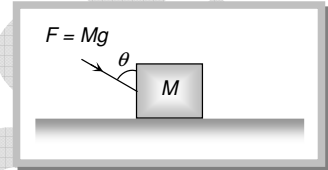


Friction Assignment

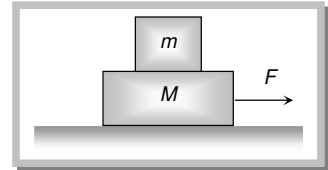
- A body is sliding down an inclined plane having coefficient of friction 0.5. If the normal reaction is twice that of the resultant downward force along the incline, the angle between the inclined plane and the horizontal is
(a) 15° (b) 30° (c) 45° (d) 60°
- A block of mass 2 kg rests on a rough inclined plane making an angle of 30° with the horizontal. The coefficient of static friction between the block and the plane is 0.7. The frictional force on the block is
(a) 9.8 N (b) $0.7 \times 9.8 \times \sqrt{3}\text{ N}$ (c) $9.8 \times \sqrt{3}\text{ N}$ (d) $0.7 \times 9.8\text{ N}$
- A body of weight W is lying at rest on a rough horizontal surface. If the angle of friction is θ , then the minimum force required to move the body along the surface will be
(a) $W \tan \theta$ (b) $W \cos \theta$ (c) $W \sin \theta$ (d) $W \cos \theta$
- A block of mass M is placed on a rough horizontal surface as shown in the figure. A force $F = Mg$ acts on the block. It is inclined to the vertical at an angle θ . The coefficient of friction is μ . The block can be pushed along the surface only when

- $\tan \theta \geq \mu$
- $\cot \theta \geq \mu$
- $\tan \theta / 2 \geq \mu$
- $\cot \theta / 2 \geq \mu$



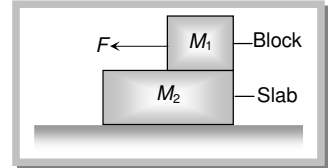
- A plane is inclined at an angle θ with the horizontal. A body of mass m rests on it. If the coefficient of friction is μ , then the minimum force that has to be applied parallel to the inclined plane to make the body just move up the inclined plane is
(a) $mg \sin \theta$ (b) $\mu mg \cos \theta$
(c) $\mu mg \cos \theta - mg \sin \theta$ (d) $\mu mg \cos \theta + mg \sin \theta$
- A block of mass m is placed on another block of mass M which itself is lying on a horizontal surface. The coefficient of friction between the two blocks is μ_1 and that between the block of mass M and horizontal surface is μ_2 . What maximum horizontal force can be applied to the lower block so that the two blocks move without separation

- $(M + m)(\mu_2 - \mu_1)g$
- $(M - m)(\mu_2 - \mu_1)g$
- $(M - m)(\mu_2 + \mu_1)g$
- $(M + m)(\mu_2 + \mu_1)g$



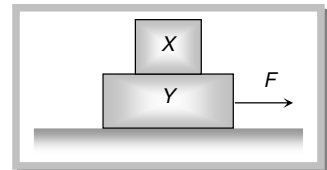
- A block of mass M_1 is placed on a slab of mass M_2 . The slab lies on a frictionless horizontal surface. The coefficient of static friction between the block and slab is μ_1 and that of dynamic friction is μ_2 . A force F acts on the block M_1 . Take $g = 10\text{ ms}^{-2}$. If $M_1 = 10\text{ kg}$, $M_2 = 30\text{ kg}$, $\mu_1 = 0.5$, $\mu_2 = 0.15$ and $F = 40\text{ N}$, what will be the acceleration with which the slab will move

- 5 ms^{-2}
- 2 ms^{-2}
- 1 ms^{-2}
- Zero



- In the above problem if $F = 100\text{ N}$, what will be the acceleration with which the slab will move
(a) 5 ms^{-2} (b) 2 ms^{-2} (c) 1 ms^{-2} (d) None of these
- A block X of mass 4 kg is lying on another block Y of mass 8 kg . As shown in the figure. When the force acting on X is 12 N , block X is on the verge of slipping on Y . The force F in Newton necessary to make both X and Y move simultaneously will be

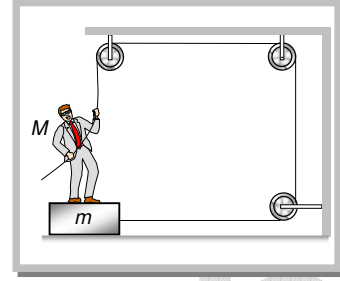
- 36
- 3.6
- 0.36
- 3.6



GRAVITY CLASSES

19. A board of mass m is placed on the floor and a man of mass M is standing on the board as shown. The coefficient of friction between the board and the floor is μ . The maximum force that the man can exert on the rope so that the board does not slip on the floor is

- (a) $F = \mu(M + m)g$
 (b) $F = \mu mg$
 (c) $F = \frac{\mu Mg}{\mu + 1}$
 (d) $F = \frac{\mu(M + m)g}{\mu + 1}$

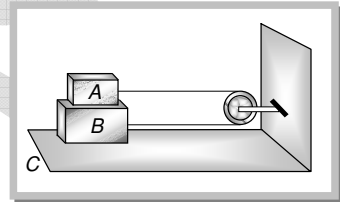


20. A body slides over an inclined plane forming an angle of 45° with the horizontal. The distance x travelled by the body in time t is described by the equation $x = kt^2$, where $k = 1.732$. The coefficient of friction between the body and the plane has a value

- (a) $\mu = 0.5$ (b) $\mu = 1$ (c) $\mu = 0.25$ (d) $\mu = 0.75$

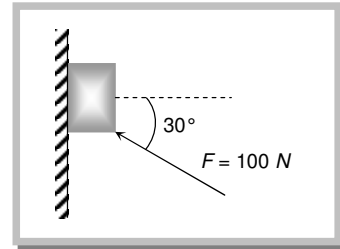
21. Two blocks A and B of masses m and M respectively are placed on each other and their combination rests on a fixed horizontal surface C . A light string passing over the smooth light pulley is used to connect A and B as shown. The coefficient of sliding friction between all surfaces in contact is μ . If A is dragged with a force F then for both A and B to move with a uniform speed we have

- (a) $F = \mu(M + m)g$
 (b) $F = \mu mg$
 (c) $F = \mu(3M + m)g$
 (d) $F = \mu(3m + M)g$



22. A force of 100 N is applied on a block of mass 3 kg as shown in figure. The coefficient of friction between the surface of the block is $1/4$. The friction force acting on the block is

- (a) 15 N downwards
 (b) 25 N upwards
 (c) 20 N downwards
 (d) 20 N upwards



23. A block moves down a smooth inclined plane of inclination θ . Its velocity on reaching the bottom is v . If it slides down a rough inclined plane of same inclination its velocity on reaching the bottom is v/n , where n is a number greater than 0. The coefficient of friction μ is given by

- (a) $\mu = \tan \theta \left[1 - \frac{1}{n^2} \right]$ (b) $\mu = \cot \theta \left[1 - \frac{1}{n^2} \right]$ (c) $\mu = \tan \theta \left[1 - \frac{1}{n^2} \right]^{\frac{1}{2}}$ (d) $\mu = \cot \theta \left[1 - \frac{1}{n^2} \right]^{\frac{1}{2}}$

24. Consider a car moving along a straight horizontal road with a speed of 72 km/hr . If the coefficient of static friction between the tyres and the road is 0.5 , the shortest distance in which the car can be stopped is ($g = 10\text{ m/s}^2$)

- (a) 30 m (b) 40 m (c) 72 m (d) 20 m

25. All the surfaces shown in the figure are rough. The direction of friction on B due to A is

- (a) Zero
 (b) To the left
 (c) Upwards
 (d) Downwards

