



PHYSICS

BOOKS - MTG-WBJEE PHYSICS

(HINGLISH)

LAWS OF MOTION

**Wb Jee Workout Category 1 Single Option
Correct Type 1 Mark**

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. 30 N

B. 3 N

C. 0.3 N

D. 0.03 N

Answer: A



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2. A bullet is fired with a velocity u making an angle of 60° with the horizontal plane. The horizontal component of the velocity of the bullet when it reaches the maximum height is:

A. u

B. 0

C. $\frac{\sqrt{3}u}{2}$

D. $u/2$

Answer: D



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3. If two bodies stick together after collision and move as a single body, the collision is said to be

A. perfectly inelastic

B. elastic

C. inelastic

D. perfectly elastic.

Answer: A



4. Compare time of ascent with time of descent of a projectile fired at 50° with the horizontal.

A. 1 : 4

B. 1 : 1

C. 5 : 4

D. 4 : 5

Answer: B



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5. A pellet of mass 1 g is moving with an angular velocity of 1 rad/s along a circle of radius 1 m. The centrifugal force is

A. 0.1 dyne

B. 1 dyne

C. 10 dyne

D. 100 dyne

Answer: D



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6. A ball of mass m performs uniform circular motion in a circle of radius R . Linear momentum is represented by p . The radial force acting on the particle is

A. mRp^2

B. $\frac{mp^2}{R}$

C. $\frac{p^2}{mR}$

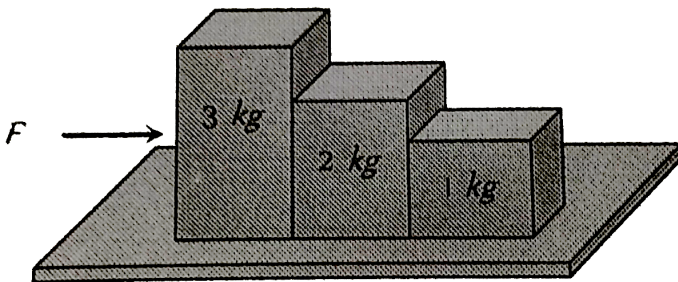
D. $\frac{p^2 R}{m}$

Answer: C



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7. Consider the following statements about the blocks shown in the diagram that are being pushed by a constant force on a frictionless table



(a) All

blocks move with the same acceleration

(b) The net force on each block is the same

Which of these statements are/is correct

A. A only

B. B only

C. Both a and b

D. neither a nor b

Answer: A



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8. If a person can throw a stone to maximum height of h metre vertically, then the maximum distance through which it can be thrown horizontally by the same person is

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

B. h

C. $2h$

D. $3h$

Answer: C



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9. The mass of a body in a lift at rest is m . If the lift ascends with uniform acceleration a , the effective mass will be

A. $m\left(1 + \frac{g}{a}\right)$

B. $m\left(1 + \frac{a}{g}\right)$

C. $m\left(1 - \frac{a}{g}\right)$

D. $m\left(1 - \frac{g}{a}\right)$

Answer: B





10. A force varies with time and traces a sine curve. The peak value of force is F_0 . The average force is given by

A. F_0

B. $\sqrt{F_0}$

C. $\sqrt{2} \cdot F_0$

D. zero

Answer: D



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11. A particle is moving with a constant speed v in a circle. What is the magnitude of average velocity after half rotation?

A. $2v$

B. $v\left(\frac{v}{\pi}\right)$

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

D. $\frac{v}{2\pi}$

Answer: B



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12. A man is at rest in the middle of an ice pond. If ice is perfectly smooth, then he can get started himself to move the shore by making use of Newton's

- (a) First law
- (b) Second law
- (c) Third law
- (d) First and third law

A. first law of motion

B. second law of motion

C. third law of motion

D. first and second law of motion

Answer: D



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13. A cyclist is travelling with velocity v on a banked curved road of radius R . The angle through which the cyclist leans inwards is given by

A. $\tan \theta = \frac{Rg}{v^2}$

B. $\tan \theta = v^2 Rg$

C. $\tan \theta = \frac{v^2 g}{R}$

D. $\tan \theta = \frac{v^2}{Rg}$

Answer: D



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14. A car is moving on a road and rain is falling vertically. Select the correct answer.

- A. the rain will strike the back screen only
- B. the rain will strike the front screen only
- C. the rain will strike both the screens
- D. the rain will not strike any of the screens.

Answer: B



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15. A projectile is thrown with an initial velocity of $(x \vec{i} + y \vec{j}) m/s$. If the range of the projectile is double the maximum height reached by it, then

A. $x = 2y$

B. $y = 2x$

C. $x = y$

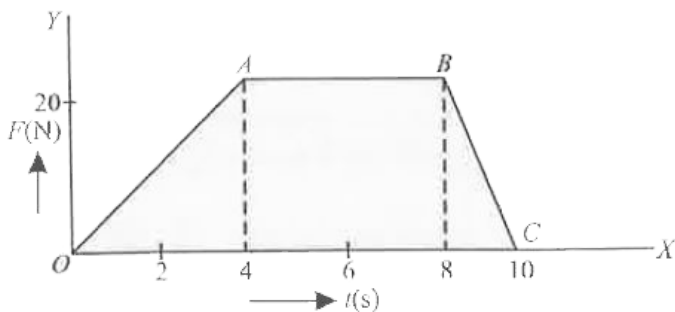
D. $y = 4x$

Answer: B



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16. 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. 0

B. 100

C. 140

D. 200

Answer: C



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17. A cricket ball of mass 250g collides with a bat with velocity $10m/s$ and returns with the same velocity within 0.01 second. The force acted on bat is

A. 25 N

B. 50 N

C. 250 N

D. 500 N

Answer: D



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18. A man is walking on a road with a velocity 3 km/hr . Suddenly rain starts falling. The velocity of rain is 10 km/hr in vertically downward

direction. the relative velocity of rain with respect to man is :-

A. 13 km/h

B. 109 km/h

C. 77 km/h

D. 13 km/h

Answer: B



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19. A force vector applied on a mass is represented as $\vec{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$ and acceleration with m/s^2 . What will be the mass of the body in kg.

A. 10 kg

B. 20 kg

C. $10\sqrt{2}$ kg

D. $2\sqrt{10}$ kg

Answer: C



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20. A shell of mass 10 kg is moving with a velocity with a velocity of 10ms^{-1} when it blasts and forms two parts of mass 9 kg and 1 kg respectively. If the 1st mass is stationary, the velocity of the 2nd is

A. 1 m/s

B. 10m/s

C. 25ms^{-1}

D. 500ms^{-1}

Answer: C



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21. The maximum range of a gun on horizontal terrain is 25 km. If $g = 10 \text{ ms}^{-2}$, the muzzle velocity of the shell

A. 250ms^{-1}

B. 2500ms^{-1}

C. 25ms^{-1}

D. 500ms^{-1}

Answer: D



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22. The width of river is 1 km. The velocity of boat is 5 km/hr. The boat covered the width of river with shortest possible path in 15 min. Then the velocity of river stream is:

A. 3 km/h

B. 4 km/h

C. $\sqrt{29}$ km/h

D. $\sqrt{41}$ km/h

Answer: A



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23. the circular motion of a particle with constant speed is

A. periodic but not simple harmonic

B. simple harmonic but not periodic

C. period and simple harmonic

D. neither periodic nor simple harmonic.

Answer: A



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24. When a horse pulls a wagon, the force that causes the horse to move forward is the force

A. cart on the ground

B. ground on the cart

C. horse on the ground

D. ground on the horse.

Answer: D



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25. The horizontal range and the maximum height of a projectile are equal. The angle of projection of the projectile is

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

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

$$C. \theta = \tan^{-1}(3)$$

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

Answer: D



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26. Two equal masses m_1 and m_2 moving along the same straight line with velocities $+3m/s$ and $-5m/s$ respectively collide elastically. Their velocities after the collision will be respectively.

A. $-4m/s$ and $+4m/s$

B. $+4m/s$ for both

C. $-3m/s$ and $+5m/s$

D. $-5m/s$ and $+3m/s$

Answer: D



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27. A rocket motor consumes 100 kg of fuel per second exhausting it with a speed of $6 \times 10^3\text{ ms}^{-1}$ What thrust is exerted on the

rocket ? What will be the velocity of the rocket at the instant its mass is reduced to $(1/40)$ of its initial mass ? Take initial velocity of rocket as zero . Neglect gravity .

A. $1000ms^{-2}$

B. $100ms^{-2}$

C. $10ms^{-2}$

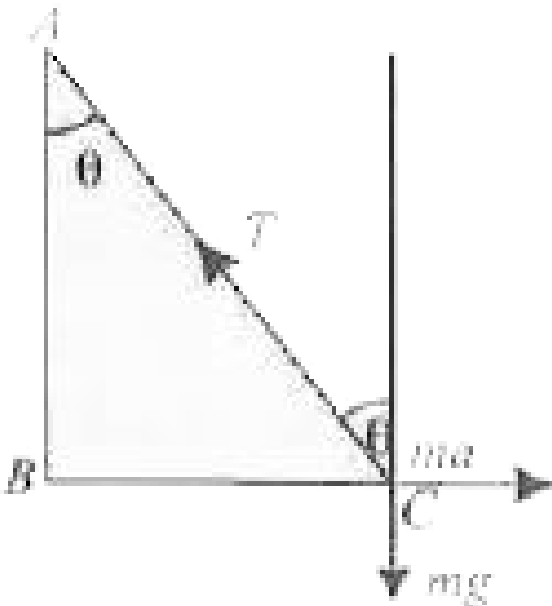
D. $1ms^{-2}$

Answer: D



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28. A plumb line gets inclined to vertical at angle θ when the carriage travels with an acceleration a . The plumb line is suspended from the roof of the carriage. The acceleration a is given by



A. $a = g \tan \theta$

B. $a = g \sin \theta$

C. $a = g \cos \theta$

D. $a = g \sec \theta$

Answer: A



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29. A particle executes circular motion under a central attractive force inversely proportional to distance R. The speed of the particle is

A. Dependent on R

B. Dependent on R^2

C. Independent of R

D. Dependent on $1/R$

Answer: C



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30. If M is mass of rocket, r is rate of ejection of gases and u is velocity of gases with respect

to rocket then acceleration of the rocket dv/dt

is equal to

A. $\frac{ru}{M - rt}$

B. $\frac{M - rt}{ru}$

C. $\frac{ru}{M + rt}$

D. $\frac{ru}{M}$

Answer: A



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**Wb Jee Workout Category 2 Single Option
Correct Type 2 Marks**

1. A body of mass m moving with velocity $3km/h$ collides with a body of mass $2m$ at rest. Now, the coalesced mass starts to move with a velocity

A. 3 km/hour

B. 4 km/hour

C. 1 km/hour

D. 2 km/hour

Answer: C



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2. A particle is projected from the ground with a kinetic energy E at an angle of 60° with the horizontal. Its kinetic energy at the highest point of its motion will be

A. $E / \sqrt{2}$

B. $E / 2$

C. $E / 4$

D. $E/8$

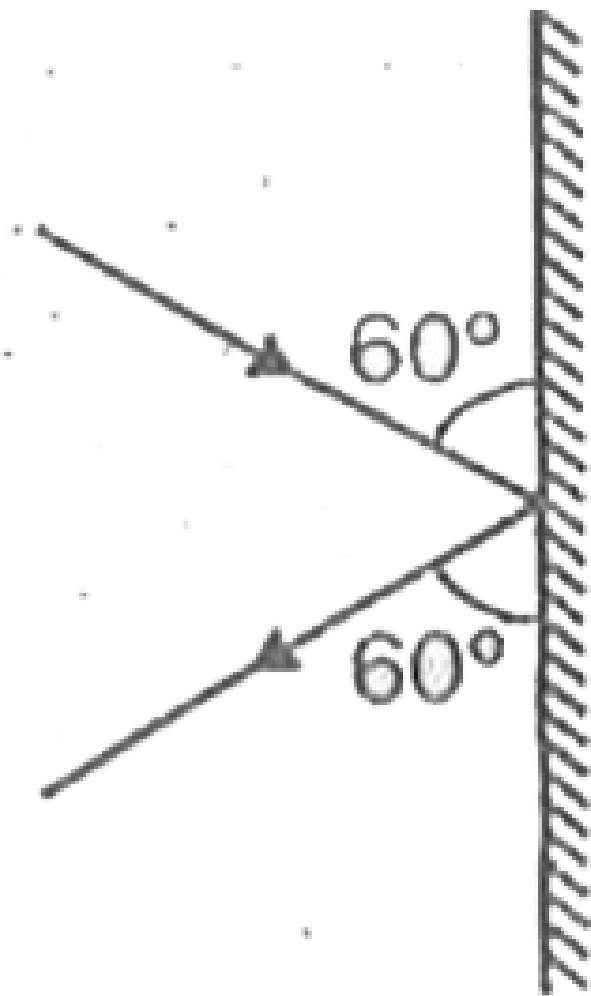
Answer: C



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3. A body of mass 3 kg moving with velocity 10 m/s hits a wall at an angle of 60° and returns at the same angle. The impact time was 0.2 s.

Calculate the force exerted on the wall.



A. $150\sqrt{3}N$

B. $50\sqrt{3}N$

C. 100 N

D. $75\sqrt{3}N$

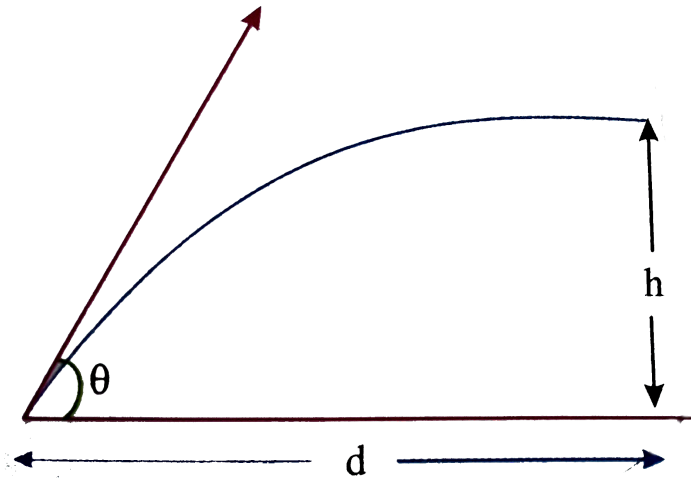
Answer: A



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4. If a stone is to hit at a point which is at a distance d away and at a height h (see fig) above the point from where the stone starts, then what is the value of initial speed u

if the stone is launched at an angle θ ?



A. $\frac{g}{\cos \theta} \sqrt{\frac{d}{2(d \tan \theta - h)}}$

B. $\frac{d}{\cos \theta} \sqrt{\frac{g}{2(d \tan \theta - h)}}$

C. $\sqrt{\frac{gd^2}{h \cos^2 \theta}}$

D. $\sqrt{\frac{gd^2}{d - h}}$

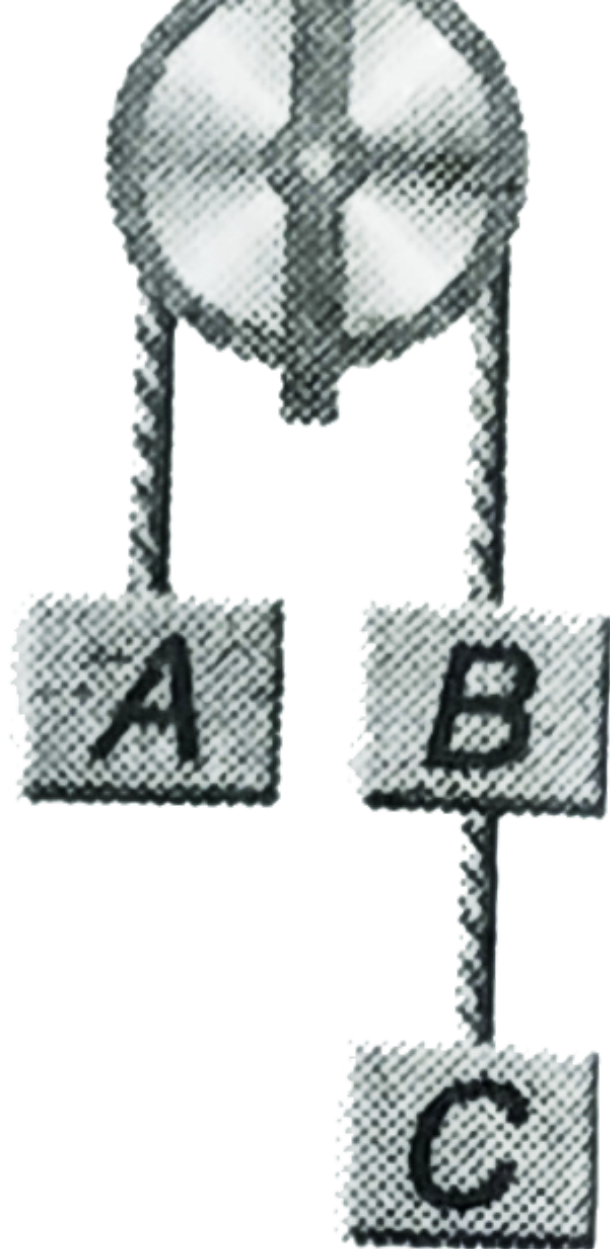
Answer: B



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5. 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. 13.0 newton

C. 3.3 newton

D. 19.6 newton

Answer: B

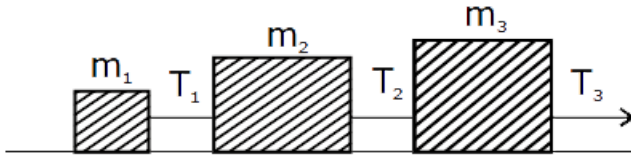


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6. Three block are connected as shown, on a horizontal frictionless table and pulled to the right with a force $T_3 = 60$ N. If $m_1 = 10kg$,

$m_2 = 20 \text{ kg}$ and $m_3 = 30 \text{ kg}$, the tension T_2

is-



A. 40 N

B. 30 N

C. 20 N

D. 10 N

Answer: B



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7. For a given velocity, a projectile has the same range R for two angles of projection. If t_1 and t_2 are the time of flight in the two cases, then $t_1 t_2$ is equal to

A. R

B. R^2

C. R^3

D. \sqrt{R}

Answer: A



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8. In a projectile motion, the height

$y = \sqrt{3}t - 5t^2 + r^3$ and horizontal distance

$x = t + 2t^2 - t^3$. The angle of projection is

given by

A. 30°

B. 60°

C. 45°

D. 75°

Answer: B



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9. An aeroplane executes a horizontal loop at a speed of 720 kmph with its wings banked at 45° . What is the radius of the loop? (Take $g = 10 \text{ m s}^{-2}$)

A. 7.2 km

B. 4 km

C. 2 km

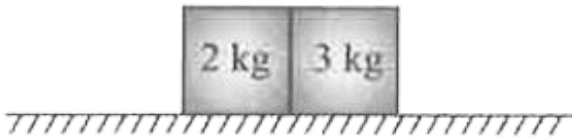
D. 4.5 km

Answer: B



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10. Find the normal force between 2 kg and 3 kg blocks.



A. zero

B. 20 N

C. 30 N

D. 10 N

Answer: A



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11. 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. 0 N

B. 1 N

C. 2 N

D. 3 N

Answer: B

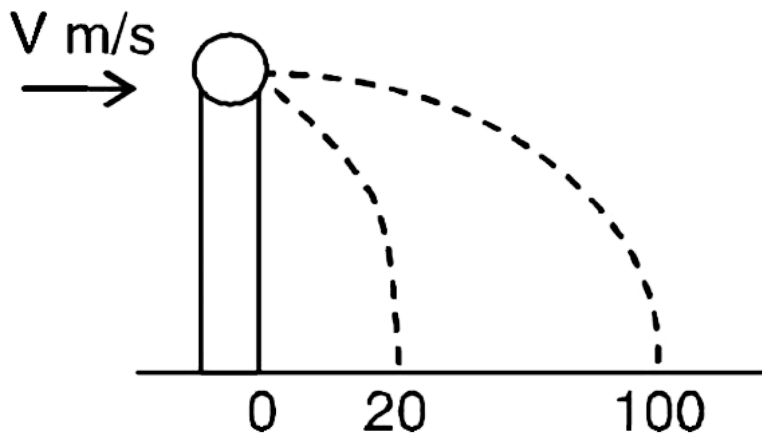


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12. A ball of mass 0.2 kg rests on a vertical post of height 5 m. A bullet of mass 0.01 kg, travelling with a velocity $V\text{ m/s}$ in a

horizontal direction, hits the centre of the ball.

After the collision, the ball and bullet travel independently. The ball hits the ground at a distance of 20 m and the bullet at a distance of 100 m from the foot of the post. The velocity V of the bullet is



A. 250 m/s

B. $250\sqrt{2}$ m/s

C. 400 m/s

D. 500 m/s

Answer: D



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13. 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. 9 N-s

B. zero

C. 1.8 N-s

D. 0.9 N-s

Answer: D



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14. From the top of a tower, 80m high from the ground a stone is thrown in the horizontal direction with a velocity of $8ms^{-1}$. The stone reaches the ground after a time t and falls at a distance of d from the foot of the tower. Assuming $g = 10ms^{-2}$, the time t and distance d are given respectively by

A. 6s, 64 m

B. 6s, 48 m

C. 4s, 32 m

D. 4s, 16 m

Answer: C



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15. A projectile can have the same range R for two angles of projection. If t_1 and t_2 be the time of flight in the two cases, then find the relation between t_1 , t_2 and R .

A. $R = \sqrt{H_1 H_2}$

B. $R_2 = H_1^2 + H_2^2$

C. $R = H_1 + H_2$

D. $R = 4\sqrt{H_1 H_2}$

Answer: D

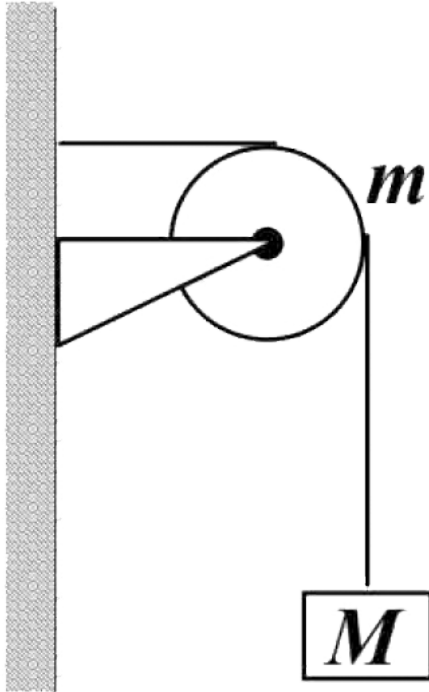


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**Wb Jee Workout Category 3 One Or More Than
One Option Correct Type 2 Marks**

1. A string of negligible mass going over a clamped pulley of mass m supports a block of mass M as shown in the figure. The force on

the pulley by the clamp is given by



$$A. g\sqrt{(M + m)^2 + M^2}$$

B. $\sqrt{2} \cdot mg$

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

D. $\sqrt{2}Mg$

Answer: A



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2. A rope of negligible mass can support a load of M kg. What will be the mass of the greatest load raised by the rope? 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 .

A. $\frac{M}{1 + \frac{2h}{gt^2}} kg$

B. $\frac{M}{\frac{2h}{gt^2}} kg$

C. $\frac{Mgt^2}{2h - gt^2} kg$

D. $\frac{Mh^2}{2h + gt^2} kg$

Answer: A



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3. A reference frame attached to the earth

A. is an inertial frame by definition.

B. cannot be an inertial frame because the earth is revolving round the sun.

C. is an inertial frame because Newton's laws are applicable in this frame.

D. cannot be an inertial frame because the earth is rotating about its own axis.

Answer: B::D



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4. Two ships are $10\sqrt{2}$ km apart on a line running south to north. The one further north is moving west with a speed of 25 km/h, while the other towards north with a speed of 25 km/h.

A. Their distance of closest approach is

$5\sqrt{2}$ km.

B. Their distance of closest approach is 10 km

C. Time required to reach the closest distance is 17 min

D. Time required to reach the closest distance is 29 min.

Answer: B::C



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5. Two masses of 0.25 kg each moves towards each other with speed 3 m s^{-1} and 1 m s^{-1} collide and stick together. The final velocity will be

A. 0.5 m s^{-1}

B. 2 m s^{-1}

C. 1 m s^{-1}

D. 0.25 m s^{-1}

Answer: C



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6. A ball hits the floor and rebounds after an inelastic collision. In this case

A. the momentum of the ball just after the collision is the same as that just before the collision

B. the mechanical energy of the ball remains the same in the collision

C. the total momentum of the ball and the earth is conserved

D. the total energy of the ball and the earth is conserved.

Answer: C::D



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7. A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle.

The motion of the particle takes place in a plane. It follows that

- A. its velocity is constant
- B. its acceleration is constant
- C. its kinetic energy is constant
- D. it moves in a circular path

Answer: C::D



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8. A spherical ball A of mass 4 kg, moving along a straight line strikes another spherical ball B of mass 1 kg at rest. After the collision, A and B move with velocities $v_1 \text{ m s}^{-1}$ and $v_2 \text{ m s}^{-1}$ respectively making angles of 30° and 60° with respect to the original direction of motion of A. The ratio $\frac{v_1}{v_2}$ will be

A. $\frac{\sqrt{3}}{4}$

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

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

D. $\sqrt{3}$

Answer: A



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9. A train is moving north with speed 20 m s. If it turns west with same speed

A. The resultant velocity makes an angle of 45° in the south of west direction.

B. The change in velocity will be

$$20\sqrt{2}ms^{-1}$$

C. The resultant velocity makes an angle of

60° in the south of west direction.

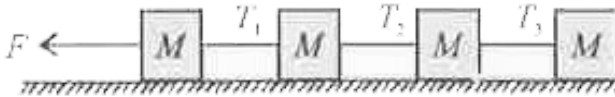
D. The change in velocity is $10\sqrt{2}ms^{-1}$.

Answer: A::B



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10. Four blocks each of mass M connected by a massless strings are pulled by a force F on a smooth horizontal surface, as shown in figure.



A. $T_3 = \frac{1}{4}F$

B. $T_2 = \frac{1}{2}F$

C. $T_1 = \frac{3}{4}F$

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

Answer: A::B::C



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Wb Jee Previous Years Questions Caterogy 1 Single Option Correct Type 1 Mark

1. A particle is moving with a uniform speed v in a circular path of radius r with the centre at O . When the particle moves from a point P to Q on the circle such that $\angle POQ = \theta$, then the magnitude of the change in velocity is

A. $2v \sin(2\theta)$

B. zero

C. $2v \frac{\sin(\theta)}{2}$

D. $2v \cos \theta \left(\frac{\theta}{2} \right)$

Answer: C



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2. A bullet of mass m travelling with a speed v hits a block of mass M initially at rest and gets embedded in it. The combined system is free to move and there is no other force acting on

the system. The heat generated in the process will be

A. zero

B. $\frac{mv^2}{2}$

C. $\frac{Mmv^2}{2(M - m)}$

D. $\frac{mMv^2}{2(M + m)}$

Answer: D



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3. A shell of mass $5M$, acted upon by no external force and initially at rest, bursts into three fragments of masses M , $2M$ and $2M$ respectively. The first two fragments move in opposite directions with velocities of magnitude $2v$ and v respectively. The third fragment will

A. move with a velocity v in a direction perpendicular to the other two

B. move with a velocity $2v$ in the direction of velocity of the first fragment

C. be at rest

D. move with a velocity v in the direction of velocity of the second fragment.\

Answer: C



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4. A cricket ball thrown across a field is at heights h_1 and h_2 from the point of projection at time t_1 and t_2 respectively after the throw. The ball is caught by a fielder at the same height as that of projection. The time of flight of the ball in this journey is

A. $\frac{h_1 t_2^2 - h_2 t_1^2}{h_1 t_2 - h_2 t_1}$

B. $\frac{h_1 t_1^2 + h_2 t_2^2}{h_2 t_1 + h_1 t_2}$

C. $\frac{h_1 t_2^2 + h_2 t_1^2}{h_1 t_2 + h_2 t_1}$

D. $\frac{h_1 t_1^2 - h_2 t_2^2}{h_1 t_1 - h_2 t_2}$

Answer: A



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5. A particle is moving uniformly in a circular path of radius r . When it moves through an angular displacement θ , then the magnitude of the corresponding linear displacement will be

A. $2r \cos\left(\frac{\theta}{2}\right)$

B. $2r \cos\left(\frac{\theta}{2}\right)$

C. $2r \tan\left(\frac{\theta}{2}\right)$

D. $2r \sin\left(\frac{\theta}{2}\right)$

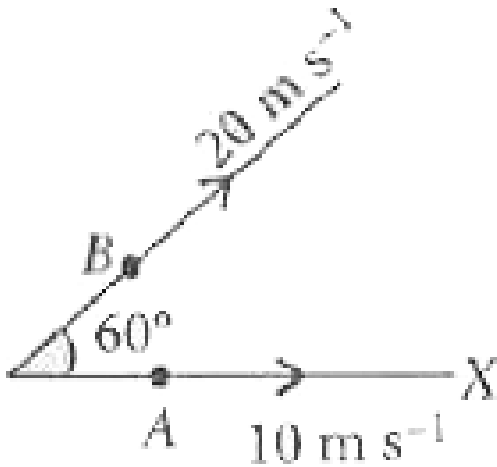
Answer: D



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6. Particle A moves along X-axis with a uniform velocity of magnitude 10 m/s. Particle B moves with uniform velocity 20 m/s along a direction making an angle of 60° with the positive direction of X-axis as shown in the figure. The

relative velocity of B with respect to that A is



A. 10 m/s along X-axis

B. $10\sqrt{3} \text{ m/s}$ along Y-axis (perpendicular to X-axis)

C. $10\sqrt{5} \text{ m/s}$ along the bisection of the velocities of A and B.

D. 30 m/s along negative X -axis.

Answer: B



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7. A block of mass 1 kg starts from rest at $x = 0$ and moves along the X - axis under the action of a force $F = kt$, where t is time and $k = 1 \text{ N s}^{-1}$. The distance, the block will travel in 6 seconds is

A. 36 m

B. 72 m

C. 108 m

D. 18 m

Answer: A



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8. The velocity (v) of a particle (under a force F)

depends on its distance (x) from the origin

(with $x > 0$) $v \propto \frac{1}{\sqrt{x}}$. Find how the

magnitude of the force (F) on the particle depends on x .

A. $F \propto \frac{1}{x^{3/2}}$

B. $F \propto \frac{1}{x}$

C. $F \propto \frac{1}{x^2}$

D. $F \propto x$

Answer: C



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9. Two masses m_1 and m_2 ($m_1 > m_2$) are connected by massless flexible and inextensible string passed over massless and frictionless pulley. The acceleration of centre of mass is

A. g

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

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

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

Answer: D



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10. Two particles are simultaneously thrown in horizontal direction from two points on a riverbank, which are at certain height above the water surface. The initial velocities of the particles are $v_1 = 5\text{ m/s}$ and $v_2 = 7.5\text{ m/s}$ respectively. Both particles fall into the water at the same time. First particles enters the water at a point $s = 10\text{ m}$ from the bank.

Determine

(a) the time of flight of the two particles,

(b) the height from which they are thrown,

(c) the point where the second particle falls in water.

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

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

C. $\frac{4v^2}{g}$

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

Answer: C



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Wb Jee Previous Years Questions Category 2

Single Option Correct Type 2 Marks

1. A body is projected from the ground with a velocity $v = (3\hat{i} + 10\hat{j})ms^{-1}$. The maximum height attained and the range of the body respectively are (given $g = 10ms^{-2}$)

- A. 5 m and 6 m
- B. 3 m and 10 m
- C. 6 m and 5 m
- D. 3 m and 5 m

Answer: A



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Wb Jee Previous Years Questions Category 3 One Or More Than One Option Correct Type 2 Marks

1. A small steel ball bounces on a steel plate held horizontally. On each bounce the speed of the ball arriving at the plate is reduced by a factor e (coefficient of restitution) in the rebound, so that $v_{\text{upward}} = eV_{\text{downward}}$. If the

ball is initially dropped from a height of 0.4 m above the plate and if 10 seconds later the bouncing ceases, the value of e is

A. $\sqrt{\frac{2}{7}}$

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

C. $\frac{13}{18}$

D. $\frac{17}{18}$

Answer: D



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2. A projectile thrown with an initial velocity of 10m s^{-1} at an angle with the horizontal, has a range of 5 m. Taking $g=10\text{ m s}^{-2}$ and neglecting air resistance, what will be the estimated value of α ?

A. 15°

B. 30°

C. 45°

D. 75°

Answer: A::D



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