PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

LAWS OF MOTION

Physics

1. A player stops a football weighing 0.5 kg which comes flying towards him with a velocity of $10 m / s$. If the impact lasts for $1 / 50$th sec.

and the ball bounces back with a velocity of 15 m/s, then the average force involved is

A. 250N

B. 1250 N

C. 500 N

D. 625 N

Answer:

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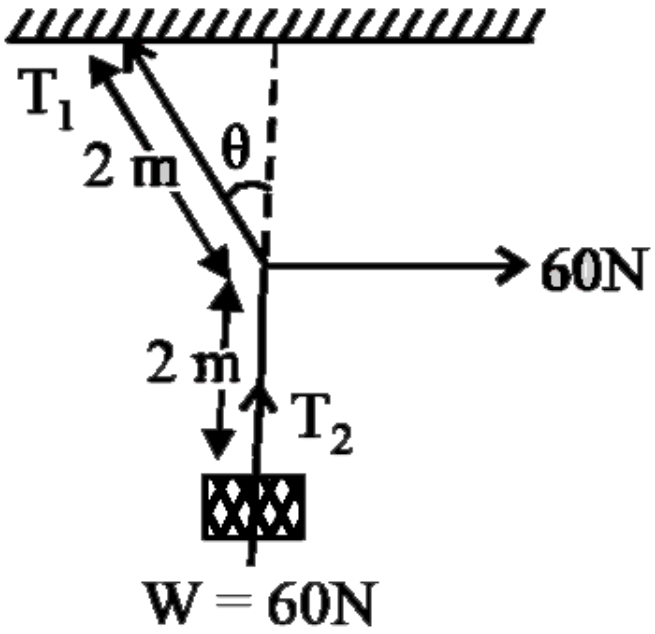
2. For the given situation as shown in the figure, the value of q θ keep the system in equilibrium will be



A. 30°

B. 45°

C. 0°

D. 90°

Answer: b

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3. 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. $127.5 kg / s$

B. $137.5\ kg / g$

C. $155.5 kg / g$

D. $187.5\ kg / s$

Answer:

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4. Which one of the following statements is correct?

A. If there were no friction, work need to be done to move a body up an inclined plane is zero.

B. If there were no friction, moving vehicles could not be stopped even by locking the brakes.

C. As the angle of inclination is increased, the normal reaction on the body placed on it increases.

D. A duster weighing 0.5 kg is pressed against a vertical board with force of 11 N. If the coefficient of friction is 0.5, the work done in rubbing it upward through a distance of 10 cm is 0.55 J.

Answer:

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5. 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 thanthe preyiious height, the momentum when it hits the ground will change by

A. $68\,\%$

B. $41\,\%$

C. $200\,\%$

D. $100\,\%$

Answer:

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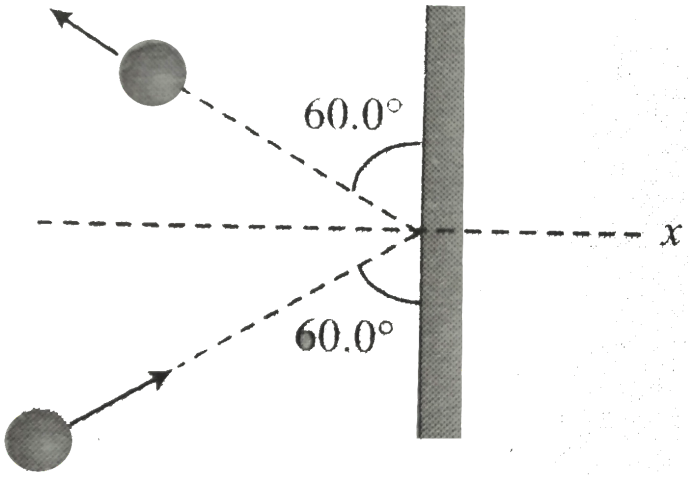
6. A 3-kg steel ball strikes a wall with a speed of $10.0ms^{-1}$ at an angle of 60.0° with the surfaces of the wall. The ball bounces off with the same speed and same angle. If the ball was in contact with the wall for 0.2s, find the

average force exerted by the wall on the ball.



A. 150N

B. zero

C. $150\sqrt{3N}$

D. 300N

Answer:

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7. The upper half of an inclined plane with inclination ϕ is perfectly smooth while the lower half is rough. A body starting from rest at the top will again come to rest at the bottom if the coefficient of friction for the lower half is given by

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

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

C. $\mu = \tan\theta$

D. $\mu = \dfrac{1}{\tan\theta}$

Answer:

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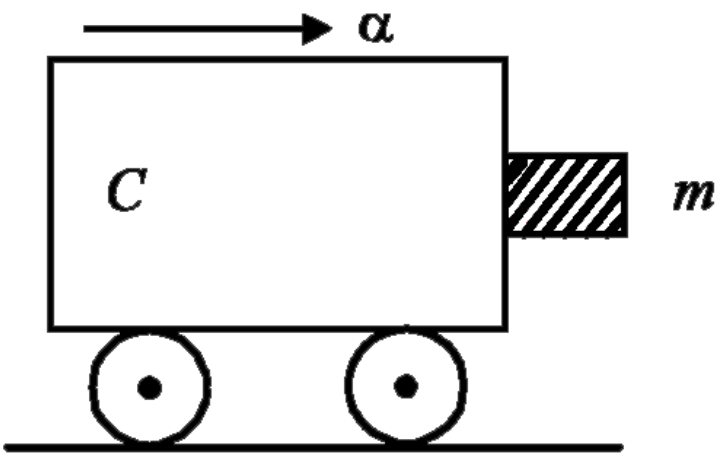
8. A block of mass m is in contact with the cart C as shown in the figure.



The coefficient of static friction between the block and the cart is μ. The acceleration a of the cart that will prevent the block from falling satisfies: A bridge is in the from of a semi-circle of radius 40m. The greatest speed with which a motor cycle can cross the bridge without leaving the ground at the highest point is

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

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

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

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

Answer:

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9. A bridge is in the form of a semicircle of radius $40m$. The greatest speed with which a motorcycle can cross the bridge without

leaving the ground at the highest point (frictional force is negligibly small)

A. $40ms^{-1}$

B. $20ms^{-1}$

C. $30ms^{-1}$

D. $15ms^{-1}$

Answer:

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10. An explosion blows a rock into three parts. Two parts go off at right angles to each other . These two are $1kg$ first part moving with a velocity of $12ms^{-1}$ and $2kg$ second part moving with a velocity of $8ms^{-1}$. If the third part flies off with a velocity of $4ms^{-1}$. Its mass would be

A. 40 ms^{-1}

B. 20 ms^{-1}

C. 30 ms^{-1}

D. 15 ms^{-1}

Answer:

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11. A monkey is decending from the branch of a tree with constant acceleration. If the breaking strength is 75% of the weight of the monkey, the minimum acceleration with which monkey can slide down without breaking the branch is

A. g

B. $\frac{3g}{4}$

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

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

Answer:

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12. A car having a mass of 1000 kg is moving at a speed of $30 \text{metres} / \text{sec}$. Brakes are applied to bring the car to rest. If the frictional force

between the tyres and the road surface is 5000 newtons, the car will come to rest in

A. 5seconds

B. 10seconds

C. 12seconds

D. 6seconds

Answer:

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13. A spring is compressed between two toy carts of mass m_1 and m_2. When the toy carts are released, the springs exert equal and opposite average forces for the same time on each toy cart. If v_1 and v_2 are the velocities of the toy carts and there is no friction between the toy carts and the ground, then :

A. $v_1 / v_2 = m_1 / m_2$

B. $v_1 / v_2 = m_2 / m_1$

C. $v_1 / v_2 = m_2 / m_1$

D. $V_1 / v_2 = m_1 / m_2$

Answer:

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14. The rate of mass of the gas emitted from the rear of a rocket is initially $0.1 kg / s$. If the speed of the gas relative to the rocket is $50 m / s$ and the mass of the rocket is $2 kg$, then the acceleration of the rocket in m / s^2 is

A. 5

B. 5.2

C. 2.5

D. 25

Answer:

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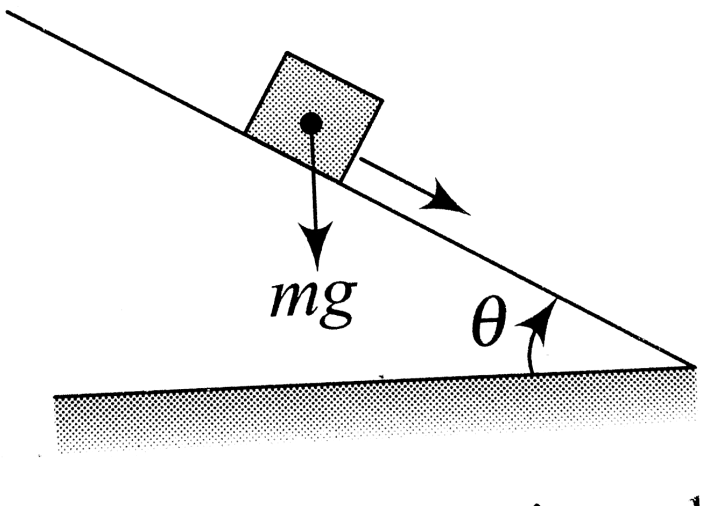
15. A plank with a box on it at one end is gradully raised about the other end. As the angle of inclination with the horizntal reaches 30° , the box starts to slip and slide $4.0m$

down the plank in $4.0s$. The coefficients of static and knitic friction between the box and the plank will be, respectively.



A. 0.6and 0.5

B. 0.5 and 0.6

C. 0.4 and 0.3

D. 0.6 and 0.6

Answer:

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16. Four blocks of the same mass m connected by cords are pulled by a force F on a smooth horizontal surface as shown in Determine the tensions T_1, T_2 and T_3 in the cords.

A. $T_1 = \frac{1}{4}F, T_2 = \frac{3}{2}F, T_3 = \frac{1}{4}F$

B. $T_1 = \frac{1}{4}F, T_2 = \frac{1}{2}F, T_3 = \frac{1}{2}F$

C. $T_1 = \frac{3}{4}F, T_2 = \frac{1}{2}F, T_3 = \frac{1}{4}F$

D. $T_1 = \frac{3}{4}F, T_2 = \frac{1}{2}F, T_3 = \frac{1}{2}F$

Answer:

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17. A body of mass M is kept n a rough horizontal surfasce (friction coefficient $= \mu$). A person is trying to pull he body by applying

a horizontal force but the body is not moving.

The force by the surface on A is F, where

A. F=Mg

B. F=μMg

C. $M, g \leq F \leq Mg\sqrt{1+\mu^2}$

D. $Mg > F > Mg\sqrt{1+\mu^2}$

Answer:

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18. Which one of the following motions on a smooth plane surface does not involve force?

A. Accelerated motion in a straight line

B. Retarded motion in a straight line

C. Motion with constant momentum along a straight line

D. Motion along a straight line with varying velocity

Answer:

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19. A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pulley at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of knetic friction between the block and table is μ_k . When the block A is sliding on the table, the tension in the string is.

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

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

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

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

Answer:

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20. The upper half of an inclined plane with inclination ϕ is perfectly smooth while the lower half is rough. A body starting from rest at the top will again come to rest at the

bottom if the coefficient of friction for the lower half is given by

A. $2\cos\phi$

B. $2\sin\phi$

C. $\tan\phi$

D. $2\tan\phi$

Answer:

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21. A particle describes a horizontal circle in a conical funne whoses inner surface is smooth with speed of $0.5m/s$. What is the height of the plane of circle from vertex the funnel?

A. 0.25cm

B. 2cm

C. 4cm

D. 2.5cm

Answer:

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22. You are on a frictionless horizontal plane. How can you get off if no horizontal force is exerted by pushing against the surface?

A. By jumping

B. By spitting or sneezing

C. by rolling your body on the surface

D. By running on the plane

Answer:

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23. The coefficient of static and dynamic friction between a body and the surface are 0.75 and 0.5 respectively. A force is applied to the body to make it just slide with a constant acceleration which is

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

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

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

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

Answer:

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24. The minimum force required to start pushing a body up rough (frictional coefficient μ) inclined plane is F_1 while the minimum force needed to prevent it from sliding down is F_2. If the inclined plane makes an angle θ from the horizontal such that $\tan\theta = 2\mu$ then the ratio $\frac{F_1}{F_2}$ is

A. 1

B. 2

C. 3

D. 4

Answer:

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25. Tension in the cable supporting an elevator, is equal to the weight of the elevator.

From this, we can conclude that the elevator is going up or down with a

A. uniform velocity

B. uniform acceleration

C. variable acceleration

D. either (b) or (c)

Answer:

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26. A particle tied to a string describes a vertical circular motion of radius r continually. If it has a velocity $\sqrt{3gr}$ at the highest point, then the ratio of the respective tensions in the string holding it at the highest and lowest points is

A. $4:3$

B. $5:4$

C. $1:4$

D. $3:2$

Answer:

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27. Why is it difficult to move a bike with its brakes on ?

A. rolling friction opposes motion on road

B. sliding friction opposes motion on road

C. rolling friction is more than sliding friction

D. sliding friction is more than rolling friction

Answer:

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28. A plumb line is suspended from a celling of a car moving with horizontal acceleration of a. What will be the angle of inclination with vertical?

A. $\tan^{-1}(a/g)$

B. $\tan^{-1}(g/a)$

C. $\cos^{-1}(a/g)$

D. $\cos^{-1}(g/a)$

Answer:

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29. A block has been placed on an inclined plane with the slope angle θ. Block slide down

the plane at constant speed. The cofficient of Kinetic friction is equal to

A. $\sin\theta$

B. $\cos\theta$

C. g

D. $\tan\theta$

Answer:

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30. 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:

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31. A block of mass is placed on a surface with a vertical cross section given by $y = \frac{x^3}{6}$. If the coefficient of friction is 0.5, the maximum height above the ground at which the block can be placed without slipping is:

A. $\frac{1}{6}m$

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

C. $\frac{1}{3}m$

D. $\frac{1}{2}m$

Answer:

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32. A ball of mass 10 g moving perpendicular to the plane of the wall strikes it and rebounds in the same line with the same

velocity. If the impulse experienced by the wall is 0.54 Ns, the velocity of the ball is

A. $27ms^{-1}$

B. $3.7ms^{-1}$

C. $54ms^{-1}$

D. $37ms^{-1}$

Answer:

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33. A block is kept on a inclined plane of inclination q of length l. The velocity of particle at the bottom of inclined is (the coefficient of friction is μ

A. $[2gl(\mu\cos\theta - \sin\theta)]$

B. $\sqrt{2gl(\sin\theta - \mu\cos\theta)}$

C. $\sqrt{2gl(\sin\theta + \mu\cos\theta)}$

D. $\sqrt{2gl(\cos\theta + \mu\sin\theta)}$

Answer:

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34. A $100g$ iron ball having velocity $10m/s$ collies with a wall at an angle 30° and rebounds with the same angle. If the period of contact between the ball and wall is 0.1 second, then the force experinced by the wall is

A. 10N

B. 100N

C. 1.0N

D. 0.1N

Answer:

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35. A bullet is fired from a gun. The force on the bullet is given by $F = 600 - 2 \times 10^5$ t, where F is in newtons and t in seconds. The force on the bullet becomes zero as soon as it leaves the barrel. What is the average impulse imparted to the bullet?

A. 1.8 N-s

B. zero

C. 9 N-s

D. 0.9 N-s

Answer:

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36. Two stone of masses m and $2m$ are whirled in horizontal circles, the heavier one in a radius $r/2$ and the lighter one in radius r.

The tangential speed of lighter stone is n times that of the value of heavier stone when the experience same centripetal forces. the value of n is

A. 3

B. 4

C. 1

D. 2

Answer:

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37. A 0.1 kg block suspended from a massless string is moved first vertically up with an acceleration of $5ms^{-2}$ and then moved vertically down with an acceleration of $5ms^{-2}$. If T_1 and T_2 are the respective tensions in the two cases, then

A. $T_2 > T_1$

B. $T_1 - T_2 = 1N \quad \text{if} \quad g = 10ms^{-2}$

C. $T_1 - T_2 = 1kgf$

D. $T_1 - T_2 = 9.8N, \quad \text{if} \quad g = 9.8ms^{-2}$

Answer:

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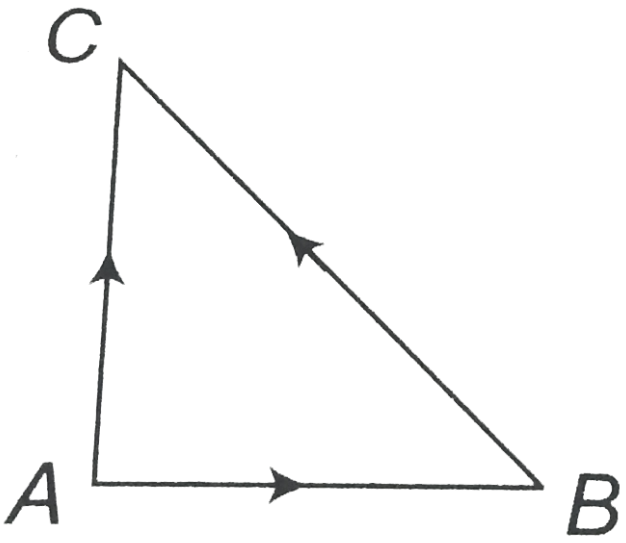
38. Three forces start acting simultaneously on a particle moving with velocity $\overrightarrow{v}$. These forces are represented in magnitude and direction by the three sides os a triangle ABC (as shown). The particle will now move with

velocity.



A. less than $\overrightarrow{v}$

B. greater than $\overrightarrow{v}$

C. |v| in the direction of the largest forece

BC

D. $\overrightarrow{v}$, remaining unchanged

Answer:

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39. If in a stationary lift, a man is standing with a bucket full of water, having a hole at its bottom. The rate of flow of water through this hole is R_0. If the lift starts to move up and down with same acceleration and then the rates of flow of water are Ru and Rd, then

A. $R_0 > R_u > R_d$

B. $R_u > R_0 > R_d$

C. $R_d > R_0 > R_u$

D. $R_u > R_d > R_0$

Answer:

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40. A stationary body of mass 3 kg explodes into three equal pieces. Two of the pieces fly off in two mutually perpendicular directions,

one with a velocity of $3\hat{i}ms^1$ and the other with a velocity of $4\hat{j}ms^{-1}$. - If the explosion occurs in $10^{-4}s$, the average force acting on the third piece in newton is

A. $\left(3\hat{i}+4\hat{j}\right)\times 10^{-4}$

B. $\left(3\hat{i}-4\hat{j}\right)\times 10^{-4}$

C. $\left(3\hat{i}-4\hat{j}\right)\times 10^{-4}$

D. $-\left(3\hat{i}+4\hat{j}\right)\times 10^{-4}$

Answer:

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