

EKLAVYA BATCH

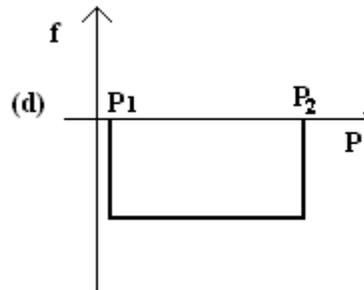
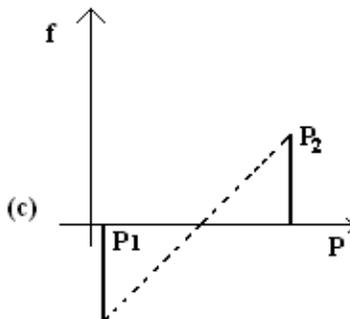
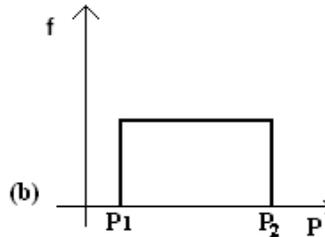
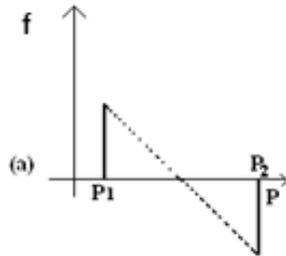
THE GURUKUL INSTITUTE

PLOT 5C, 2ND FLOOR, GANAPATI COMPLEX, SEC-13, OPP. JAIPURIA SCHOOL, VASUNDHRA, GHAZIABAD (U.P) PH NO. 9810780903
GURUKUL QUIZ-2 ON MECHANICS

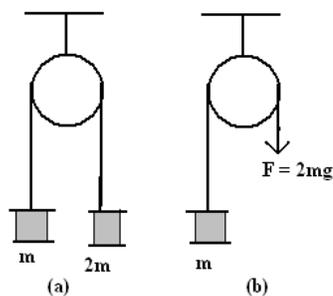
TIME : 3 HRS

M.M ; 100

1. A block of mass m is on an inclined plane of angle θ . The coefficient of friction between the plane and the block is μ and $\tan \theta > \mu$. The block is held stationary by applying a force P parallel to the plane. The direction of force pointing up the plane is taken to be positive. As P is varied from $P_1 = mg(\sin \theta - \mu \cos \theta)$ to $P_2 = mg(\sin \theta + \mu \cos \theta)$, the frictional force f versus graph will look like-

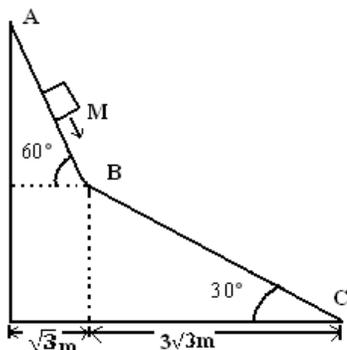


2. A point mass of 1 kg collides elastically with a stationary point mass of 5 kg. After their collision, the 1 kg mass reverses its direction and moves with a speed of 2m/s. Which of the following statement (s) is (are) correct for the system of these two masses?
- Total momentum of the system is 3kgm/s
 - Momentum of 5 kg mass after collision is 4 kg m/s.
 - Kinetic energy of the centre of mass is 0.75 J.
 - Total kinetic energy of the system is 4 J.
3. A body of mass 2kg moving with a speed of 100m/s hits a wall and rebounds with the same speed. If the contact time is (1/50)s, the force applied on the wall is
- 10^4 N
 - 2×10^4 N
 - 4N
 - 8N
4. A student uses a simple pendulum of exactly 1m length to determine g , the acceleration due to gravity. He uses a stop watch with the least count of 1 sec for this and record 40 seconds for 20 oscillations. For this observation, which of the following statement(s) is (are) true?
- Error ΔT in measuring T , the time period, is 0.05 seconds.
 - Error ΔT in measuring T , the time period is 1 second.
 - Percentage error in the determination of g is 5%.
 - Percentage error in the determination of g is 2.5%.
5. The pulley arrangement of figures (a) and (b) are identical. The mass of the rope is negligible. In the figure (a) the mass m is lifted by attaching a mass $2m$ to the other end of the rope. In figure (b) mass m is lifted up by pulling the other end of the rope with a constant downward force $F = 2mg$.

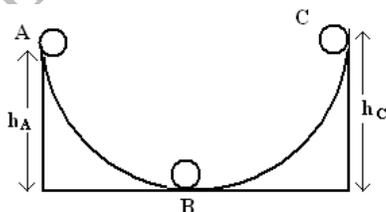


The ratio of acceleration in the two cases will be

- a) 1 : 1 b) 1 : 3 c) 3 : 1 d) 1 : 2
6. A lift is moving upward with acceleration 3.675 m/s^2 then weight at a person will be-
- a) Up to 37.5 % less c) up to 37.5 % more
- b) Up to 17.5% more d) remain same
7. A small block of mass M moves on a frictionless surface of an inclined plane. The angle of the incline suddenly changes from 60° to 30° at point B. The block is initially at rest at A. Assume that collisions between the block and the incline are totally inelastic ($g = 10 \text{ m/s}^2$)

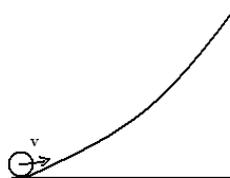


- A. The speed of the block at a point B immediately after it strikes the second incline is-
- a) $\sqrt{60} \text{ m/s}$ b) $\sqrt{45} \text{ m/s}$ c) $\sqrt{30} \text{ m/s}$ d) $\sqrt{15} \text{ m/s}$
- B. The speed of the block at point C, immediately before it leaves the second incline is –
- a) $\sqrt{120} \text{ m/s}$ b) $\sqrt{105} \text{ m/s}$ c) $\sqrt{90} \text{ m/s}$ d) $\sqrt{75} \text{ m/s}$
- C. If collision between the inclined plane and block is completely is elastic, then the vertical (upward) component of the velocity of the block at point B, immediately after it strikes incline is
- a) $\sqrt{30} \text{ m/s}$ b) $\sqrt{15} \text{ m/s}$ c) zero d) $-\sqrt{15} \text{ m/s}$
8. A ball moves over a fixed track as shown in the figure. From A to B the ball rolls without slipping. If surface BC is frictionless and K_a , K_b and K_c are kinetic energies of the ball at A, B and C respectively, then –



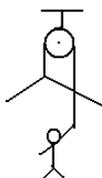
- a) $h_A > h_C$; $K_b > K_c$
- b) $h_A > h_C$; $K_c > K_a$
- c) $h_A = h_C$; $K_b = K_c$
- d) $h_A < h_C$; $K_b > K_c$

9. A small object with uniform density rolls up a curved surface with an initial velocity v . It reaches up to a maximum height of $3v^2/4g$ with respect to the initial position. The object is

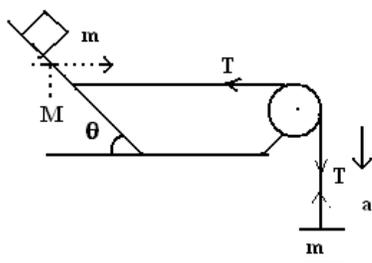


- a) Ring b) solid sphere c) hollow sphere d) disc.
10. Linear momentum of P of a body performing one dimensional motion is changing according to $P = at^3 + bt$ where a and b are positive constants then net force acting on the body is proportional to

- a) t^2 b) a constant c) t d) $1/t$
11. The following figure shows a painter in a platform suspended along the building. When the painter pulls the rope the force exerted on the floor is 450 N while the weight of the painter is 1000N. If the weight of the platform is 250N, the acceleration produced in the platform will be ($g = 10 \text{ m/s}^2$)



- a) 4 m/s^2 b) 2 m/s^2 c) 5 m/s^2 d) 6 m/s^2
12. What should be the value of m' (mass of suspended block) so as to prevent the smaller block m from sliding over the triangular block of mass M . all surfaces are frictionless and the string and pulley are light.



- a) $m' = \frac{m+M}{\cot \theta - 1}$ b) $m' = \frac{\cot \theta - 1}{m+M}$ c) $m' = \frac{m+M}{\tan \theta - 1}$ d) $m' = \frac{M-m}{\cot \theta - 1}$
13. A block of mass M placed on a smooth horizontal surface is pulled by a constant force F acting at an angle θ with the horizontal. The acceleration produced in the block is a . then –
- a) If $a \leq g/\tan \theta$, the acceleration is along the horizontal direction.
 b) If $a \leq g/\tan \theta$, the normal reaction is $N = M(g - a \tan \theta)$
 c) The acceleration a will not be parallel to the applied force F .
 d) All of the above.
14. Two monkeys A & B are of masses M and m respectively ($M > m$). They are holding a rope which is passing through a stationary smooth pulley. They moves on rope such that upward acceleration becomes double of downward acceleration of A then tension in the rope will be:
- a) $\frac{4Mmg}{2M+m}$ b) $\frac{3Mmg}{(M+2m)}$ c) $\frac{3Mmg}{2(M+m)}$ d) $\frac{3Mmg}{(M+m)}$
15. A person is standing on the floor of lift, releases a coin. Coin reaches on floor in time t_1 if lift is stationary, and coin reaches on floor in time t_2 if lift is moving with uniform velocity-

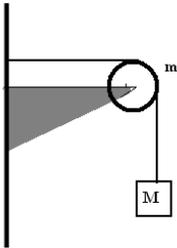
- a) $t_1 = t_2$
- b) $t_1 < t_2$
- c) $t_1 > t_2$
- d) $t_1 < t_2$ or $t_1 > t_2$ depends on lift on moving downwards or upwards.

16. A force of 6N acts on a body at rest of mass 1kg. during this time, the body attains a velocity 30m/s. th time for which the force acts on the body is-

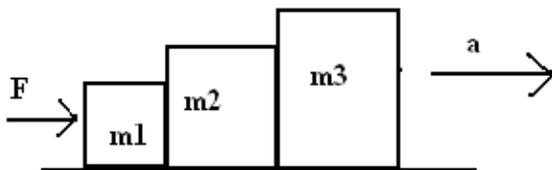
- a) 10 sec
- b) 8 sec
- c) 7 sec
- d) 5 sec.

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

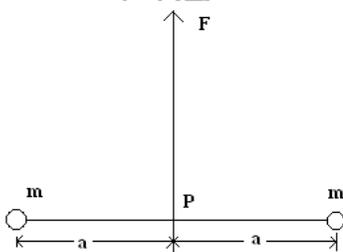
- a) $\sqrt{2} Mg$
- b) $\sqrt{2} mg$
- c) $[\sqrt{(M + m)^2 + m^2}]g$
- d) $[\sqrt{(M + m)^2 + m^2}]/g$



18. Three blocks of masses $m_1 = 1\text{kg}$, $m_2 = 1.5\text{ kg}$, and $m_3 = 2\text{kg}$ are in contact with each other on a friction less surface as shown in fig. find (a) horizontal force F needed to push the block as on unit with an acceleration of 4 m/sec^2 . (b) the resultant force on each block and (c) the magnitude of contact force between blocks.

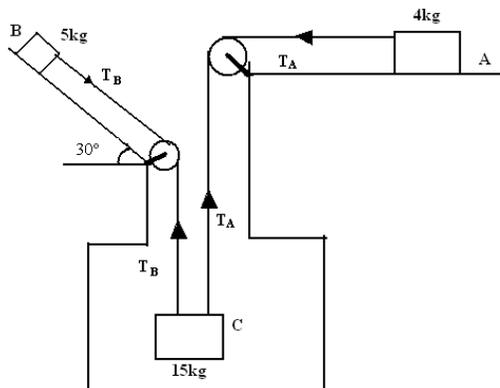


19. Two particles of mass m each are tied at the ends of a light string of length of length $2a$.The whole system is kept on a frictionless horizontal surface with the string held tight so that each mass is at a distance a from the centre P . Now, the midpoint of the string is pulled vertically upwards with a small but constant force F . As a result the particles move towards each other on the surface. Find the magnitude of acceleration, when the separation between them becomes twice.



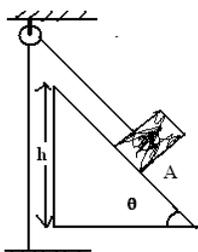
20. A solid cylinder rolls without slipping on an inclined plane at an angle θ . Find the linear acceleration of the cylinder. Mass of the cylinder is M .

21.



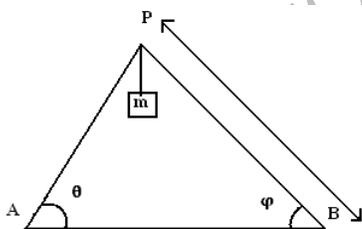
Find acceleration of the masses (coefficient of friction $\mu = 0.4$)?

22.



In the above system, the pulley and the string are mass less and a block A of mass m rests on an incline with coefficient of friction μ . The angle of inclination is θ . As the lock is released from rest to slide downwards, the spring gets extended. Calculate the speed of the block as it reaches the end of the wedge.

23. Two identical ladders are arranged as shown in the figure. Mass of each ladder is M and length L . the system is in equilibrium. Find direction and magnitude of frictional force acting at A or B.



24. An elevator and its load weight a total of 1600 lb. find the tension T in the supporting cable when the elevator, originally moving downward at 20ft s^{-1} is brought to rest with constant acceleration in a distance of 50 ft.

25. A lift is moving upwards with an acceleration a_0 . An inclined plane is placed in this lift. What is the time taken by a body of mass m in sliding down from the top of this plane to the bottom (if length of the base of the plane is l and angle is θ).