PHYSICS

BOOKS - MTG GUIDE PHYSICS (HINGLISH)

LAWS OF MOTION

Illustration

1. A force $\vec{F} = \left(6\hat{i} - 8\hat{j} + 10\hat{k}\right) N$ produces acceleration of $1 ms^{-2}$ in a body. Calculate the

mass of the body.

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2. A block of 5 kg is resting on a frictionless plane. It is struck by a jet releasing water at the rate of 3 kg/s at a speed of 4 ms^{-1}. Calculate the initial acceleration of the block.

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3. A force of 50 N acts in the direction as shown in figure on a block of mass 5 kg, resting on a smooth horizontal surface. Find the acceleration of the block.

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4. A man weighing $80kg$ is standing on a trolley weighting $320kg$. The trolley is resting on frictionless horizontal rails. If the man

starts walking on the trolley along the rails at speed $1m/s$ (w.r.t. to trolley) then after $4s$ his displacement relative to the ground will be :

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5. A cricket ball of mass 0.2 kg moves with a velocity of 20 m/s and is brought to rest by a player in 0.1 s. Calculate the impulse of the ball and average force applied by the player.

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6. A hammer of mass 1 kg moving with a speed of 6 ms^{-1} strikes a wall and comes to rest in 0.1 sec. Calculate

Impulse of the force

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7. A hammer of mass 1 kg moving with a speed of 6 ms^{-1} strikes a wall and comes to rest in 0.1 sec. Calculate

Average retarding force that stops the hammer

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8. A hammer of mass 1 kg moving with a speed of 6 ms^{-1} strikes a wall and comes to rest in 0.1 sec. Calculate

Average retardation of the hammer

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9. In figure A, B and C, each block have acceleration a_1, a_2 anda_3 respectively. F_1 and

F_2 are external forces of magnitude 2mg and mg respectively. Find the value of a_1, a_2 and a_3

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10. A pulley system is shown in figure, pulley p_1 is fixed to a rigid support and pulley P_2 is capable of moving freely upward or downward. The pulleys and strings are ideal. Weights of two masses A and B are 200 N and 300 N

respectively. Find the tensions T_1 and T_2 and also the acceleration of A and B ($g = 10ms^{-2}$).

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11. A rope of negligible mass can support a load of M kg. Prove that the mass of the greatest load which can be raised is equal to $\frac{M}{1+\frac{2h}{gt^2}}$kg, where g is the acceleration due to gravity and h is the height through which the

said load rises from rest with uniform acceleration in time t.

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12. A horizontal force of 500 N pulls two masses 10 kg and 20 kg (lying on a frictionless table) connected by a light string. What is the tension in the string ? Does the answer depend on which mass end the pull is applied?

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13. A uniform rope of length L , resting on frictionless horizontal table is pulled at one end by a force F . What is the tension in the rope at a distance x from the end where the force is applied ?

[Hint : Consider the motion of the entire rope and the motion of x length of rope using P = ma formula and third law of motion]

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14. Two blocks are attached to the two ends of a string passing over a smooth pulley as shown in the figure. Find the acceleration of the block.

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15. A body of mass m rests on a horizontal rough platform. Coefficient of static friction is

u. Calculate the minimum possible force required to move the body along the platform.

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16. What is the maximum value of the force F such that the block shown in the arrangement does not move?

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17. A block of mass 0.1 kg is pressed EUR against a wall with a horizontal force of 5 N as shown in the figure. If the coefficient of friction between the wall and the block is 0.5, calculate the frictional force acting on the block.

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18. If the coefficient of friction between an insect and bowl is μ and the radius of the bowl is r, find the maximum height to which the insect can crawl in the bowl.

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19. A car is moving in a circular horizontal track of radius 10 m with a constant speed of 10 m/s. A plumb bob is suspended from the roof of the car by a light rigid rod. What will be the

angle made by the rod with the vertical? (g = 10 ms^{-2})

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Neet Cafe Topicwise Practive Questions Newton S Laws Of Motion

1. A cricketer catches a ball of mass 150 gm. in 0.1 second moving with speed $20ms^{-1}$. Then he experiences force of : -

A. 300 N

B. 30 N

C. 3N

D. 0.3 N

Answer: B

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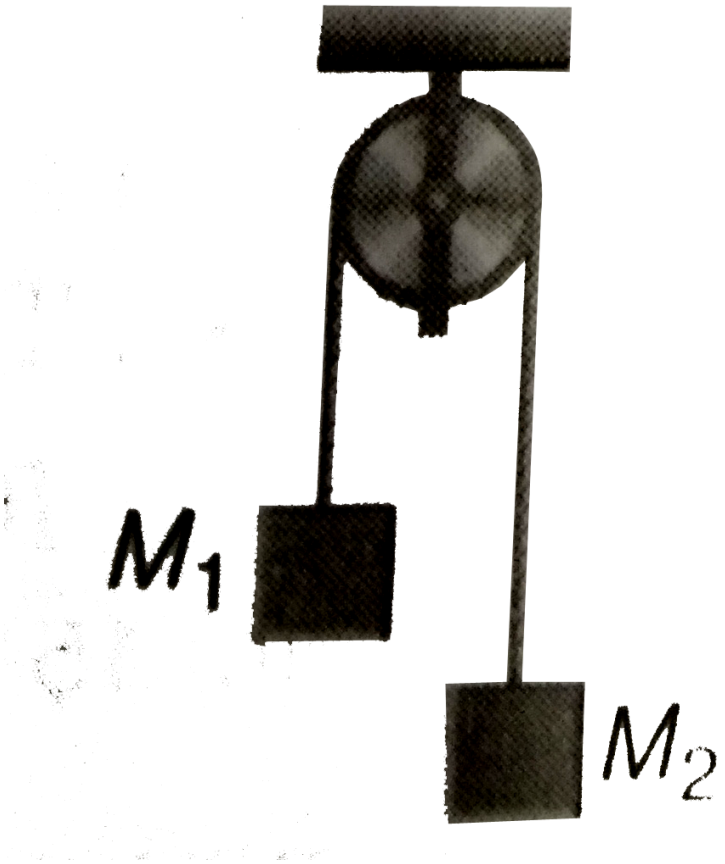
2. Two masses $M_1 = 5kg, M_2 = 10$kg are connected at the ends of an inextensible string passing over a frictionless pulley as shown. When masses are released, then

acceleration of masses will be



A. g

B. g/2

C. g/3

D. g/4

Answer: C

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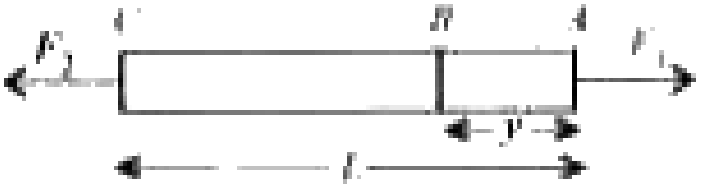
3. A rod of length L and mass M is acted on by two unequal forces F_1 and $F_2(< F)$as shown in the figure.



The tension in the rod at a distance y from the end A is given by

A. $F_1\left(1-\frac{y}{L}\right)+F_2\left(\frac{y}{L}\right)$

B. $F_2\left(1-\frac{y}{L}\right)+F_1\left(\frac{Y}{L}\right)$

C. $(F_1-F_2)\frac{y}{L}$

D. None of these

Answer: A

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4. A book is lying on the table. What is the angle belween the action of the book on the table and the reaction of the table on the book?

A. 0°

B. 45°

C. 90°

D. 180°

Answer: D

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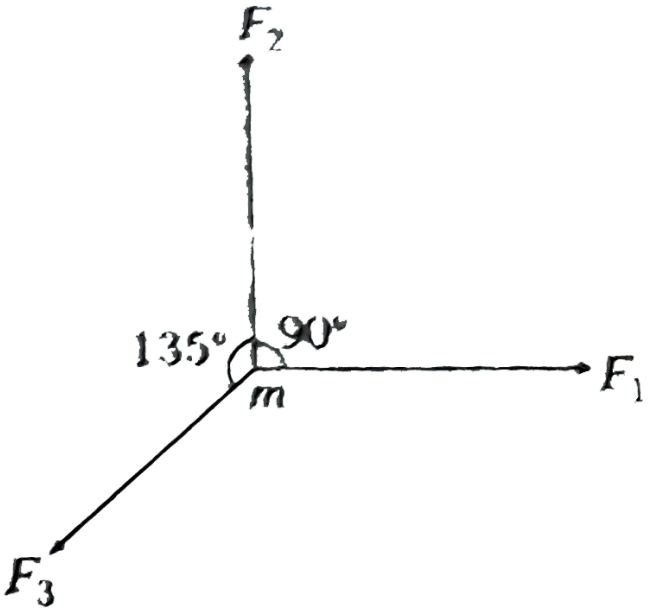
5. When a force F acs on a body of mass m the acceleration product in the body is a . If htree equal forces $F_1 = F_2 = F_3 = F$ act on the same body as shown in figure the accleration produced is



A. $\left(\sqrt{2}-1\right)a$

B. $\left(\sqrt{2}+1\right)a$

C. $\sqrt{2}a$

D. a

Answer: A

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6. The ratio of the weight of a man in a stationary lift and when it is moving downward with uniform acceleration ' a ' is

3 : 2. The value of ' a ' is (g - Acceleration due to gravity of the earth)

A. $\frac{3}{2}g$

B. $\frac{g}{3}$

C. g

D. $\frac{2}{3}g$

Answer: B

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7. A block released from rest from the top of a smooth inclined plane of angle θ_1 reaches the bottom in time t_1. The same block released from rest from the top of another smooth inclined plane of angle θ_2 reaches the bottom in time t_2 If the two inclined planes have the same height, the relation between t_1 and t_2 is

A. $\frac{t_2}{t_1} = \left(\frac{\sin\theta_1}{\sin\theta_2}\right)^{1/2}$

B. $\frac{t_2}{t_1} = 1$

C. $\frac{t_2}{t_1} = \frac{\sin\theta_1}{\sin\theta_2}$

D. $\frac{t_2}{t_1} = \frac{\sin^2\theta_1}{\sin^2\theta_2}$

Answer: C

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8. A block of weight 4 kg is resting on a smooth horizontal plane. If it is struck by a jet of water at the rate of 2 kg s^{-1} and at the speed of 10 m s', then the initial acceleration of the block is

A. $15ms^{-2}$

B. $10ms^{-2}$

C. $2.5ms^{-2}$

D. $5ms^{-2}$

Answer: D

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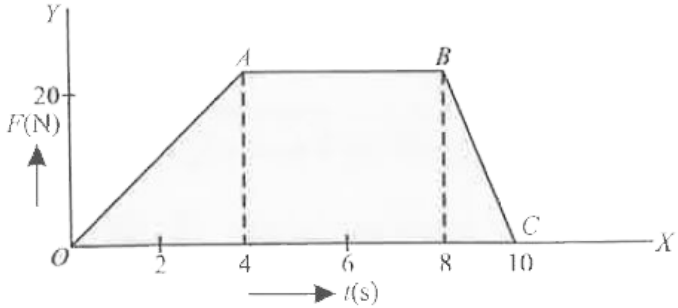
9. A body of mass 5 kg is acted on by a net force F which varies with time t as shown in the given figure. Then the net momentum in S.I. units gained by the body at the end of 10

seconds is



A. $0kgms^{-1}$

B. $100kgms^{-1}$

C. $140kgms^{-1}$

D. $200kgms^{-1}$

Answer: C

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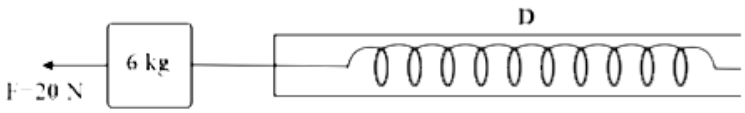
10. A dynamometer D, which is a device used to measure force, is attached to two blocks of masses 6 kg and 4 kg. Forces of 20 N and 10 N are applied on the blocks as shown in the figure. The reading of the dynamometer is



A. 10 N

B. 20 N

C. 6 N

D. 14N

Answer: D

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11. A string of length L and mass M is lying on a horizontal table. A force F is applied at one of its ends. Tension in the string at a distance x from the end at which force is applied is

A. Zero

B. F

C. $\frac{F(L-y)}{L}$

D. $\frac{F(l-y)}{M}$

Answer: C

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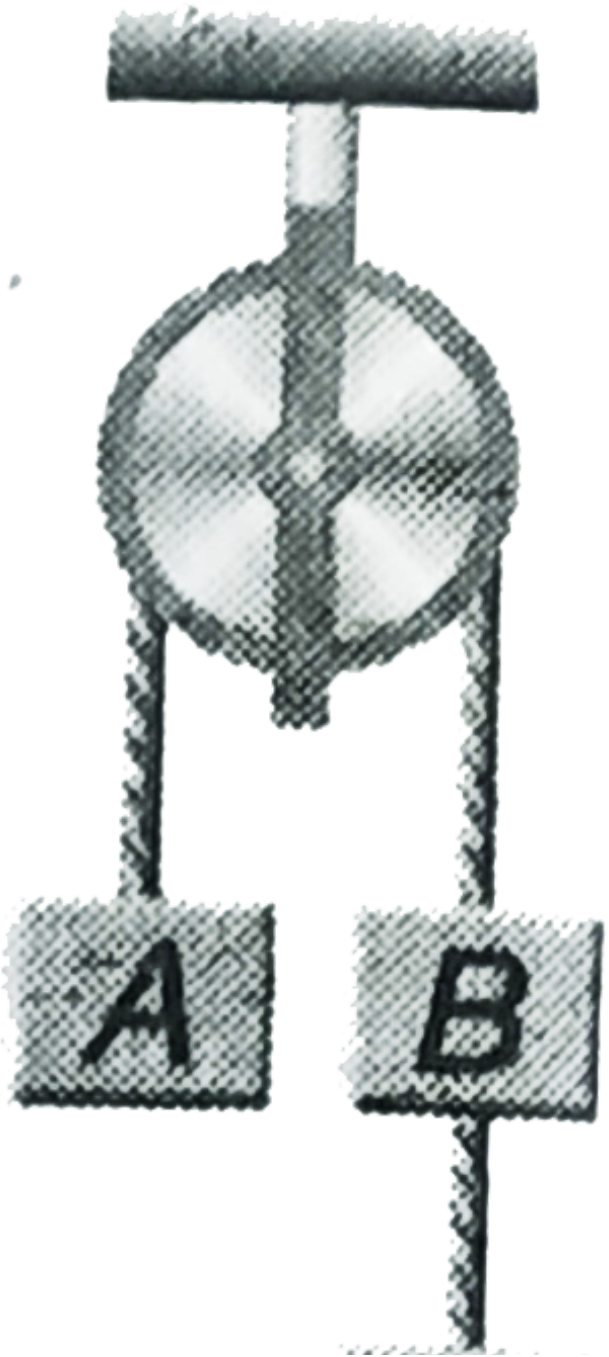
12. Three equal weight A, B and C of mass $2kg$ each are hanging on a string passing over a fixed frictionless pulley as shown in the figure. The tension in the string connecting

weights B and C is approximately



A. Zero

B. 13 N

C. 3.3 N

D. 19.6 N

Answer: B

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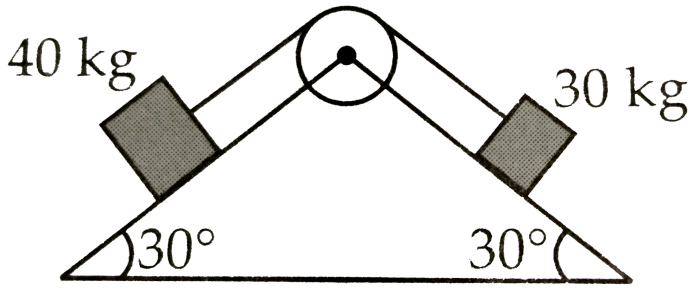
13. Two blocks of masses of 40 kg and 30 kg are connected by a weightless string passing over a frictionless pulley as shown in the figure.



A. 188 N

B. 2=368 N

C. 288 N

D. 168 N

Answer: D

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14. Sand particles drop vertically at the rate of $2kgs^{-1}$ on a conveyor belt moving horizontally with a velocity of $0.2ms^{-1}$.

The extra force required to keep the belt moving is

A. 0.4 N

B. 0.08 N

C. 0.04 N

D. 0.2 N

Answer: A

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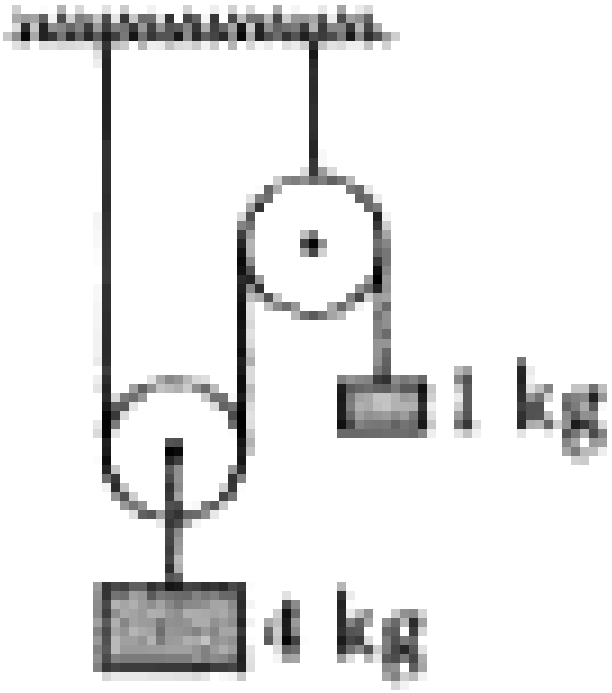
15. In the system shown in the figure, the acceleration of 1 kg block is



A. $\frac{g}{2}$ downwards

B. $\frac{g}{2}$ upwards

C. $\frac{g}{4}$ downwards

D. $\frac{g}{4}$ upwards

Answer: B

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16. An object is kept on a smooth inclined plane of height 1 unit and length l units. The horizontal acceleration to be imparted to the inclined plane so that the object is stationary relative to the incline is

A. $g\sqrt{l^2-1}$

B. $g\left(l^2-1\right)$

C. $\frac{g}{\sqrt{l^2-1}}$

D. $\frac{g}{l^2-1}$

Answer: C

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17. A body, under the action of a force $\overrightarrow{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$, acquires an acceleration of $1ms^{-2}$. The mass of this body must be.

A. 10 kg

B. 20 kg

C. $10\sqrt{2}kg$

D. $2\sqrt{10}kg$

Answer: C

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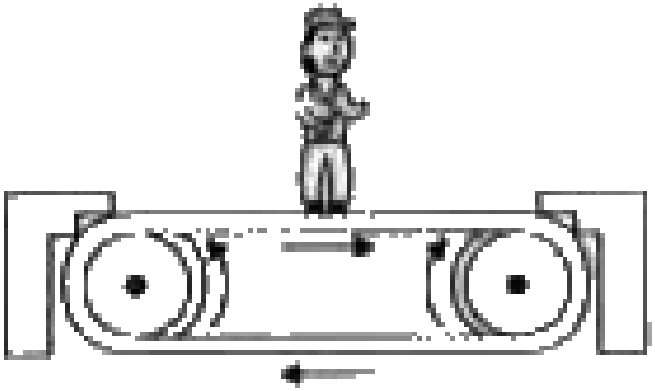
18. Figure shows a man standing stationary with respect to a horizontal conveyer belt that is accelerating with 1 ms^{-2} What is the net

force on the man? (Mass of the man = 65 kg)



A. 35N

B. 45N

C. 55N

D. 65N

Answer: D

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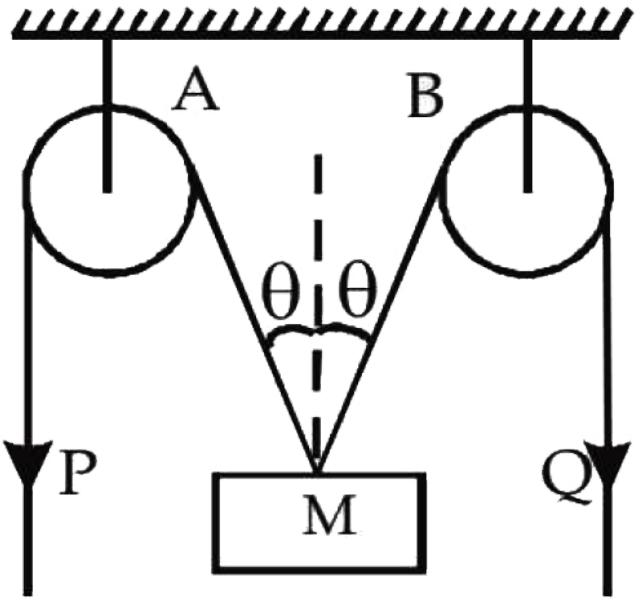
19. In the arrangement shown in the Fig, the ends P and Q of an unstretchable string move downwards with uniform speed U. Pulleys A and B are fixed.

Mass M moves upwards with a speed



A. $2v\cos\theta$

B. $v\cos\theta$

C. $\dfrac{2v}{\cos\theta}$

D. $\frac{v}{\cos\theta}$

Answer: D

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20. A player caught a cricket ball of mass 150g moving at a rate of $20m/s$. If the catching process is completed in 0.1s, the force of the blow exerted by the ball on the hand of the player is equal to

A. 3 N

B. 30 N

C. 300 N

D. 150N

Answer: B

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21. Ten one-rupee coins are put on top each other on a table. Each coin has a mass m. The rection of the 6^{th} coin (counted from the bottom) on the 7^{th} coin is

A. 4mg

B. 6mg

C. 7mg

D. 3mg

Answer: A

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22. Physical independence of force is a Consequcnce of

A. third law of motion

B. second law of motion

C. first law of motion

D. all of these laws

Answer: C

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23. A man of mass 60 kg is standing on a spring balance inside a lift. If the lift falls

downwards, then the reading of the spring balance will be:-

A. zero

B. 60 kg f

C. $< 60kgf$

D. $> 60kgf$

Answer: A

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24. The force on a particle of mass $10g$ is $\left(\hat{i}10 + \hat{j}5\right)$N If it starts from rest what would be its position at time $t = 5s$?

A. $12500\hat{i} + 6250\hat{j}m$

B. $6250\hat{i} + 12500\hat{j}m$

C. $12500\hat{i} + 12500\hat{j}m$

D. $6250\hat{i} + 6250\hat{j}m$

Answer: A

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25. A body is moving under the action of two force $\overrightarrow{F_1 = 2\hat{i} - 5\hat{j}}$, $\overrightarrow{F_2 = 3\hat{i} - 4\hat{j}}$. Its velocity will become uniform under a third force $\overrightarrow{F_3}$ given by.

A. $5\hat{i} - \hat{j}$

B. $-5\hat{i} - \hat{j}$

C. $5\hat{i} + \hat{j}$

D. $-5\hat{i} + 9\hat{j}$

Answer: D

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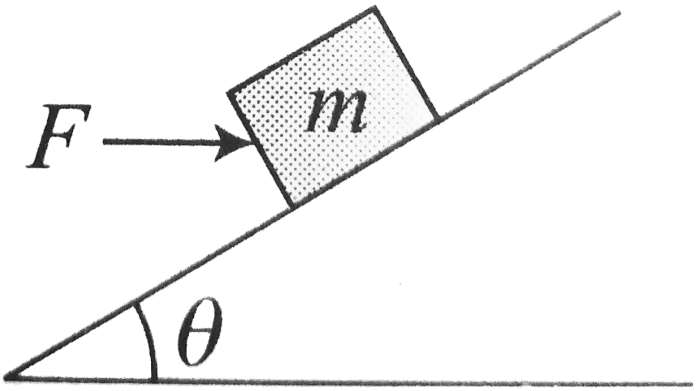
26. A horizontal force acting on a block of mass m which is placed on an inclined plane (as shown in the figure). What is the normal reaction N on the block?



A. $gm \sin\theta + f \cos\theta$

B. $mg\sin\theta - F\cos\theta$

C. $mg\cos\theta - F\sin\theta$

D. $mg\cos\theta + f\sin\theta$

Answer: D

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27. A ball of mass m is thrown upward with a velocity v. If air exerts an average resisting force F, the velocity with which the ball returns to the thrower is

A. $v\sqrt{\frac{mg}{mg+F}}$

B. $v\sqrt{\frac{F}{mg+F}}$

C. $v\sqrt{\frac{mg-F}{mg+F}}$

D. $v\sqrt{\frac{mg+F}{mg}}$

Answer: C

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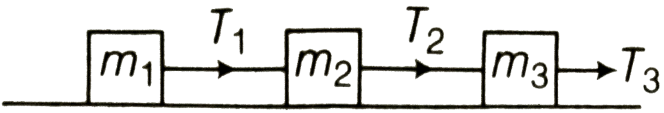
28. Three blocks of masses m_1, m_2 and m_3 are connected by mass less string as shown

kept on a frictionless table.



They are pulled with a force $T_3 = 40N$. If $m_1 = 10kg, m_2 = 6kg$ and $m_3 = 4kg$, the tension T_2 will be

A. 10 N

B. 20 N

C. 32 N

D. 40 N

Answer: B

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29. Two bodies with masses m_1 and $m_2(m_2 > m)$connected by a thread lie on a smooth table. A force Q is first applied to the larger mass and then to the smaller mass. The ratio of tensions in the thread in the two cases will be

A. $\frac{m_1}{m_2}$

B. $\frac{m_1}{m_2}$

C. $\frac{m_2}{m_1 + m_2}$

D. $\frac{m_1}{m_2 - m_2}$

Answer: A

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30. A 5000 kg rocket is set for vertical firing. The exhaust speed is 800 m/s. To give an initial upward acceleration of 20 m/s^2, the

amount of gas ejected per second to supply the needed thrust will be (Take $g = 10m/s^2$)

A. $187.5kg/s$

B. $157.5kg/s$

C. $137.5kg/s$

D. $127.5kg/s$

Answer: A

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31. A lift is moving down with acceleration a. A man in the lift drops a ball inside the lift. The acceleration of the ball as observed by the man in the lift and a man standing stationary on the ground are respectively

A. g,g

B. a,a

C. $(g-a), g$

D. a, g

Answer: C

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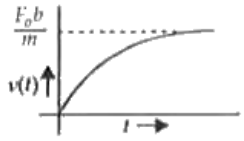
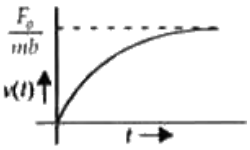
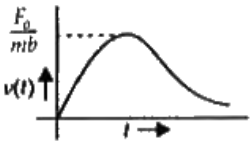
32. A particle of mass m is at rest the origin at time $t = 0$. It is subjected to a force $F(t) = F_0 e^{-bt}$ in the x - direction. Its speed $v(t)$ is depicted by which of the following curves ?

A. 

B. 

C. 

D. 

Answer: B

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33. A 1 kg particle strikes a wall with velocity 1 m/s at an angle of 60° with the wall and reflects at the same angle. If it remains in contact with wall for 0.1 s, then the force is

A. 0

B. $10\sqrt{3}$ N

C. $30\sqrt{3}N$

D. $40\sqrt{3}N$

Answer: B

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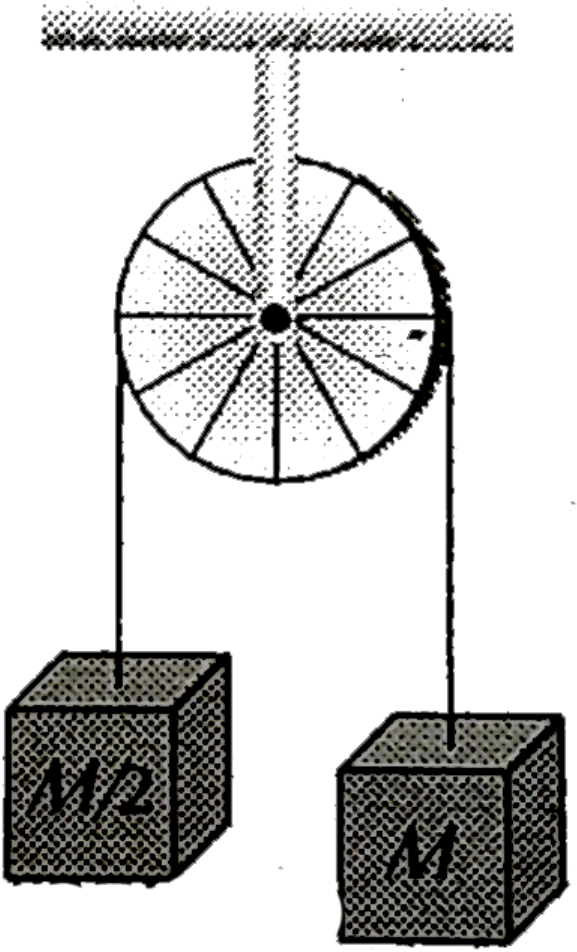
34. Two masses M and M/ 2 are joint together by means of a light inextensible string passes over a frictionless pulley as shown in figure.

When bigger mass is released the small one will ascend with an acceleration of



A. $\frac{g}{3}$

B. $\frac{3g}{2}$

C. g

D. $\frac{g}{2}$

Answer: A

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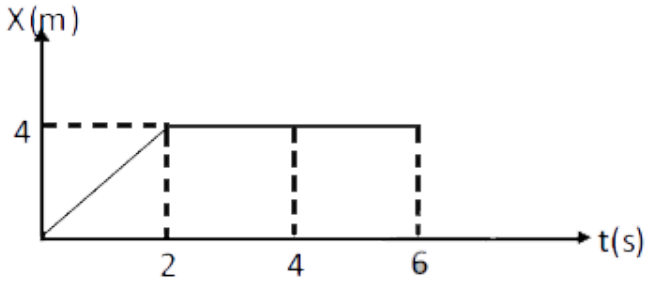
35. The position-time graph of a particle of mass 0.1 kg is shown. The impulse at t = 2s is :



A. $0.2kgms^{-1}$

B. $0.02kgms^{-1}$

C. $0.1kgms^{-1}$

D. $0.4kgms^{-1}$

Answer: A

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36. A trolley of mass 300 ks carrying a sand bag of 25 kg is moving uniformly with a speed of $27km/h$ on a frictionless track. After a while, sand starts leaking out of a hole on the trolley's floor at the rate of $0.05kgs^{-1}$. What is the speed of the trolley after the entire sand bag is empty ?

A. $27kmh^{-1}$

B. $54kmh^{-1}$

C. $108kmh^{-1}$

D. $135kmh^{-1}$

Answer: A

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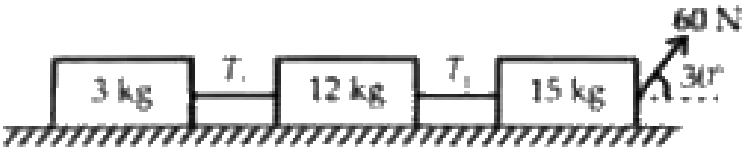
37. Three masses are connected as shown in figure on a horizontal frictionless surface and pulled by a force of 60 N. The tensions T_1 and T_2 are in the ratio



A. $1:1$

B. $1:5$

C. $1:4$

D. $4:5$

Answer: B

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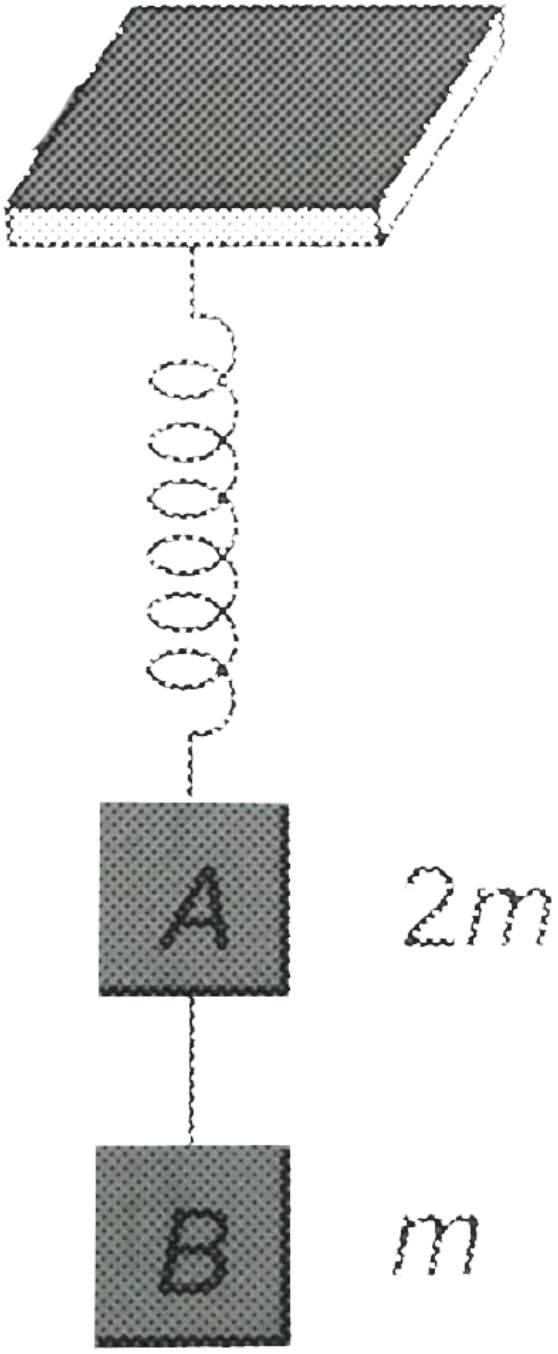
38. Two blocks A and B of masses 2m and respectively, are connected by a massless and inextensible string. The whole system is suspended by a masslessspring as shown in

the figure. The magnitude of acceleration of A and B, immediately after the string is cut, are

respectively


A
2m
B
m

A. $g, \frac{g}{2}$

B. $\frac{g}{2}, g$

C. g, g

D. $\frac{g}{2}, \frac{g}{2}$

Answer: B

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39. A $0.2kg$ object at rest is subjected to a force $\left(0.3\hat{i} - 0.4\hat{j}\right)N$. What is its velocity vector after $6\,\sec$

A. $\left(9\hat{i}-12\hat{j}\right)$

B. $\left(8\hat{i}-16\hat{j}\right)$

C. $\left(12\hat{i}-9\hat{j}\right)$

D. $\left(16\hat{i}-8\hat{j}\right)$

Answer: A

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40. A light string passing over a smooth light pulley connects two blocks of masses m_1 and

m_2 (vertically). If the acceleration of the system is $g/8$, then the ratio of the masses is

A. $8:1$

B. $9:7$

C. $4:3$

D. $5:3$

Answer: B

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41. In a rocket of mass 1000 kg fuel is consumed at a rate of 40 kg/s . The velocity of the gases ejected from the rocket is $5 \times 10^4 m/s$. The thrust on the rocket is

A. $2 \times 10^3 N$

B. $2 \times 10^4 N$

C. $2 \times 10^6 N$

D. $2 \times 10^8 N$

Answer: C

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42. In a tug-of-war contest, two men pull on a horizontal rope from opposite sides. The winner will be the man who

A. exerts greater force on the rope

B. exerts greater force on the ground

C. exerts a force on the rope which is greater than the tension in the rope

D. makes a smaller angle with the vertical

Answer: B

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43. Bullets of $0.03kg$ mass each hit a plate at the rate of 200 bullets per second with a velocity of $30m/s$. The average force acting on the plate in newton is

A. 120

B. 180

C. 300

D. 480

Answer: D

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44. A monkey climbs up and another monkey climbs down a rope hanging from a tree with same uniform acceleration separately. If the respective masses of monkeys are in the ratio 2:3, the common acceleration must be

A. $\frac{g}{5}$

B. $6g$

C. $\frac{g}{2}$

D. g

Answer: A

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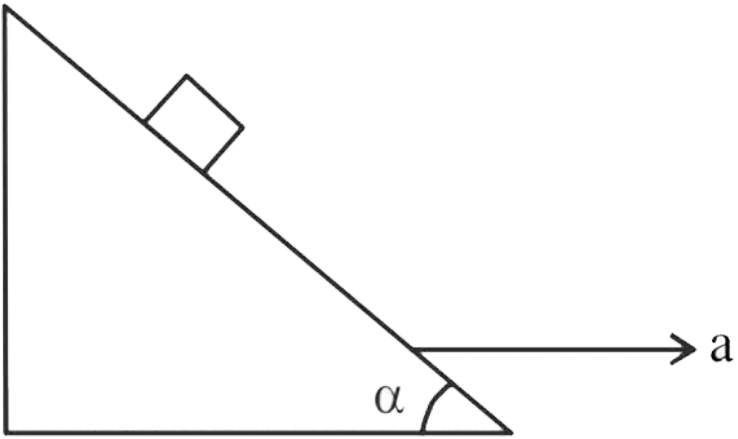
45. A block is kept on a frictionless inclined surface with angle of inclination α. The incline is given an acceleration 'a' to keep the block

stationary. Then a is equal to



A. $g\tan\alpha$

B. g

C. $g\cos ec\alpha$

D. $\frac{g}{\tan\alpha}$

Answer: A

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46. A block of mass m is resting one a smooth horizontal surface. One end of a uniform rope of mass m/3 is fixed to the block, which is pulled in the horizontal direction by applying force F at the other end. The tension in the middle of the rope is

A. $\frac{8}{7}S$

B. $\frac{1}{7}F$

C. $\frac{1}{8}F$

D. $\frac{7}{8}F$

Answer: D

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47. A body of mass 40 kg wants to climb up a rope hanging vertically. The rope can withstands a maximum tension of 500 N. What

is the maximum acceleration with which the boy can climb rope? Tak e $g = 10m / s^2$

A. $1.5ms^{-2}$

B. $2.0ms^{-2}$

C. $2.5ms^{-2}$

D. $3.0ms^{-2}$

Answer: C

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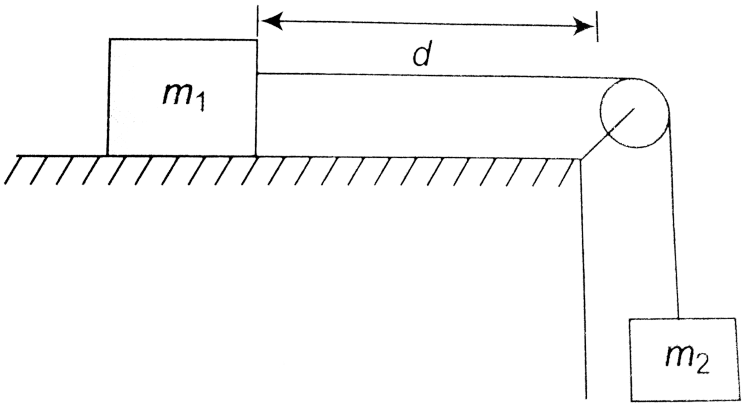
48. A block of mass m_1 lies on a smooth horizontal table and is connected to another freely hanging block of mass m_2 by a light inextensible string passing over a smooth fixed pulley situated at the edge o fthe table. Initially the system is at rest with m_1 a distance d from the pulley. Then the time taken for m_1 to reach the pulley is.



A. $\frac{m_2 g}{m_1 + m_2}$

B. $\sqrt{\frac{2d(m_1 + m_2)}{m_2 g}}$

C. $\frac{\sqrt{2m_2 d}}{(m_1 + m_2)g}$

D. $\sqrt{\frac{2m_1 d}{(m_1 + m_2)g}}$

Answer: B

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49. A block of mass m is connected to another block of mass M by a spring (massless) of

spring constant k. The block are kept on a smooth horizontal plane. Initially the blocks are at rest and the spring is unstretched. Then a constant force F starts acting on the block of mass M to pull it. Find the force of the block of mass M.

A. $\frac{MF}{m+M}$

B. $\frac{mF}{M}$

C. $\frac{(M+m)F}{m}$

D. $\frac{mF}{m+M}$

Answer: D

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50. The force on a rocket moving with a velocity 300 m/s is 210N. The rate of consumption of fuel of rocket is

A. $0.07kg/s$

B. $1.4kg/s$

C. $0.7kg/s$

D. $10.7kg/s$

Answer: C

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51. A body of mass 5 kg statrs from the origin with an initial velocity $\overrightarrow{u} = \left(30\hat{i} + 40\hat{j}\right)ms^{-1}$. If a constant force $\left(-6\hat{i} - 5\hat{j}\right)N$ acts on the body, the time in which they component of the velocity becomes zero is

A. $5s$

B. $20s$

C. $40s$

D. $80s$

Answer: C

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52. Two masses M_1 and M_2 are accelerated uniformly on a frictionless surface as shown in figure. The ratio of the tensions $\frac{T_1}{T_2}$ is

A. $\frac{M_1}{M_2}$

B. $(M_2)(M_1)$

C. $\frac{(M_1 + M_2)}{M_2}$

D. $\frac{M_1}{(M_1 + M_2)}$

Answer: D

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53. A chain of 5 links each of mass 0.1 kg is lifted vertically with a constant acceleration 1.2 ms^2. The force of interaction between the top link and the one immediately below it is

A. 5.5 N

B. 4.4 N

C. 3.04 N

D. 7.6 N

Answer: B

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54. Three masses of 1 kg, 6 kg and 3 kg are connected to each other with strings and are placed on a table as shown in figure. What is

the acceleration with which the system is moving? (Take g = 10 ms^{-2})

A. zero

B. $1ms^{-2}$

C. $2ms^{-2}$

D. $3ms^{-2}$

Answer: C

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55. A man of mass 90 kg is standing in a lift whose cable broke suddenly. If the lift falls freely, the force exerted by the floor on the man is

A. 90 N

B. 180 N

C. zero N

D. any negative value

Answer: C

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56. Two masses of 40 kg and 30 kg are connected by a weightless string passing over a frictionless pulley as shown in the figure. The acceleration of the system would be

A. $0.7ms^{-2}$

B. $0.8ms^{-2}$

C. $0.6ms^{-2}$

D. $0.5ms^{-2}$

Answer: A

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57. A boy of mass 40 kg stands in a frame of mass 360 kg. He pulls on a light rope which passes over a pulley. The other end of the rope is firmly attached to the frame. What force should be exerted by the boy on the rope for the system to be in equilibrium?

A. 40g

B. 400g

C. 200g

D. 100g

Answer: C

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58. Two masses of 10 kg and 20 kg respectively are tied together by a massless spring. A force of 200 N is applied on a 20 kg mass as shown

in figure. At the instant shown, the acceleration of 10 kg mass is 12 ms^{-2} the acceleration of 20 kg mass is

A. 0

B. $10ms^{-2}$

C. $4ms^{-2}$

D. $12ms^{-2}$

Answer: C

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59. A body stands on a weighing machine inside a lift. When the lift is going down wit acceleration $g/4$, the machine shows a reading 30 kg. When the lift goes upwards with acceleration $g/4$, the reading would be

A. $18kg$

B. $37.5kg$

C. $50kg$

D. $67.5kg$

Answer: C

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60. A triangular block of mass M with angle $30^\circ, 60^\circ, 90^\circ$ rests with its $30^\circ - 90^\circ$ side on a horizontal smooth fixed table. A cubical block of mass m rests on the $60^\circ - 30^\circ$ sideofthe triangular block. What horizontal acceleration a must M have relative to the stationary table so that m remains stationary

with respect to the triangular block [M = 9 kg, m = 1 kg]

A. g

B. $\frac{g}{\sqrt{2}}$

C. $\frac{g}{\sqrt{3}}$

D. $\frac{g}{\sqrt{(3)}}$

Answer: C

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61. A block of mass m starting from rest slides down a smooth inclined plane of gradient e, fixed in a lift moving upwards with an acceleration an as shown in figure. If the base of the inclined plane has length L, the time taken by the block to slide from top to bottom of the inclined plane, will be

A. $\dfrac{L}{(g_a \_ 0)\sin 2\theta}$

B. $\left[\dfrac{4L}{(g+a_0)\sin 2\theta}\right]^{1/2}$

C. $\dfrac{(g+a_0)\sin 2\theta}{2L}$

D. $\left[\frac{2L}{(g+a_0)\sin\theta}\right]^2$

Answer: B

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62. Two blocks of mass 4 kg and 6 kg are attached to the ends of a string passing over a pulley. The 4 kg mass is attached to the table by another string. The tension in this string T_1 is

A. $19.6N$

B. $25N$

C. $10.6N$

D. $10N$

Answer: A

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63. Human heart is pumping blood with constant velocity v m s^{-1} at the rate of M kg s^{-1}. The force required for this is (in N)

A. M

B. Mv

C. $\frac{M}{v}$

D. $v\frac{dM}{dt}$

Answer: B

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64. Which one of the following is not force

A. Impulse

B. Tension

C. Thrust

D. Weight

Answer: A

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65. Two bodies of masses 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a frictionless pulley. The acceleration of the system is :

A. $\frac{g}{2}$

B. $\frac{g}{3}$

C. $\frac{g}{5}$

D. $\frac{g}{10}$

Answer: C

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66. A passenger getting down from a moving bus, falls in the direction of the motion of the bus. This is is an example for

A. inertia of motion

B. second law of motion

C. third law of motion

D. inertia of rest

Answer: A

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67. A body of mass 6 kg is hanging from another of mass 10 kg as shown in figure. This combination is being pulled up by a string

with an acceleration of 2 ms^{-2} The tension T_1 is $(g = 10ms^2)$

A. 240 N

B. 150 N

C. 220N

D. 192 N

Answer: D

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68. Which one of the following is not a contact force?

A. Viscous force

B. Magnetic force

C. Friction

D. Buoyant force

Answer: B

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69. Same force acts on two bodies of different masses 3 kg and 5 kg initially at rest. The ratio of time required to acquire same final velocity is

A. $5:3$

B. $25:9$

C. $9:25$

D. $3:5$

Answer: D

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70. A large force is acting on a body for a short time. The impulse imparted is equal to the change in

A. acceleration

B. momentum

C. energy

D. velocity

Answer: B

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71. A man, of mass 60kg, is riding in a lift. The weights of the man, when the lift is acceleration upwards and downwards at $2ms^{-2}$ are respectively.

(Taking $g = 10ms^{-2}$)

A. 720 N and 480 N

B. 480 N and 720 N

C. 600 N and 600 N

D. 600 N and 480 N

Answer: A

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72. In the system shown in figure, tension T_3 is

A. $5g$

B. $3g$

C. g

D. $6g$

Answer: D

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73. Two pulley arrangements (A) and (B) are as shown in the figure. Neglect the masses of the ropes and pulleys and the friction at the axle of the pulleys. The ratio of the acceleration of mass m in arrangement (A) to that in arrangement (B) is

A. $1:1$

B. $1:2$

C. $1:3$

D. $2:1$

Answer: C

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74. A man sits on a chair supported by a rope passing over a frictionless fixed pulley. The man who weighs $1,000N$ exerts a force of

$450N$ on the chair downwards while pulling the rope on the other side. If the chair weighs $250N$ then the acceleration of the chair is .

A. $0.45ms^{-2}$

B. zero

C. $\frac{9}{25ms^{-2}}$

D. $2ms^{-2}$

Answer: D

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75. Rocket propulsion is associated with

A. the conservation of angular momentum

B. the conservation of mass

C. the conservation of mechanical energy

D. Newton's III law of motion

Answer: D

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76. The elevator shown in figure is descending, with an acceleration of $2ms^{-2}$. The mass of the block A is 0.5 kg and the mass of the block B is 1 kg. The force exerted by the block A on the block B is (Take g = $10ms^{-2}$)

A. $2N$

B. $4N$

C. $6N$

D. $8N$

Answer: B

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77. Two bodies of masses m and M are attached to the two ends of a light string passing over a fixed ideal pulley $(M > > m)$. When the bodies are in motion, the tension in the string is approximately

A. $(m - m)g$

B. mg

C. $2mg$

D. $\left(\frac{m}{M}\right)mg$

Answer: C

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78. A trolley T of mass 5 kg on a smooth horizontal surface is pulled by a load of 2 kg through a uniform rope ABC of length 2 m and mass 1 kg, (figure). As the load falls from BC =0 m to BC = 2 m, its acceleration, in m s2

changes from (Take g = 10 ms^{-2})

A. $\frac{20}{6}$ to $\frac{30}{6}$

B. $\frac{20}{8}$ to $\frac{30}{8}$

C. $\frac{20}{5}$ to $\frac{30}{6}$

D. $\frac{20}{6}$ to $\frac{30}{5}$

Answer: D

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79. Two blocks of 2 kg and 1 kg are in contact on a frictionless table. If a force of 3 N is applied on 2 kg block, then the force of contact between the two blocks will be

A. $0N$

B. $1N$

C. $2N$

D. $3N$

Answer: B

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80. A body of mass 0.05 kg is observed to fall with an acceleration of $9.5ms^{-2}$. The opposing force (in newton) of air on the bod is $(g = 9.8ms^{-2})$

A. $0.015N$

B. $0.15N$

C. $0.030N$

D. zero

Answer: A

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81. A block of mass 10 kg is moving horizontally with a speed of 1.5 ms^{-1} on a smooth plane. If a constant vertical force 10N acts on it, the displacement of the block from the point of application of the force at the end of 4 second is

A. 5m

B. 20 m

C. 12 m

D. 10 m

Answer: D

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Neet Cafe Topicwise Practive Questions Law Of Conservation Of Linear Momentum And Its Applications

1. Two ice skaters A and B approach each other at right angles. Skater A has a mass 30 kg and velocity 1 m/s and skater B has a mass 20 kg and velocity 2 m/s. They meet and cling together. The final velocity of the couple is

A. 2 m/s

B. 1.5 m/s

C. 1 m/s

D. 2.5 m/s

Answer: C

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2. A 5 kg shell kept at rest suddenly splits up into three parts. If two parts of mass 2 kg each are found flying due north and east with a velocity of 5 m/s each, what is the velocity of the third part after explosion ?

A. 10 m/s due north-east

B. $\frac{10}{\sqrt{2}}$ m/s due south-east

C. $10\sqrt{2}$m/s due south-west

D. $10\sqrt{2}$m/s due south-east

Answer: C

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3. A shell of mass 100 g moving with speed of 50 ms^{-1} along a straight line inclined at an angle $\tan^{-1}\left(\frac{4}{3}\right)$ to the horizontal bursts into two pieces. The piece of mass 60 g starts moving horizontally with a speed of 50 ms^{-1}. The other piece moves with a speed of

A. $50ms^{-1}$ opposite to the first piece

B. 100 ms^{-1} in vertically downward direction

C. $50ms^{-1}$ in the same direction as the first piece

D. zero (remains at rest)

Answer: B

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4. A man of $50kg$ is standing at one end on a boat of length $25m$ and mass $200kg$.If he starts running and when he reaches the other end, has a velocity $2ms^{-1}$ with respect to the boat.The final velocity of the boat is

A. $\frac{2}{5}$

B. $\frac{2}{3}$

C. $\frac{8}{5}$

D. $\frac{8}{3}$

Answer: A

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5. A jet engine works on the principle of conservation of

A. conservation of linear momentum

B. conservation of mass

C. conservation of energy

D. conservation of angular momentum

Answer: A

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6. Newton's third law of motion leads to the law of conservation of

A. linear momentum

B. angular momentum

C. potential energy

D. kinetic energy

Answer: A

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Neet Cafe Topicwise Practive Questions Equilibrium Of Concurrent Forces

1. A ball of mass 1 kg hangs in equilibrium from two strings OA and OB as shown in figure. What are the tensions in strings OA and OB? (Taking g = 10 m/s^2)

A. $5N,$ zero

B. zero$5\sqrt{3}N$

C. $5N, 5\sqrt{3}N$

D. $5\sqrt{3}N, 5N$

Answer: C

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2. A body of mass m is suspended by two strings making angles α and β with the horizontal. Tensions in the two strings are

A. $T_1 = \frac{mg\cos\beta}{\sin(\alpha+\beta)} = T_2$

B. $T_1 = \frac{mg\sin\beta}{\sin(\alpha+\beta)} = T_2$

C. $T_1 = \frac{mg\cos\theta}{\sin(\alpha+\beta)}, T_2 = \frac{mg\cos\alpha}{\sin(\alpha+\beta)}$

D. None of these

Answer: C

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3. A mass M of 100 kg is suspended with the use of strings A, B and C as shown in the figure, where W is the vertical wall and R is a

rigid horizontal rod. The tension in the string B is

A. $100gN$

B. zero

C. $100\sqrt{2}N$

D. $\frac{100}{\sqrt{2}}gN$

Answer: A

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4. A mass M is hung with light inextensible strings as shown in the figure. The tension in the horizontal string is

A. $\sqrt{3}mg$

B. $\sqrt{2}Mg$

C. $\frac{Mg}{\sqrt{3}}$

D. $\frac{Mg}{2}$

Answer: A

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5. A mass of 10 kg is suspended from a spring balance. It is pulled aside by a horizontal string so that it makes an angle of 60° with the vertical. The new rading of the balance is

A. $10\sqrt{3}kgwt$

B. $20\sqrt{3}kgwt$

C. $20kgwt$

D. 10 kg wt

Answer: C

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6. A body is said to be in equilibrium if all the forces acting on it

A. are in the same direction

B. are equal in magnitude

C. have zero resultant

D. can be arranged in pair

Answer: C

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7. Three concurrent co-planer force $1N$, $2N$ and $3N$ acting along different directions on a body

A. can keep the body in equilibrium if 2 N and 3 N act at right angle.

B. can keep the body in equilibrium if I N and 2 N act at right angle.

C. cannot keep the body in equilibrium.

D. can keep the body in equilibrium if 1 N and 3 N act at an acute angle.

Answer: C

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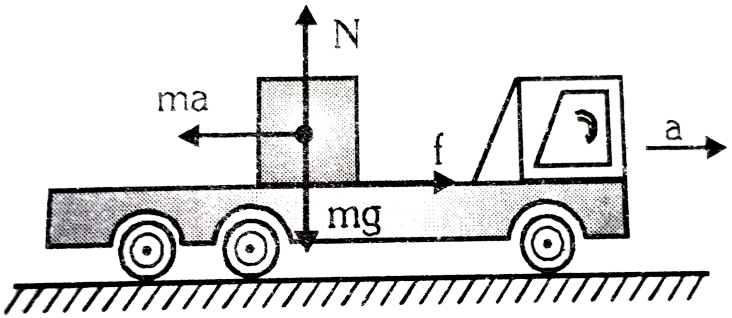
Neet Cafe Topicwise Practive Questions Friction

1. A block of mass 1kg lies on a horizontal surface in a turck, the coefficient of static fricition between the block and the surface is

0.6, what is the force of fricition on the block.

If the acceleration of the truck is $5m/s^2$.



A. 5N

B. 6N

C. 7N

D. 8N

Answer: A

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2. A homogoneous chain of length L lies on a table. The coefficient of friction between the chain and the table is μ. The maximum length which can hang over the table in equilibrium is

A. $\left(\frac{\mu}{\mu+1}\right)L$

B. $\frac{1-\mu}{\mu}\Big)L$

C. $\frac{1-\mu}{1+\mu}\Big)L$

D. $\left(\frac{2\mu}{\mu+1}\right)L$

Answer: A

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3. A trolley of mass M is attached to a block of mass m by a string passing over a frictionless pulley as shown in figure.

If the coefficient of friction between the trolley and the surface below is , what is the acceleration of the trolley and the block system, when they are released ?

A. $\left(\frac{m-M}{m+M}\right)g$

B. $\frac{m}{M}g$

C. $\frac{\mu m-M}{m+M}\Big)g$

D. $\left(\frac{m-\mu M}{m+M}\right)g$

Answer: D

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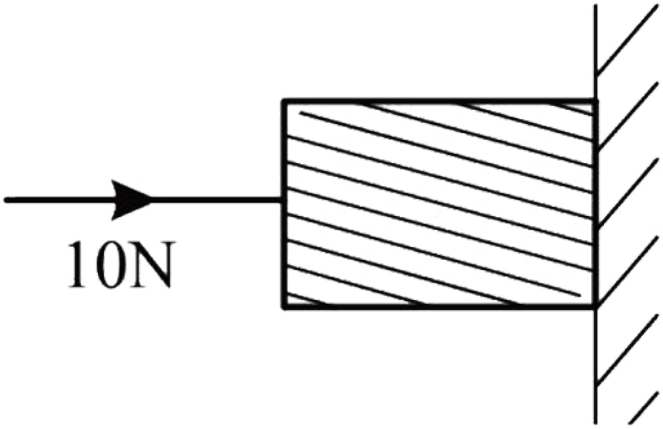
4. A horizontal force of 10N is necessary to just hold a block stationary against as well. The coefficient of friction between the block and

the wall is 0.2. The weight of the block is



A. 20 N

B. 50 N

C. 100 N

D. 2 N

Answer: D

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5. A marble block of mass 2 kg lying on ice when given a velocity of $6m/s$ is stopped by friction in 10s. Then the coefficient of friction is

A. 0.02

B. 0.03

C. 0.06

D. 0.01

Answer: C

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6. An object is placed on the surface of a smooth inclined plane of inclination . It takes time t to reach the bottom of the inclined plane. If the same object is allowed to slide

down rough inclined plane of same inclination , it takes time nt to reach the bottom where n is a number greater than 1. The coefficient of friction 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. $\mu = \tan\theta\left[1 - \frac{1}{n^2}\right]^{1/2}$

D. $\mu = \cot\theta\left[1 - \frac{1}{n^2}\right]^{1/2}$

Answer: A

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7. An ice cart of mass 60 kg rests on a horizontal snow patch with coefficient of static friction 1/3. Assuming that there is no vertical acceleration, then the magnitude of the maximum horizontal force required to move the ice cart is (g = 9.8 ms^{-2})

A. 100 N

B. 110 N

C. 209 N

D. 196 N

Answer: D

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8. A body of mass 25 kg is at rest on a horizontal surface. Minimum horizontal force required to just start the motion is 73.5 N and a force of 49 N is needed to keep the body moving with a constant velocity. What is the coefficient of static friction?

A. 0.2

B. 0.3

C. 0.4

D. 0.5

Answer: B

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9. 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 , magnitude of force required to move the body is equal to :

A. $\frac{W\cos\phi}{\cos(\theta-\phi)}$

B. $\frac{W\sin\phi}{\cos(\theta+\phi)}$

C. $\frac{W\tan\phi}{\sin(\theta-\phi)}$

D. $\frac{W\sin\theta}{\tan(\theta-\phi)}$

Answer: B

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10. A body of mass 40kg resting on a rough horizontal surface is subjected to a force P which is just enough to start the motion of the body. If $\mu_s = 0.5\mu_k = 0.4, g = 10ms^{-2}$ an dthe force P is continuously applied on the body, then the accceleration of the body is.

A. zero

B. $1ms^{-2}$

C. $2ms^{-2}$

D. $2.4ms^{-2}$

Answer: B

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11. A body of mass m slides down a rough plane of inclination α . If μ is the coefficient of friction, then acceleration of the body will be

A. $g \sin \alpha$

B. $\mu \cos \alpha$

C. $g(\sin \alpha - \mu \cos \alpha)$

D. $g(\cos \alpha - \mu \sin \alpha)$

Answer: C

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12. If μ_k is the coefficient of kinetic friction, μ_l is the coefficient of rolling friction and us is the coefficient of static friction, then

A. $\mu_s > \mu_k > \mu_r$

B. $\mu_s < \mu_k < \mu_r$

C. $\mu_s < \mu_r < \mu_k$

D. $\mu_s \mu_r > \mu_k$

Answer: A

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13. An object is gently placed on a long conveyer belt moving with a speed of 5 ms^{-1} If the coefficient of friction between the object and the belt is 0.5, the block will slide on the belt up to a distance (Take g = 10 ms^{-2})

A. $2.0m$

B. $2.5m$

C. $3.0m$

D. $3.5m$

Answer: B

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14. A horizontal force just sufficient to move a body of mass $4kg$ lying on a rought horizontal surface is applied on it .The coefficient of static and kinetic friction the body and the surface are $0.8 \text{ and } 0.6$ respectively If the

force contines to act even after the block has started moving the acceleration of the block in ms^{-2} is $\left(g = 10ms^{-2}\right)$

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. 2

D. 4

Answer: C

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15. A body takes time to reach the bottom of an inclined plane of angle with the horizontal. If the plane is made rough, time taken now is 2t. The coefficient of friction of the rough surface is

A. $\frac{3}{4}\tan\theta$

B. $\frac{2}{3}\tan\theta$

C. $\frac{1}{4}\tan\theta$

D. $\frac{1}{2}\tan\theta$

Answer: A

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16. A body is sliding down a rough inclined plane The coefficient of friction between the body and the plane is 0.5.The ratio of the net force required for the body to slide down and the normal reaction on the body is $1:2$ Then the angle of the inclined plane is

A. 15°

B. 30°

C. 45°

D. 60°

Answer: C

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17. A block of mass 0.5 kg has an initial velocity of 10 ms^{-1} down an inclined plane of angle 309, the coefficient of friction between the block and the inclined surface is 0.2. The velocity of the block after it travels a distance

of 10 m is (Take g = $10ms^{-2}$)

A. $17ms^{-1}$

B. $13ms^{-1}$

C. $24ms^{-1}$

D. $8ms^{-1}$

Answer: B

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18. A block of mass m placed on a rough inclined plane of inclination $\theta = 30^\circ$ can just be prevented from sliding down by applying a force Fi up the plane and it can be just made to slide up the plane by applying a force F_2 up the plane. If the coefficient of friction between the block and the inclined plane is $\frac{1}{2\sqrt{2\sqrt{3}}}$ the relation between F_1 and F_2 is

A. $F_2 = 4F_1$

B. $f_2 - 3F_1$

C. $F_2 - 2F_1$

D. $F_2 - F_1$

Answer: B

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19. A block of mass 200 kg is being pulled up by men on an inclined plane at an angle of 45° as shown. The coefficient of static friction is 0.5. Each man can only apply a maximum force of 500 N. The number of men required for the block to just start moving up the plane

is

A. 10

B. 15

C. 5

D. 3

Answer: C

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20. The rear side of a truck is open and a box of 40 kg mass is placed 5 m from the open end The coefficient of friction between the box and the surface below it is 0.15 On a straight road the truck starts from rest and accelerates with $2m/s^2$ At what distance from the starting point does the box fall off the truck ? Ignore the size of the box .

A. 20 m

B. 30 m

C. 40 m

D. 50 m

Answer: A

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21. In the following figure, an object of mass 1.2 kg is at rest at point P. If R and F are the reaction and the frictional force, respectively, then

A. $R = 6N, f = 6\sqrt{3}N$

B. $R = 3N, f = 3\sqrt{3}N$

C. $R = 6N, F = 3N$

D. $R6\sqrt{3}N, F = 6N$

Answer: D

View Text Solution

22. A blocky of mass m rests on a horizotal floor with which it has a coefficient of static friction μ. It is desired to make the body move by applying the minimum possible force F.

Find the magnitude of F and the direction in which it has be applies.

A. μmg

B. $\frac{\sqrt{1+\mu^2}}{\mu}mg$

C. $\mu\sqrt{1+\mu^2}mg$

D. $\frac{\mu mg}{\sqrt{1+\mu^2}}$

Answer: D

Watch Video Solution

23. Block A of mass 35 kg is resting on a frictionless floor. Another block B of mass 7 kg is resting on it as shown in figure. The coefficient of static friction between the blocks is 0.5, while coefficient of kinetic friction is 0.4. If a force of 100 N is applied to block B, acceleration of block A will be (Take g = 10 ms^2)

A. $0.8ms^{-2}$

B. $2.4ms^{-2}$

C. $0.4ms^{-2}$

D. $4.4ms^{-2}$

Answer: A

View Text Solution

24. A cubical block rests on an inclined plane of coefficient of friction $\mu = \frac{1}{\sqrt{3}}$. What should be the angle of inclination so that the block just slides down the inclined plane?

A. 30°

B. 60°

C. 45°

D. 90°

Answer: A

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25. A boy of mass 40kg is climbing a vertical pole at a constant speed.If the coefficient of friction between his palms and the pole is 0.8

and $g = 10\frac{m}{s^2}$,the horizontal force that he is applying on the pole is?

A. $300N$

B. $400N$

C. $500N$

D. $600N$

Answer: C

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26. A block of mass 2 kg rests on a horizontal surface. If a horizontal force of 5 N is applied on the block, the frictional force on it is $(\text{take}, u_k = 0.4, \mu_s = 0.5)$

A. $5N$

B. $10N$

C. $8N$

D. zero

Answer: A

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27. Identify the correct statement

A. Static friction depends on the area of contact

B. Kinetic friction depends on the area of contact.

C. Coefficient of static friction does not depend on the surfaces in contact

D. Coefficient of kinetic friction is less than the coefficient of static friction.

Answer: D

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Neet Cafe Topicwise Practive Questions Dynamics Of Uniform Circular Motion

1. A cystlist riding a bicycle a bicycle at a speed of $14\sqrt{3}$ m/s takes a turn around a circular a

circular road of radius $20\sqrt{3}$ m without skidding . What is his inclination to the vertical ?

A. 30°

B. 90°

C. 45°

D. 60°

Answer: D

Watch Video Solution

2. A cyclist bends while taking turn to

A. reduce friction

B. generate required centripetal force

C. reduce apparent weight

D. reduce speed

Answer: B

Watch Video Solution

3. A stone of mass $0.3kg$ attched to a $1.5m$ long stirng is whirled around in a horizontal cirlcle at a speed of 6 m/s The tension in the string is

A. $10N$

B. $20N$

C. $7.2N$

D. $30N$

Answer: C

Watch Video Solution

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4. A car of mass 1000 kg moves on a circular track of radius 20 m . If the coefficient of friction is 0.64, then the maximum velocity with which the car can move is

A. 22.4 m/s

B. 5.6 m/s

C. 11.2 m/s

D. 6.5 m/s

Answer: C

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5. If a body of 5 kg is moving in a circle of radius 5 m with a velocity 100 m s^{-1}, then the centripetal force acting on the body is

A. 100 N

B. $10^4 N$

C. $10^3 N$

D. $10N$

Answer: B

Watch Video Solution

6. A body moves along a circular path of radius $5m$. The coefficient of friction between the surface of the path and the body is 0.5. The angular velocity in rad/s with which the body should move so that it does not leave the path is $\left(g - 10m/s^{-2}\right)$

A. 4

B. 3

C. 2

D. 1

Answer: D

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7. A car is moving on a circular road of diameter 50 m with a speed of 5 m/s. It is suddenly accelerated at a rate of $1m/s^2$. If the

mass of he car is 500 kg, then the net force acting on the car is

A. $5N$

B. $1000N$

C. $500\sqrt{2}N$

D. $\frac{500}{\sqrt{2}}N$

Answer: C

Watch Video Solution

8. A body is moving in a circular path with acceleration a. If its speed gets doubled, find the ratio of centripetal acceleration after and before the speed is changed

A. $1:4$

B. $\frac{1}{4}:1$

C. $2:1$

D. $4:1$

Answer: D

Watch Video Solution

Watch Video Solution

9. A car is moving with speed $30m/\sec$ on a circular path of radius 500 m . Its speed is increasing at the rate of , $2m/\sec^2$, What is the acceleration of the car

A. $2.5ms^{-2}$

B. $2.7ms^{-2}$

C. $2ms^{-1}$

D. $4.5ms^{-2}$

Answer: B

Watch Video Solution

10. A particle of mass 5 kg moves in a circle of radius 20 cm. Its linear speed at a time t is given by v=4t, t is in s and v is in ms^{-1} The net force acting on the particle at 1 = 0.5 s

A. $20\sqrt{28}N$

B. $20N$

C. $100N$

D. $20\sqrt{26}N$

Answer: D

Watch Video Solution

11. A coin placed on a rotating table just slip when it is placed at a distance 4 r from the centre, on doubling the angular velocity of the table , the coin will just slip now the coin is at a distance from centre is

A. 4r

B. 2r

C. r

D. $\frac{r}{4}$

Answer: C

Watch Video Solution

12. A block of mass m is placed on a smooth sphere of radius R. It slides when pushed slightly. At what vertical distance h, from the top, will it leave the sphere?

A. $\frac{R}{4}$

B. $\frac{R}{3}$

C. $\frac{R}{2}$

D. R

Answer: B

View Text Solution

13. A particle is moving in a circle of radius R in such a way that at any instant the normal and tangential components of its acceleration are

equal. If its speed at t=0 is Vo, the time taken to complete the first revolution is

A. $\frac{R}{v_0}$

B. $\frac{R}{v_0}\left(1-e^{-2\pi}\right)$

C. $\frac{R}{v_0}e^{-2\pi}$

D. $\frac{2\pi R}{v_0}$

Answer: B

View Text Solution

14. A particle is moving on a circular path of 10 m radius. At any instant of time, its speed is $5ms^{-1}$ and the speed is increasing at a rate of 2 m s^2. The magnitude of net acceleration at this instant is

A. $5ms^{-2}$

B. $2ms^{-2}$

C. $3.2ms^{-2}$

D. $4.3ms^{-2}$

Answer: C

View Text Solution

15. A motorcycle moving with a velocity of 72 km h^{-1} on a flat road takes a turn on the road at a point where the radius of curvature of the road is 20 m. The acceleration due to gravity is $10ms^{-2}$. In order to avoid skidding, he must not bent with respect to the vertical plane by an angle greater than

A. $\theta = \tan^{-1}(2)$

B. $\theta = \tan^{-1}(6)$

C. $\theta \tan^{-1}(4)$

D. $\theta = \tan^{-1}(25.92)$

Answer: A

View Text Solution

16. A tube one metre long is filled with liquid of mass 1 kg. The tube is closed at both the ends and is revolved about one end in a horizontal plane at 2 rev/s. The force experienced by the liquid at the other end is

A. $4\pi^2 N$

B. $8\pi^2 N$

C. $16\pi^2 N$

D. $20\pi^2 N$

Answer: B

View Text Solution

17. A stone of mass 2 kg is tied to a string of length 0.5 m. If the breaking tension of the string is 900 N, then the maximum angular

velocity, the stone can have in uniform circular motion is

A. $30 rads^{-1}$

B. $20 rads^{-1}$

C. $10 rads^{-1}$

D. $40 rads^{-1}$

Answer: A

View Text Solution

18. The coefficient of friction between the tyres and the road is 0.25. The maximum speed with which a car can be driven round a curve of radius 40 m without skidding is (Take $g = 10ms^{-2}$)

A. $40ms^{-1}$

B. $20ms^{-1}$

C. $15ms^{-1}$

D. $10ms^{-1}$

Answer: D

View Text Solution

19. The banking angle for a curved road of radius 490 m for a vehicle moving at 35 ms^{-1} is

A. $\tan^{-1}(0.25)$

B. $\tan^{-1}(0.35)$

C. $\tan^{-1}(1)$

D. $\tan^{-1}(0.65)$

Answer: A

View Text Solution

20. If μ_s is the coefficient of static friction, the maximum speed $V_{\max}$ with which a vehicle can negotiate an unbanked curved track having radius R and inclined at an angle θ with respect to horizontal plane is

A. $\sqrt{Rg\tan\theta}$

B. $\sqrt{\mu_s Rg}$

C. $\sqrt{Rg}$

D. $\sqrt{\frac{\tan\theta}{Rg}}$

Answer: B

View Text Solution

Check Your Neet Vitals

1. A ship of mass 3×10^7 kg initially at rest is pulled by a force of 5×10^4 N through a distance of 3 m. Assuming that the resistance

due to water is negligible, what will be the speed of the ship?

A. $0.1ms^{-1}$

B. $1.5ms^{-1}$

C. $5ms^{-1}$

D. $0.2ms^{-1}$

Answer: A

View Text Solution

2. A block moves down a smooth inclined plane of inclination 45°. 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 vin, where n is a number greater than zero. The coefficient of friction μ is given by

A. $\mu = \left(1 - \frac{1}{n}\right)$

B. $\mu = \left(1 - \frac{1}{n^2}\right)$

C. $\mu = \sqrt{1 - \frac{1}{n^2}}$

D. $\mu = \sqrt{1 - \frac{1}{n}}$

Answer: B

View Text Solution

3. A spring balance carries a load. When the load is pulled aside so that the balance makes an angle of 30° with the vertical, the balance reads 4 kg wt. The mass of the load is

A. $\sqrt{3}kg$

B. $3Kg$

C. $2\sqrt{3}Kg$

D. $9Kg$

Answer: C

View Text Solution

4. A block of mass m is resting on an inclined plane. The inclination of the plane to the horizontal is gradually increased. It is found that when angle of inclination is θ, the block

just begins to slide down the plane. What is the minimum force F applied parallel to the plane that would just make the block move up the plane?

A. $2mg\sin\theta$

B. $mg\sin\theta$

C. $mg\cos\theta$

D. $2mg\cos\theta$

Answer: A

View Text Solution

5. A stone tied to a string of length L is whirled in a vertical circle, with the other end of the string at the centre. At a certain instant of time, the stone is at its lowest position, and has a speed u. The magnitude of change in its velocity as it reaches a position, where the string is horizontal is

A. $\sqrt{u^2 - 2gL}$

B. $\sqrt{2gL}$

C. $\sqrt{u^2 - gL}$

D. $\sqrt{2\left(u^2 - gL\right)}$

Answer: D

View Text Solution

6. A heavy small sized sphere is suspended by a string of length 2. The sphere is rotated uniformly in a horizontal circle with the string making an angle $\theta$with the vertical. The time period of this conical pendulum is

A. $2\pi\sqrt{\frac{l\tan\theta}{g}}$

B. $2\pi\sqrt{\frac{l\cos\theta}{g}}$

C. $2\pi\sqrt{\frac{1}{g}}$

D. $2\pi\sqrt{\frac{l\cos\theta}{g}}$

Answer: D

View Text Solution

7. A body of mass $5\times10^{-3}kg$ is launched upon a rough inclined plane making an angle of 30^{o} with the horizontal. Find the coefficient

of friction between the body and the plane if the time of ascent is half of the time of descent.

A. 0.346

B. 0.436

C. 0.463

D. 0.364

Answer: A

View Text Solution

8. The coefficient of kinetic friction between a 20 kg box and the floor is 0.40. How much work does a pulling force do on the box in pulling it 8.0 m across the floor at constant speed? The pulling force is directed 37° above the horizontal.

A. 343 J

B. 482 J

C. 14.4 J

D. None of these

Answer: B

View Text Solution

9. A ball of mass 1 kg is thrown upwards with a velocity 10 ms^{-1} If air exerts an average resisting force 1 N, the velocity with which the ball returns to the thrower is

A. $10\sqrt{\frac{10}{11}}$

B. $10\sqrt{\frac{1}{11}}$

C. $10\sqrt{\frac{9}{11}}$

D. 10 sqrt((9)/(15))`

Answer: C

View Text Solution

10. A 7 kg shell kept at rest suddenly splits up into three parts. If two parts of mass 3 kg each are found flying due north and cast with a velocity of 3 m/s each, what is the velocity of the third part after explosion ?

A. 9 m/s due north-east

B. $\frac{9}{\sqrt{2}}$ m/s due south-east

C. $9\sqrt{2}$ m/s due south-west

D. $9\sqrt{2}$ m/s due south-east

Answer: C

View Text Solution

11. A block released from rest from the top of a smooth inclined plane of angle 30° reaches the bottom in time t_1. The same block released from rest from the top of another smooth

inclined plane of angle 60°, reaches the bottom in time t_2. If the two inclined planes have the same height, the relation between t_1 and t_2 is

A. $\frac{t_2}{t_1} = \frac{1}{2}$

B. $\frac{t_2}{t_1} = 1$

C. $\frac{t_2}{t_1} = \frac{1}{\sqrt{3}}$

D. $\frac{t_2}{t_1} = 2$

Answer: C

View Text Solution

12. A block of weight 8 kg is resting on a smooth horizontal plane. If it is struck by a jet of water at the rate of $2kgs^{-1}$ and at the speed of 20 m s^{-1} , then the initial acceleration of the block is

A. $15ms^{-2}$

B. $10ms^{-2}$

C. $2.5ms^{-2}$

D. $5ms^{-2}$

Answer: D

View Text Solution

13. A stone is dropped from a height h. It hits the ground with a certain momentum P. If the same stone is dropped from a height 100% more than the previous height, the momentum when it hits the ground will change by

A. $68\ \%$

B. $41\ \%$

C. $200\ \%$

D. $100\ \%$

Answer: B

View Text Solution

14. A stream of water flowing horizontally with a speed of $15ms^{-1}$ gushes out of a tube of cross-sectional area $10^{-2}m^2$, and hits a vertical wall nearby. What is the force exerted

on the wall by the impact of water, assuming it does not rebound?

A. $1.25 \times 10^3 N$

B. $2.25 \times 10^3 N$

C. $3.25x10^3 N$

D. $4.25 \times 10^3 N$

Answer: B

View Text Solution

15. Which one of the following statements is not true ?

A. The same force for the same time causes the same change in momentum for different bodies.

B. The rate of change of momentum of a body is directly proportional to the applied force and takes place in the direction in which the force acts.

C. A greater opposing force is needed to stop a heavy body than a light body in the same time, if they are moving with the same speed.

D. The greater the change in the momentum in a given time, the lesser is the force that needs to be applied.

Answer: D

View Text Solution

16. A person in an elevator accelerating upwards with an acceleration of 2 ms^{-2}, tosses a coin vertically upwards with a speed of 20 ms^{-1}. After how much time will the coin fall back into his hand ?

(take $g = 10ms^{-2}$)

A. $1.67s$

B. $2s$

C. $3.33s$

D. $5s$

Answer: C

View Text Solution

17. Two masses of 5 kg and 3 kg are suspended with help of massless inextensible strings as shown in figure. The whole system is going upwards with an acceleration of $2ms^{-2}$ The tensions T_1 and T_2 are (Take g = $10ms^{-2}$)

A. $96N, 36N$

B. $36n, 96N$

C. $96N, 96N$

D. $36N, 36N$

Answer: A

View Text Solution

18. A block of mass M is held against a rough vertical wall by pressing it with a finger. If the coefficient of friction between the block and the wall is μ and the acceleration due to

gravity is g, what is the minimum force required to be applied by the finger to hold the block against the wall?

A. μMg

B. Mg

C. $\frac{Mg}{\mu}$

D. $2\mu Mg$

Answer: C

View Text Solution

19. There are four forces acting at a point P produced by strings as shown in figure, which is at rest. The forces F_1 and F_2 are

A. $\frac{1}{\sqrt{2}N, \frac{3}{\sqrt{2}}N}$

B. $\frac{3}{\sqrt{2}}N, \frac{1}{\sqrt{2}}N$

C. $\frac{1}{\sqrt{2}}N, \frac{1}{\sqrt{2}}N, \frac{1}{\sqrt{2}}N$

D. $\frac{3}{\sqrt{2}}N, \frac{3}{\sqrt{2}}N$

Answer: A

View Text Solution

20. 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

Answer: B

View Text Solution

21. A 100 kg gun fires a ball of 1 kg horizontally from a cliff of height 500 m. It falls on the ground at a distance of 400 m from the

bottom of the cliff. Find the recoil velocity of the gun. (Take g = 10 ms^{-2})

A. $0.2ms^{-1}$

B. $0.4ms^{-1}$

C. $0.6ms^{-1}$

D. $0.8ms^{-1}$

Answer: B

View Text Solution

22. A large force is acting on a body for a short time. The impulse imparted is equal to the change in

A. acceleration

B. momentum

C. energy

D. velocity

Answer: B

View Text Solution

Aipmt Neet Mcq

1. A block of mass m is in contact with the cart C as shown in the figure. The coefficient of static friction - between the block and the cart is u. The acceleration a of the cart that will prevent the block from falling satisfies

A. $\alpha > \frac{mg}{\mu}$

B. $\alpha > \frac{g}{\mu m}$

C. $apha \geq \frac{g}{\mu}$

D. $\alpha < \frac{g}{\mu}$

Answer: C

View Text Solution

2. A person of mass 60 kg is inside a lift of mass 940 kg and presses the button on control panel. The lift starts moving upwards with an acceleration $1.0m/s^2$. If $g = 10ms^{-2}$, the tension in the supporting cable is

A. $8600N$

B. $9680N$

C. $1100N$

D. $1200N$

Answer: C

View Text Solution

3. A body of mass M hits normally a rigid wall with velocity V and bounces back with the same velocity. The impulse experienced by the body is

A. MV

B. 1.5MV

C. 2MV

D. zero

Answer: C

View Text Solution

4. A conveyer belt is moving at a constant speed of 2 ms^{-1} A box is gently dropped on it. The coefficient of friction between them is μ

= 0.5. The distance that the box will move relative to belt before coming to rest on it, taking $g = 10ms^{-2}$, is

A. $0.4m$

B. 1.2 m

C. 0.6m

D. zero

Answer: A

View Text Solution

5. A car of mass 1000 kg negotiates a banked curve of radius 90 m on a frictionless road. If the banking angle is 45°, the speed of the car is

A. $20ms^{-1}$

B. $30ms^{-1}$

C. $5ms^{-1}$

D. $10ms^{-1}$

Answer: B

View Text Solution

6. A stone is dropped from a height h. It hits the ground with a certain momentum P. If the same stone is dropped from a height 100% more than the previous height, the momentum when it hits the ground will change by

A. 0.68

B. 0.41

C. 2

D. 1

Answer: B

View Text Solution

7. A car of mass m is moving on a level circular track of radius R. If μ_s represents the static friction between the road and tyres of the car, the maximum speed of the car in circular motion is given by

A. $\sqrt{\mu_s Rg}$

B. $\sqrt{\frac{Rg}{\mu_s}}$

C. $\sqrt{\frac{mRg}{\mu_s}}$

D. $\sqrt{(\mu_s Rg)}$

Answer: D

View Text Solution

8. Three blocks with masses m, 2m and 3m are connected by strings, as shown in the figure. After an upward force F is applied on block m, the masses move upward at constant speed v. What is the net force on the block of mass

2m? (g is the acceleration due to gravity)

A. $3mg$

B. 6 mg

C. zero

D. 2mg

Answer: C

View Text Solution

9. An explosion breaks a rock into three parts in a horizontal plane. Two of them go off at right angles to each other. The first part of mass 1 kg moves with a speed of $12ms^{-1}$ and the second part of mass 2 kg moves with 8 ms^{-1} speed. If the third part flies off with $4ms^{-1}$ speed, then its mass is

A. 7kg

B. 17kg

C. 3 kg

D. 5kg

Answer: D

View Text Solution

10. The upper half of an inclined plane of inclination θ is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will again come to rest at the bottom, if the coefficient of friction between

the block and lower half of the plane is given by

A. $\mu = 2\tan\theta$

B. $\mu\tan\theta$

C. $\mu = \frac{1}{\tan\theta}$

D. $\mu = \frac{2}{\tan\theta}$

Answer: A

View Text Solution

11. A system consists of three masses m_1, m_2 and my connected by a string passing over a pulley P. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (the coefficient of friction = μ). The pulley is frictionless and of negligible mass. The downward acceleration of mass m, is mi (Assume $m_1 = m_2 = m_3 = m$)

A. $\frac{g(1 - g\mu)}{9}$

B. $\frac{2g\mu}{3}$

C. $\frac{g(1-2\mu)}{3}$

D. $\frac{g(1-2\mu)}{2}$

Answer: C

View Text Solution

12. The force F acting on a particle of mass m is indicated by the force-time graph as 31/1 shown. The change in ZO momentum of the particle over the time interval from zero to 8 s

is

A. $24Ns$

B. $20Ns$

C. $12Ns$

D. 6 Ns`

Answer: C

View Text Solution

13. A balloon with mass m is descending down with an acceleration a where a

A. $\frac{2ma}{g+a}$

B. $\frac{2ma}{g-a}$

C. $\frac{ma}{g-a}$

D. $\frac{ma}{g-a}$

Answer: A

View Text Solution

14. A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pully at the edge of the table and from its other end another block B of mass m2 is suspended. The coefficient of kinetic friction between the block and the table is H. When the block A is sliding on the table, the tension in the string is

A. $\frac{m_1 m_2(1+\mu_k)g}{(m_1+m_2)}$

B. $\frac{m_1 m_2(1-\mu_k)g}{(m_1)+m_2}$

C. $\frac{(m_2+\mu_k m_1)g}{(m_1+m_2)}$

D. $\frac{(m_2 - \mu_k m_1)g}{(m_1 + m_2)}$

Answer: A

View Text Solution

15. Two stones of masses m and 2m are whirled in horizontal circles, the heavier one in a radius $\frac{r}{2}$ and the lighter one in radius r. The tangential speed of lighter stone is n times that of the value of heavier stone when they

experience same centripetal forces. The value of n is

A. 4

B. 1

C. 2

D. 3

Answer: C

View Text Solution

16. A plank with a box on it at one end is gradually raised about the other end. As the angle of inclination with the horizontal reaches 30°, the box starts to slip and slides 4.0 m down the plank in 4.0 s. The coefficients of static and kinetic friction between the box and the plank will be, respectively

A. $0.5 \text{ and } 0.6$

B. 0.4 and 0.3

C. 0.6 and 0.6

D. 0.6 and 0.5

Answer: D

View Text Solution

17. A car is negotiating a curved road of radius R. The road is banked at an angle θ. The coefficient of friction between the tyres of the car and the road is μ_s. The maximum safe velocity on this road is

A. $\sqrt{\frac{g}{R}\frac{(\mu_s + \tan\theta)}{R(1 - \mu_s \tan\theta)}}$

B. $\sqrt{\frac{g}{R^2}\frac{(\mu_s+\tan\theta)}{(1-\mu_s\tan\theta)}}$

C. $gR^2\frac{(\mu_s+\tan\theta)}{(1-\mu_s\tan\theta)}$

D. $\sqrt{gR\frac{(\mu_s+\tan\theta)}{(1-\mu_s\tan\theta)}}$

Answer: D

View Text Solution

18. A rigid ball of mass m strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure. The value of impulse

imparted by the wall on the ball will be

A. mV

B. $2mV$

C. $\frac{mV}{2}$

D. $\frac{mV}{3}$

Answer: A

View Text Solution

19. Two blocks A and B of masses 3m and m respectively are connected by a massless and inextensible string. The whole system is suspended by a massless spring as shown in figure. The magnitudes of acceleration of A and B immediately after the string is cut, are respectively

A. $\frac{g}{3}, g$

B. g, g

C. $\frac{g}{3}, \frac{g}{3}$

D. $g, \frac{g}{3}$

Answer: A

View Text Solution

20. One end of string of length / is connected to a particle of mass 'm' and the other end is connected to a small peg on a smooth horizontal table. If the particle moves in circle with speed 'v', the net force on the particle

(directed towards centre) will be (T represents the tension in the string)

A. $T + \frac{mv^2}{l}$

B. $T - \frac{mv^2}{l}$

C. zero

D. T

Answer: D

View Text Solution

21. Which one of the following statements is incorrect?

A. Rolling friction is smaller than sliding friction.

B. Limiting value of static friction is directly proportional to normal reaction.

C. Frictional force opposes the relative motion.

D. Coefficient of sliding friction has dimensions of length.

Answer: D

View Text Solution

22. A block of mass m is placed on a smooth inclined wedge ABC of inclination as shown in the figure.

The wedge is given an acceleration a towards

the right. The relation between a and e for the block to remain stationary on the wedge is

A. $a = \frac{g}{\cos ec\theta}$

B. $a = \frac{g}{\sin\theta}$

C. a=g cos theta`

D. $a = g\tan\theta$

Answer: D

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23. A block of mass 10 kg is in contact against the inner wall of a hollow cylindrical drum of radius 1 m. The coefficient of friction between the block and the inner wall of the cylinder is 0.1. The minimum angular velocity needed for the cylinder to keep the block stationary when the cylinder is vertical and rotating about its axis, will be ($g = 10m/s^2$)

A. $10\pi rad/s$

B. $\sqrt{10} rad/s$

C. $\frac{10}{2\pi} rad/s$

D. $10 rad / s$

Answer: D

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24. A particle moving with velocity $\vec{v}$ is acted by three forces shown by the vector triangle PQR. The velocity of the particle will

A. change according to the smallest force $\overrightarrow{QR}$

B. increase

C. decrease

D. remain constant

Answer: D

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