JEE MAIN : CHAPTER WISE TEST-4

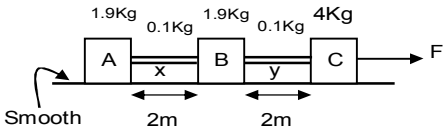
SUBJECT :- PHYSICS **DATE**.....

CLASS :- 11th **NAME**.....

CHAPTER :- NEWTON'S LAWS OF MOTION **SECTION**.....

(SECTION A)

1. Three blocks A, B & C are connected by two strings x & y as shown in figure



The system is pulled in right direction by force F. If breaking strength of strings x & y are 100N & 220N respectively then maximum value of F for which none of strings will breaks is.

(A) 400N (B) 440N

(C) 300N (D) 330N

2. Each of the figures below shows 3 blocks of masses 4m, 3m and 2m acted on by an external horizontal force F. For each figure, which of the following options is **INCORRECT**. (F_{AB} = Magnitude of the force that block A exerts on block B, F_{BC} = Magnitude of the force that block B exerts on block C) (Assume that the surface on which the blocks move is frictionless.)

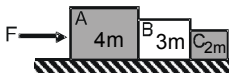


Figure-1

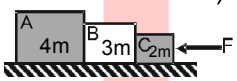


Figure-2

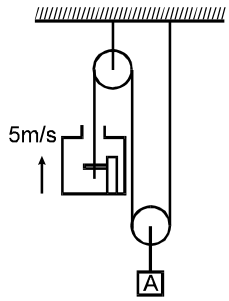
(A) In figure-1 $F_{AB} = \frac{5F}{9}$

(B) In figure-1 $F_{BC} = \frac{2F}{9}$

(C) In figure-2 $F_{AB} = \frac{4F}{9}$

(D) In figure-2 $F_{BC} = \frac{5F}{9}$

3. A motor is fixed inside a box which is moving upwards with velocity 5 m/s. String is winding at the rate 3 m/s. Then the velocity of block A will be:



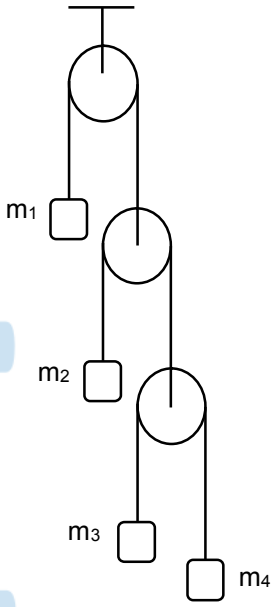
(A) 2.5 m/s downwards

(B) 5 m/s downwards

(C) 1 m/s downwards

(D) 2 m/s downwards

4. In the given arrangement all strings and pulleys are ideal. When system was released it was observed that m_1 & m_2 do not move. Then



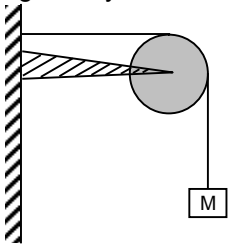
(A) $m_1 m_3 + m_1 m_4 = 4m_3 m_4$

(B) $m_2 m_3 + m_2 m_4 = 2 m_3 m_4$

(C) $m_2 m_3 + m_3 m_4 = 2m_3 m_4$

(D) $m_1 m_3 + m_1 m_4 = 8 m_3 m_4$

5. A string of negligible mass goes over a clamped pulley of mass m supports a block of mass M as shown in figure. The magnitude of force on the pulley by the clamp is given by



(A) $\sqrt{2}$ Mg

(B) $\sqrt{2}$ mg

(C) $\left(\sqrt{(M+m)^2+m^2}\right)g$

(D) $\left(\sqrt{(M+m)^2+M^2}\right)g$

6. The Newton's laws of motion are valid in-

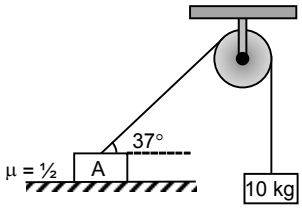
(A) inertial frames

(B) non-inertial frames

(C) rotating frames

(D) accelerated frames

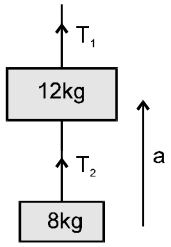
7. For the situation shown in figure below, there is no friction between pulley and string. For which of the following values of mass of block A, the system will stay at rest (g = 10 m/s^2)



(A) 4 Kg (B) 8 Kg

(C) 16 kg (D) 30 Kg

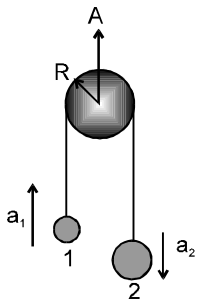
8. A body of mass 8 kg is hanging from another body of mass 12 kg. The combination is being pulled by a string with an acceleration of 2.2 m s^{-2}. The tension T_1 and T_2 will be respectively : (use g = 9.8m/s^2)



(A) 200 N, 80 N (B) 220 N, 90 N

(C) 240 N, 96 N (D) 260 N, 96 N

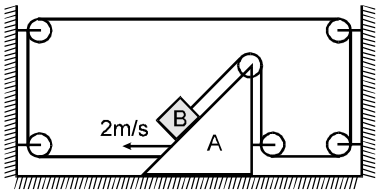
9. Two masses are connected by a string which passes over a pulley accelerating upward at a rate A as shown. If a_1 and a_2 be the acceleration of bodies 1 and 2 respectively then :



(A) A = $a_1 - a_2$ (B) A = $a_1 + a_2$

(C) A = $\frac{a_1 - a_2}{2}$ (D) A = $\frac{a_1 + a_2}{2}$.

10. System is shown in figure and wedge is moving towards left with speed 2 m/s. Then velocity of the block B will be:



(A) $\sqrt{3}$ m/s (B) 1 m/s

(C) 2 m/s (D) 0 m/s

11. A particle is moving with a constant speed along a straight line path. A force is not required to :

(A) increase its speed

(B) decrease its momentum

(C) change the direction

(D) keep it moving with uniform velocity

12. In which of the following cases the net force is not zero ?

(A) A kite skillfully held stationary in the sky

(B) A ball freely falling from a height

(C) An aeroplane rising upwards at an angle of 45º with the horizontal with a constant speed

(D) A cork lying on the surface of water

13. A force $\vec{F} = 6\ \hat{i} - 8\ \hat{j} + 10\ \hat{k}$ newton produces acceleration 1 m/s^2 in a body. The mass of the body is (in kg) :

(A) $6\ \hat{i} - 8\ \hat{j} + 10\ \hat{k}$ kg

(B) $10\sqrt{2}$ kg

(C) 100 kg

(D) 10 kg

14. A body of mass 32 kg is suspended by a spring balance from the roof of a vertically operating lift and going downward from rest. At the instants the lift has covered 20 m and 50 m, the spring balance showed 30 kg & 36 kg respectively. The velocity of the lift is:

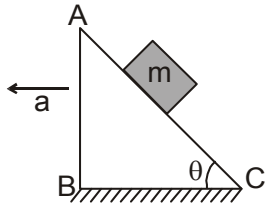
(A) decreasing at 20 m & increasing at 50 m

(B) increasing at 20 m & decreasing at 50 m

(C) continuously decreasing at a constant rate throughout the journey

(D) continuously increasing at constant rate throughout the journey

15. A block of mass m resting on a wedge of angle θ as shown in the figure. The wedge is given an acceleration a towards left. What is the minimum value of **a** due to external agent so that the mass m falls freely ?



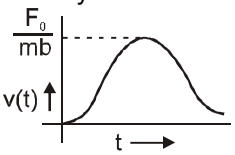
(A) g (B) g cos θ
(C) g cot θ (D) g tan θ

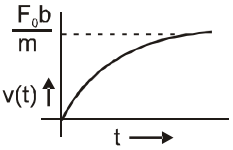
16. A block of mass m is connected to another block of mass M by a string (massless). The blocks are kept on a smooth horizontal plane. Initially the blocks are at rest. Then a constant force F starts acting on the block of mass M to pull it. Find the force on the block of mass m

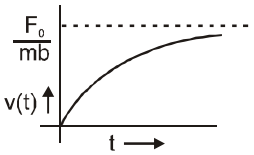
(A) $\frac{mF}{m}$ (B) $\frac{(M+m)F}{m}$

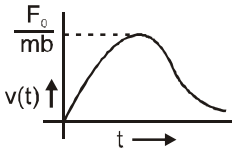
(C) $\frac{mF}{(m+M)}$ (D) $\frac{MF}{(m+M)}$

17. A particle of mass m is at rest at the origin at time t = 0. It is subjected to a force $F(t) = F_0e^{-bt}$ in the x direction. Its speed v(t) is depicted by which of the following curves ?

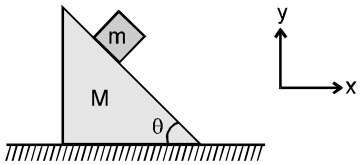
(A)


(B)


(C)


(D)


18. Consider the shown arrangement. Assume all surfaces to be smooth. If 'N' represents magnitude of normal reaction between block and wedge then acceleration of 'M' along horizontal equals:



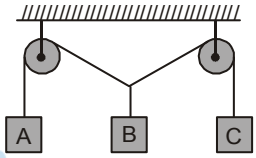
(A) $\frac{N\sin\theta}{M}$ along + ve-x-axis

(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

19. Three blocks A , B and C are suspended as shown in the figure. Mass of each block A and C is m. If system is in equilibrium and mass of B is M , then :



(A) M = 2 m (B) M < 2 m
(C) M > 2 m (D) M = m

20. Which of the following statement is absolutely correct about mass -

(A) More the mass of a body connected with spring balance more will be elongation in spring balance

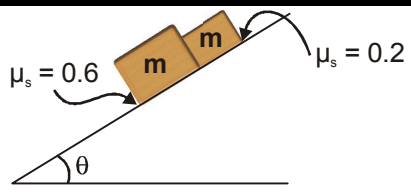
(B) More the mass of body kept in one pan of beam balance more the mass has to be kept on the other pan to keep beam-horizontal

(C) More the mass of a body, lesser will be its acceleration for a given force

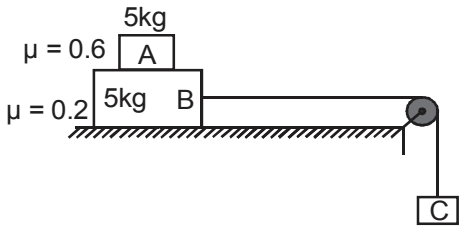
(D) All

(SECTION B)

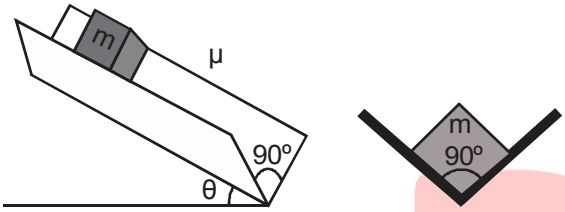
21. Two blocks of equal mass are kept in in contact with each other on an inclined plane as shown in figure. If θ_0 is the minimum value of angle θ for which both the blocks start sliding then what is the value of 2 cot θ_0.



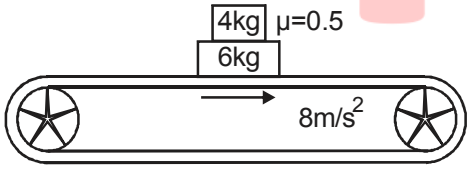
22. If acceleration of block B w.r.t. A is $2m/s^2$ just after the system isreleased from rest, then mass(in kg) of block C will be [pulley and string both are massless, take g = 10 m/s^2]



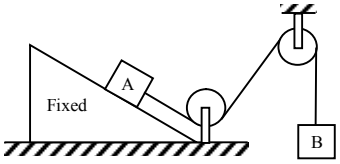
23. Value of angle of repose (in degrees) for a block placed inside an 'L-section' as shown in figure. Friction coefficient between block and both the surfaces is $\sqrt{\frac{8}{9}}$



24. A system of two blocks is placed on an accelerating conveyor belt. If there is no slipping between 6kg block and conveyor belt and friction coefficient between 4kg & 6kg block is 0.5 then frictional force acting between 6kg & conveyor belt will be

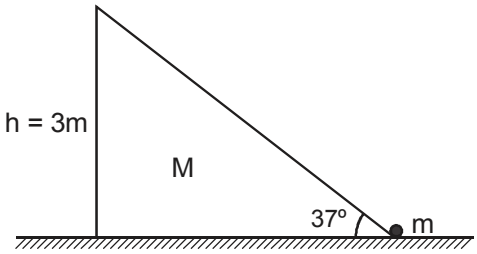


25. Two blocks A and B of equal mass m are connected through a massless string and arranged as shown in figure. Friction is absent everywhere. When the system is released from rest, then find the tension in string. Where m is 2 kg. (g = $10m/s^2$)

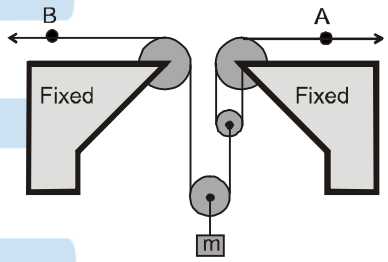


26. A uniform Rope of mass 400kg is pulled with a constant horizontal force F = 16 N on a horizontal rough surface (friction coefficient = 0.5). Tension at midpoint of the rope will be.

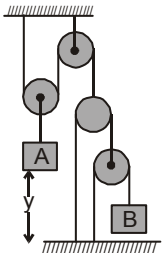
27. A smooth wedge of mass M = 10kg, height h = 3m angle of inclinationα = 37° is at rest at smooth horizontal surface. There is a small pointlike object (mass m = 0.5kg) next to the slope as shown in the figure. At what acceleration must wedge be moved in order that the point like object reaches its top in a time t = 5s. (Take right as positive direction.)



28. For the pulley system , each of the cables at A and B is given velocity of 4m/s in the direction of the arrow. Determine the upward velocity v of the load m. (in m/s)



29. The vertical displacement of block A in meter is given by $y = t^2/4$ where t is in second. Calculate the downward acceleration a_B of block B. (in m/s^2)



30. A bead of mass m is fitted on to a rod of a length of 2ℓ and can move on it without friction. At the initial moment the bead is in the middle of the rod. The rod moves translationally in a horizontal plane with an acceleration 'a' in a direction forming an angle α with the rod. Find the time when the bead will leave the rod. If ℓ = 2m, a = $2m/s^2$ and α = 60°