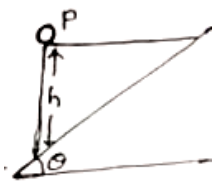
6. Two weight W_1 and W_2 in equilibrium and at rest are suspended as shown in fig, then the ratio $\frac{W_1}{W_2}$ is



(A) 5/4 (B) 4/5

(C) 8/5 (D) None of these

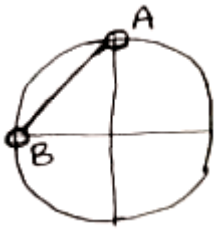
7. A wedge of height 'h' is released from rest with a light particle 'P' placed on it as shown. The wedge slides down an incline which makes an angle 'θ' with the horizontal. All the surfaces are smooth. P will reach the surface of the incline in time is _____



(A) $\sqrt{\frac{2h}{g\sin^2\theta}}$ (B) $\sqrt{\frac{2h}{g\sin\theta\cos\theta}}$

(C) $\sqrt{\frac{2h}{g\tan\theta}}$ (D) $\sqrt{\frac{2h}{g\cos^2\theta}}$

8. Two beads A and B of equal mass 'm' are connected by a light inextensible cord. They are constrained to move on a frictionless ring in vertical plane. The blocks are released from rest as shown in fig. The tension in the cord just after the release is



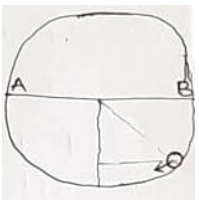
(A) $\frac{mg}{4}$ (B) $\sqrt{2}\,mg$

(C) $\frac{mg}{2}$ (D) $\frac{mg}{\sqrt{2}}$

9. An elastic spring has a length 'ℓ_1' when tension in it is 4 N its length is 'ℓ_2' when tension in it is 5 N. What will be its length when tension in it is 9 N

(A) $5\ell_1 - 4\ell_2$ (B) $5\ell_2 - 4\ell_1$ (C) $4\ell_1 + 5\ell_2$ (D) $4\ell_2 + 5\ell_1$

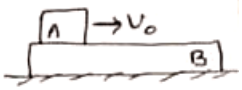
10. A particle of mass 'm' oscillate along the horizontal diameter AB inside a smooth spherical shell of Radius R. At any instant the kinetic energy of the particle is K. Then the force applied by particle on the shell at this instant is _____



(A) $\frac{K}{R}$ (B) $\frac{2K}{R}$

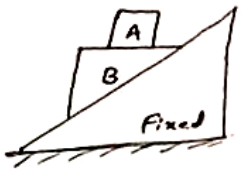
(C) $\frac{3K}{R}$ (D) $\frac{K}{2R}$

11. A block A of mass 'm' is placed over a plank 'B' of mass 2m. Plank 'B' is placed over a smooth horizontal surface. The coefficient of friction between A and B is $\frac{1}{2}$. Block A is given a velocity v_0 towards right. Acceleration of B relative to A is



(A) $\frac{g}{2}$ (B) g (C) $\frac{3g}{4}$ (D) zero

12. Block 'A' of mass 'm' is placed over a wedge 'B' of same mass 'm'. Assuming all surfaces to be smooth the displace of block 'A' in 1 sec if the system is released from rest is _____



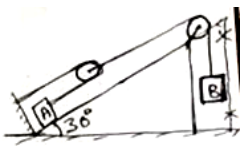
(A) $g\left(\frac{1+\sin^2\theta}{1-\sin^2\theta}\right)$ (B) $\frac{g\sin\theta}{2}$

(C) $g\left(\frac{\cos^2\theta}{1+\sin^2\theta}\right)$ (D) $g\left(\frac{\sin^2\theta}{1+\sin^2\theta}\right)$

13. Two small balls of same size and masses m_1 and $m_2\,(m_1 > m_2)$ are tied by a thin weightless thread and dropped from a certain height. Taking upward buoyancy force F into account the tension T of the thread during the flight after the motion of the ball becomes uniform will be _____

(A) $(m_1 - m_2)g$ (B) $(m_1 - m_2)\frac{g}{2}$ (C) $(m_1 + m_2)g$ (D) $(m_1 + m_2)\frac{g}{2}$

14. In the system shown in fig $m_B = 4kg$ and $m_A = 2kg$. The pulleys are massless and friction is absent every where. The acceleration of block A is _____ $\left(g = 10\ ms^{-2}\right)$



(A) $\frac{10}{3}\ ms^{-2}$ (B) $\frac{20}{3}\ ms^{-2}$

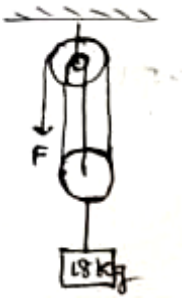
(C) $2\ ms^{-2}$ (D) $4\ ms^{-2}$

15. Find the tension in the string AB loaded with weight W at the middle. When AB is Horizontal

(A) Zero (B) W

(C) $\frac{W}{2}$ (D) infinity

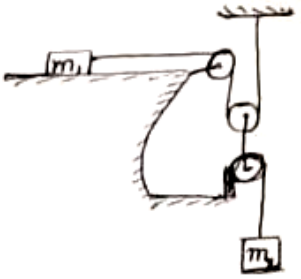
16. In the fig. at the free end of the light string a force 'F' is applied to keep the suspended mass of 18 kg at rest then the force exerted by the ceiling on the system (pulleys are light and smooth)



(A) 60 N (B) 120 N

(C) 180 N (D) 240 N

17. Two blocks of masses m_1 and m_2 are connected as shown in fig. The acceleration of the block m_2 is _____



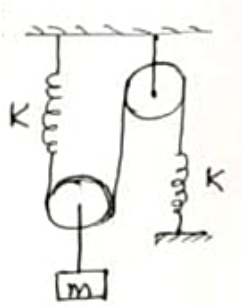
(A) $\frac{m_2 g}{m_1 + m_2}$ (B) $\frac{m_1 g}{m_1 + m_2}$

(C) $\frac{4m_2 g - m_1 g}{m_1 + m_2}$ (D) $\frac{m_2 g}{m_1 + 4m_2}$

18. The horizontal acceleration that should be given to a smooth inclined plane of angle $\sin^{-1}\left(\frac{1}{\ell}\right)$ to keep an object stationary on the plane relative to the plane is _____

(A) $\frac{g}{\sqrt{\ell^2 - 1}}$ (B) $g\sqrt{\ell^2 - 1}$ (C) $\frac{\sqrt{\ell^2 - 1}}{g}$ (D) $\frac{g}{\sqrt{\ell^2 + 1}}$

19. Block is attached to system of springs. Calculate equivalent spring constant



(A) K (B) 2K

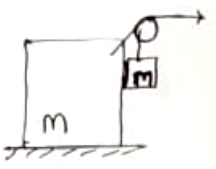
(C) 3K (D) 4K

20. Sand is being dropped on a conveyer belt at the rate of M kg/s. The force necessary to keep the belt moving with a constant velocity v m/s will be

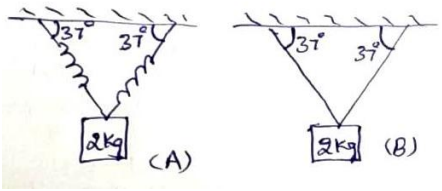
(A) $\frac{Mv}{2}$ (B) zero (C) Mv Newton (D) 2Mv newton

Numerical Based:

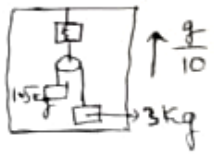
21. In the situation given all surfaces are frictionless. Pulley is ideal and string is light if $F = \frac{mg}{2}$. The acceleration of the big block is g/x, then 'x' is _____



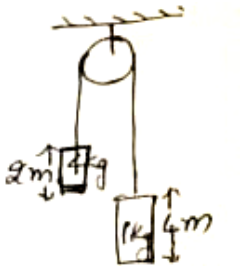
22. If at t = 0 right spring in (A) and right string in (B) breaks. The ratio of magnitudes of instantaneous acceleration of blocks A and B is $\frac{5x}{24}$. Calculate x _____



23. The elevator going up with an acceleration of g/10. The pulley and the string are light and the pulley is smooth. If reading of spring balance shown is 0.8 x. Calculate 'x'.



24. In fig both blocks are released from rest length of 4 kg blocks is 2m and of 1 kg is 4 m. Find the time they take to cross each other.



25. Two blocks of masses 10 kg and 20 kg are connected by a massless spring and are placed on a smooth horizontal surface. A force of 200 N is applied on 20 kg mass as shown in the diagram. At the instant the acceleration of 10 kg mass is 12 ms^{-2}. The acceleration of 20 kg is _____

KEY

1.	**C**	2.	**C**	3.	**A**	4.	**A**	5.	**B**
6.	**A**	7.	**A**	8.	**D**	9.	**B**	10.	**C**
11.	**C**	12.	**D**	13.	**B**	14.	**A**	15.	**D**
16.	**D**	17.	**A**	18.	**A**	19.	**B**	20.	**C**
21.	**4**	22.	**5**	23.	**6**	24.	**1**	25.	**4**

✻ *Wish You all the Best* ✻