PHYSICS

BOOKS - TARGET PHYSICS (MARATHI ENGLISH)

LAWS OF MOTION

Exercise

1. When a bus suddenly takes a turn, the passengers are thrown outwards because of

A. inerita of motion

B. acceleration of motion

C. speed of motion

D. both (B) and (C)

Answer:

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2. An aircraft is moving with a velocity of $300 \ \mathrm{ms}^{-1}$. If all the forces acting on it are balanced, then

A. It still mvoes wih the same velocity.

B. It will be just floating at the same point in space

C. It will fall down instantaneously.

D. It will lose its velocity gradually.

Answer:

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3. A boy sitting on the topmost berth in the compartment of a train which is just going to stop on a railway station drops an apple aiming at the open hand of his brother sitting just below him at a distance of about 2 metre. The apple will fall

A. precisely on his brother's hands.

B. slightly away from the hand of his brother in the direction of the train's motion.

C. slightly away from the hand of his brotherin a direction opposite to the direction of train.

D. at 2 m away from his brother.

Answer:

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4. A boy holds a hydrogen-filled balloon with a string. He is sitting in a train moving with uniform velocity on

a straight track. The string is vertical. On applying brakes, the balloon will

A. be thrown forward

B. be thrown backward

C. remain vertical

D. fall downwards

Answer:

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5. A passenger sitting in a bus moving along a circular path experiences a force which is

A. opposie to the acceleration of the bus.

B. in the same direction as that of the acceleration of the bus.

C. along the direction of motion of the bus.

D. opposite to the direction of motion of the bus.

Answer:

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6. The INCORRECT statement about Newton's second law of motion is

A. It provides a measure of inertia.

B. It provides a measure of force.

C. It relates force and acceleration

D. It relates force and momentum.

Answer:

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7. In doubling the mass and acceleration of the body, the force acting on the body with respect to the previous value

A. decrease to half

B. remains unchanged

C. increase two times

D. increases four times

Answer:

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8. If a rifle is fixed on the ground and fired, which of the following statement is CORRECT?

A. The bullet will not retun to the ground

B. Newton's third law of motion is obeyed

C. Newton's third law of motion is not obeyed

D. Recoil force doesn't act on rifle.

Answer:

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9. The inability of a body to change by itself, its state of rest or state of motion is called _____ of the body.

A. weight

B. momentum

C. force

D. inertia

Answer:

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10. Choose the correct options

Action and reaction forces do not cancel each other because

A. they have different magnitude.

B. they are acting at different direction

C. they are equl in magnitude and opposite in direction acting on two different bodies.

D. they have same direction and have different magnitudes acting on two different bodies.

Answer:

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11. A body of mass m collides against a wall with a velocity v and rebounds with the same speed. Its change of momentum is

A. 2mv

B. mv

C. $-mv$

D. zero

Answer:

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12. Choose the correct options

A force vector applied on a mass is represented as $\vec{F} = \left(6\hat{i} - 8\hat{j} + 10\hat{k}\right)$ N and accelerates with 1 ms^{-2}

What will be the mass of the body?

A. $2\sqrt{10}kg$

B. 10 kg

C. $10\sqrt{2}kg$

D. 20 kg

Answer:

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13. A system of coordinates of an observer used to describe any motion is called_____.

A. coordinates axes

B. origin of motion

C. frame of reference

D. absolute frame of reference

Answer:

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14. Inertial frame of reference implies that

A. Newton's laws of motion hold good for real forces.

B. the frames accelerate uniformly.

C. Newton's laws of motion do not hold good.

D. fictitious force acts in it.

Answer:

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15. A frame of reference which moves with constant velocity with reference to a stationary frame of reference is called_____.

A. inertial frame of rference

B. non-inertial frame of reference

C. rotatin frame of reference

D. absolute frame of reference

Answer:

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16. A frame of reference in which Newton's law of inertia does not hold good is called_____.

A. inertial frame of reference

B. non-inertial frame of reference

C. polar fram of reference

D. psuedo frame of reference

Answer:

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17. Non-inertial frame of reference have

A. zero acceleration

B. some acceleration with respect to inertial frame of reference

C. zero velocity

D. constant velocity with respect to inertial frame of reference.

Answer:

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18. A force produced due to interaction between the objects is called_____ force.

A. pseudo

B. impulse

C. real

D. moment of inertia

Answer:

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19. _____ force is defined in order to apply Newton's laws of motion is accelerated motion.

A. Pseudo

B. Gravitational

C. Real

D. Magnetic

Answer:

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20. Choose the correct options

Which of the following is NOT an example of real force?

A. The earth revolvesaround the sun.

B. Bus is moving with acceleration in straight line, the passeger experience backward force.

C. Motion between two surfaces in contact.

D. Motion of the moon around the earth

Answer:

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21. _____ forces are charge independent.

A. Strong nuclear

B. Weak gravitational

C. Electrostatic

D. Electromagnetic

Answer:

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22. Choose the INCORRECT statement.

A. The force between two nucleons hold the protons and the neutrons inside the nucleus.

B. Nuclear force obey inverse square law.

C. Weak nuclear force is weaker than gravitational force.

D. Electromagnetic force does not depend on intervening medium

Answer:

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23. If the distance between two masses is doubled, gravitational attraction between them

A. is doubled

B. becomes four times

C. is reduced to half.

D. is reduced to quarter.

Answer:

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24. Which of the following is NOT the characteristic of gravitational force ?

A. This force is always attractive and applicable for microscopic as well as macroscopic bodies.

B. Its range i unlimited and it is a very weak force as copared to other real forces.

C. It obeys inverse square law of distance.

D. It depends on intervening medium.

Answer:

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25. The electrostatic and gravitational forces are similar because

A. both are conservative.

B. both are central forces.

C. boh follow inverse squae law.

D. all of these

Answer:

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26. The forces between electric charges in relative motion are called _____.

A. electrostatic forces

B. electromagnetic forces

C. nuclear forces

D. gravitational forces

Answer:

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27. Nuclear force between proton-proton is _____.

A. repulsive

B. attractive

C. zero

D. infinite

Answer:

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28. The gravitational force of attraction between Earth and Venus, if the distance between them is 2.5×10^7 km, is [mass of Venus = 4.8×1^{24} kg, mass of the Earth $= 6 \times 10^{24}$ kg

A. $4.1 \times 10^{18} N$

B. $2. \times 10^{18} N$

C. $3.1 \times 10^{18} N$

D. $5.1 \times 10^{18} N$

Answer:

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29. When a body goes away from the centre of the earth, its gravitational force goes on decreasing. This is an example of _____.

A. constant force

B. variable force

C. division of force

D. multiplication of force

Answer:

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30. Work is always done on a body when

A. a force acts on body to displace it.

B. it moves through a certain distance.

C. it experiences an increase in energy through a mechanical influence.

D. there is no displacement

Answer:

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31. Under the action of variable force, at any instant the displacement is

A. assumed to be infinitesimally small so that the force is assumed to be constant.

B. constant whatever be themagnitude of force.

C. half the magnitude of force

D. assumed to be infinitesimally small s that the force is assumed to be perpendicular to the

displacement.

Answer:

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32. A cyclist comes to skidding spot in 10 m. If the opposing force on the cycle due to the road is 200 N. The work done by the road on the cycle is

A. 2000 J

B. $-2000J$

C. 1000 J

D. $-1000J$

Answer:

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33. Choose the CORRECT statement.

A. Increase in the kinetic energy of the body is equal to the work done by the body against the opposite force.

B. Decrease in the kinetic energy of the body is equal to the work done by the body against the opposing force.

C. Increase in potential energy of the body is equal to the work done by the body against the external force in the opposite direction.

D. Decrease in potential energy of the body is equal to the work done by the body against the opposing force in the same direction.

Answer:

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34. If the kinetic energy decreases the work done is _____.

A. zero

B. negative

C. positive

D. double

Answer:

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35. Choose the CORRECT statement.

A. Increase in the kinetic energy of the body is equal to the work done by the body against the opposite force.

B. Decrease in the kinetic energy of the body is equal to the work done by the body against the opposing force.

C. Increase in potential energy of the body is equal to the work done by the body against the external force in the opposite direction.

D. Decrease in potential energy of the body is equal to the work done by the body against the opposing force in the same direction.

Answer:

36. Which one of the following WRONG?

A. W = Change in K.E. of the body.

B. W = Final K.E. - Initial K.E.

C. $W = \int_u^v mvdv$

D. $W = mvdv$

Answer:

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37. According to work-energy theorem, the work done by the net force on a particle is equal to the change in

its

A. kinetic energy

B. potential energy

C. linear momentum

D. angular momentum

Answer:

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38. A ladder 2.5 m long and of weight 150 N has its centre of gravity 1 m from its bottom. A weight of 40 N is attached to the top end. The work required to raise

the ladder from the horizontal position to the vertical position is

A. 190 J

B. 250 J

C. 285 J

D. 475 J

Answer:

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39. Choose the correct options

Choose the WRONG statement.

A. The law of conservation of linear momentum holds goods for microscopic objects

B. The law of conservation of linear momentum holds goods for macroscopic objects.

C. The law of conservation of linear metm is true for two objects.

D. The law of conservation of linear momentum is not applicable for two colliding bodies at any angle.

Answer:

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40. The working of rocket is based on the principle of _____.

A. elasticity

B. Kepler's laws

C. Newton's

D. conservation of linear momentum

Answer:

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41. A light and a heavy body have equal K.E. Which body possesses greater momentum ?

A. Light body

B. Both have equal momentum

C. They heavy body

D. Momentum cannot be predicted.

Answer:

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42. A bullet leaves the rifle of mass one kg and rifle recoils thereby with velocity 30 cm/s. If the mass of the bullet is 3 g, the velocity of the bullet is

A. $10^4 cm/s$

B. $3 \times 10^2 cm/s$

C. $10^2 cm/s$

D. $10 cm/s$

Answer:

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43. A bullet of mass 10 g is fired with a velocity of 100 m/s from a rifle of mass 2.5 kg, the recoil velocity of the rifle is

A. $-0.4m/s$

B. $+0.4m/s$

C. $-4m/s$

D. $+4m/s$

Answer:

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44. A 30 kg shell is flying at 48 m/s. When it explodes, its one part of 18 kg stops, while the remaining part flies on with velocity

A. $120ms^{-1}100ms^{-1}$

B. $100ms^{-1}$

C. $60ms^{-1}$

D. $48ms^{-1}$

Answer:

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45. A bullet of mass 10 g moving with 300 m/s hits a block of ice of mass 5 kg and drops dead. The velocity of ice is

A. 50 cm/s

B. 60 cm/s

C. 40 cm/s

D. 30 cm/s

Answer:

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46. Two billiard balls A and B each of mass 0.05 kg moving in opposite direction with a speed of $6\ \mathrm{m\,s^{-1}}$, collide and rebound with the same speed. What is the total change in momentum of each ball ?

A. $-0.6kgms^{-1}, 0, 6kgms^{-1}$

B. $-0.6kgms^{-}$, -0.6 kg m s^-1`

C. $0.6kgms^{-1}, 0.6kgms^{-1}$

D. $0.3kgms^{-1}, 0.3kgms^{-1}$

Answer:

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47. A shell in its flight, explodes into four unequal parts. Which of the following is conserved?

A. Momentum

B. Kinetic energy

C. Potential energy

D. Gravitational energy

Answer:

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48. When two bodies stick together after collision, the collision is said to be_____.

A. perfectly elastic

B. perfectly inelastic

C. partly elastic

D. partly inelastic

Answer:

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49. Which of the following is NOT an example of inelastic collision?

A. A meteorite collides head-on on the earth.

B. Lump of mud thrown on th wal sticks to the wall.

C. A ball allowed to fall on hard surface, does nt bounce to original height.

D. The gas molecules in te container strikes the wall of the container.

Answer:

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50. For perfectly elastic collision

A. $v_2 -_1 = u_2 - u_1$

B. $v_1 - v_2 = u_1 - u_2$

C. $v_2 - v_1 = u_1 - u_1$

D. $v_2 - v_1 = \frac{u_1 + u_2}{2}$

Answer:

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51. When a massive body suffers an elastic collision with a stationary light body, then massive body approximately comes to rest and light body

A. acquires velocity greater than initial velocity of massive body.

B. sticks to the massive body and remains at rest.

C. acquires half the iniitial velocity of the massive body.

D. remains at rest but does not stick to the massive body.

Answer:

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52. A ball of mass 5 kg travelling with velocity of 15 cm/s makes a head on collision with another ball of mass 1 kg which is at rest. After the collision, the speed of the lighter ball is

A. zero

B. less than 15 cm/s.

C. equal t 15 cm/s.

D. greater than 15 m/s.

Answer:

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53. The ratio of relative velocity of separation after collision to the relative velocity of approach before collision between two colliding bodies is _____.

A. coefficient of restitution

B. velocity of collision

C. sum of the velocities

D. the law of gravitation

Answer:

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54. Choose the correct options

A block of mass m moving at a speed of u collides with another block of mass 2 m at rest. The lighter block comes to rest after the collision. The coefficient of restitution is

A. 0.8

B. 0.6

C. 0.5

D. 0.4

Answer:

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55. A body of mass 0.1 kg travelling with a velocity of 5 m/s, collides head-on with another body of mass 0.2 kg travelling in the same direction with a velocity of 1.2 m/s. If the two bodies stick together after collision, their common velocity is

A. 0.967 m/s

B. 1.233 m/s

C. 2.467 m.s

D. 2.524 m/s

Answer:

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

A. $4kmh^{-1}$

B. $3kmh^{-1}$

C. $2kmh^{-1}$

D. $1kmh^{-1}$

Answer:

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57. Choose the correct options

A ball of mass 250 g moving with 20 m/s strikes a vertical wall and rebounds along the same line with a velocity of 15 m/s. If the time of contact is 0.1 s, the force exerted by the wall on the ball is

A. 87.5 N

B. 12.5 N

C. $-12.5N$

D. $-87.5N$

Answer:

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58. Choose the correct options

The turning effect of the applied force does NOT depend upon

A. magnitude of the force.

B. direction of the force.

C. moment arm of the force.

D. material and its distance from axis of rotation.

Answer:

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59. The ability of a force to produce rotational motion is measured by its turning effect and it is called_____.

A. momentum

B. power

C. energy

D. torque

Answer:

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60. The direction of torque is given by _____.

A. direction of force only

B. direction of moment arm

C. right hand screw rule

D. left hand screw rule

Answer:

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61. The unit of moment of force is same as _____.

A. power

B. acceleration

C. momentum

D. work

Answer:

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62. Torque can NOT be given by

A. product of magnitue of the force and lever arm of the force.

B. product of magnitude o the force and perpendicular distance between its line of action of the force.

C. product of magnitude of force and moment arm of the force.

D. product of magnitude of force and maximum distance covered.

Answer:

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63. A rigid body is rotating about an axis. The best way to stop it is applying

A. pressure at the turning point.

B. upward force atthe turning pont.

C. downward force at the free end.

D. torque in opposite direction.

Answer:

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64. What is the torque of force $\vec{F} = \left(2\hat{i} - 2\hat{j} - 4\hat{k}\right)$ N acting at a point $\vec{r} = \left(3\hat{i} + 2\hat{j}\right)m$ about the origin?

A. $\left(\hat{i} + 18\hat{j} - 13\hat{k}\right)Nm$

B. $\left(\hat{i} + 18\hat{j} + 13\hat{k}\right)Nm$

C. $\left(-\hat{i} - 18\hat{j} - 13\hat{k}\right)Nm$

D. $\left(\hat{i} - 18\hat{j} - 13\hat{k}\right)Nm$

Answer:

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65. Choose the correct options

A mass of 10 kg is suspended from a rope wound on a wheel of diameter 40 cm. The torque about the axis of rotation is

A. 39.2 N m

B. 19.6 N m

C. 4 N m

D. 2 N m

Answer:

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66. _____ is a pair of equal and parallel forces acting in opposite directions at two different points of a given body

A. Couple

B. Moment of force

C. Pseudo force

D. Moment arm

Answer:

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67. The moment of couple is independent of

A. the point about which the moment is found.

B. magnitude of the force.

C. magnitude of the distance between line of action of force and perpendicular distance

D. angle made by the line of action of force.

Answer:

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68. Force applied to open or close a water tap is an example of _____.

A. elasic collision

B. conservation of momentum

C. couple

D. application of Newton's law of motion

Answer:

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69. If the force applied to a body produces rotational motion in an anticlockwise sense, the moment of the force is considered as _____.

A. negative

B. zero

C. positive

D. infinity

Answer:

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70. Condition of translational equilibrium of a rigid body is

A. $\Sigma\overrightarrow{f} = 0$

B. $\Sigma\overrightarrow{f} \neq 0$

C. $\Sigma\overrightarrow{\tau} = 0$

D. $\Sigma\overrightarrow{\tau} = 2$

Answer:

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71. 6 m long see-saw remains horizontal when two children weighing 20 kg and 30 kg respectively sit at two ends. Where is the see-saw supported?

A. 3.6 m from 20 kg

B. 2.6 m from 30 kg

C. 4 m from 20 kg

D. 4.2 m from 30 kg

Answer:

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72. Where can the total mass of an object be assumed to be concentrated?

A. centre of gravity

B. centre of mass

C. the point on the surface

D. the end point of rod

Answer:

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73. The centre of mass of two particles lies

A. on the joining the particles.

B. along the third quadrant of coordinate axes.

C. on the line perpendicular to the line joining the particles.

D. at the midpoint on the line joining the two particle.

Answer:

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74. Centre of mass of rectangular lamina lies on

A. longer side.

B. shroter side.

C. one of its point inside the lamina.

D. point of intersection of the diagonals.

Answer:

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75. Three equal masses each of 50 g, are placed at the corners of a right angled isoceles triangle whose two equal sides are 5 cm each. The position of the centre of mass of the system is

A. x = 5 cm, y = 5cm,

B. $x = \frac{5}{3}cm, y = 5cm$

C. $x = \frac{5}{3}cm, y = \frac{5}{2}cm$

D. $x = \frac{5}{3}cm, y = \frac{5}{3}cm$

Answer:

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76. Point masses of 2 kg, 3 kg, 5 kg and 7 kg are placed at the corners of a square ABCD respectively whose each side is 1 m long. The position of the centre of mass of the system is

A. $\frac{14}{17}m, \frac{8}{17}m$

B. $\frac{12}{17}m, \frac{10}{17}m$

C. $\frac{15}{17}m, \frac{10}{17}m$

D. $\frac{12}{17}m, \frac{8}{17}m$

Answer:

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77. Choose the correct options

The centre of mass of a system of two uniform spherical masses of 5 kg and 35 kg with centres of them 0.7 m apart is

A. 0.6125 m from 35 kg.

B. 0.6125 n from 5 kg.

C. 0.35 m from 35 kg.

D. 0.35 m from 5 kg

Answer:

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78. A point through which total weight of the body always acts vertically downwards whatever may be the position of the body is _____.

A. centre of mass

B. rigid body

C. centre of gravity

D. geometrical centre

Answer:

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79. For regular shapes of the small body, which of the following statement is true?

A. The centre of mass coincides with centre of gravity.

B. The centre of mass is lower than centre of gravity

C. The centre of mass is higher than centre of gravity.

D. The cenre of mass is at haf the distance of centre of gravity

Answer:

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80. Choose the correct options

For a circular ring centre of gravity lies

A. away from the ring

B. at the geometrical centre

C. on the edge of the ring

D. none of the above

Answer:

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

A. moment of inertia.

B. thrid law of motion

C. inerita of rest

D. inertia of motion

Answer:

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82. An athlete runs some distance before taking a lang jump, because

A. it gives energy to him for long jump.

B. it helps to apply large force.

C. by running, he gives himself large ineritaof motion.

D. by running, action and reaction forces increase.

Answer:

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83. Choose the correct options

A bomb of mass 9 kg explodes into two pieces of mass 3 kg and 6 kg. The velocity of mass 3 kg is 16 m/s. The kinetic energy of mass 6 kg is

A. 96 J

B. 192 J

C. 384 J

D. 768 J

Answer:

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84. The average force necessary to stop a ball of mass 20 g and speed $250 \ \mathrm{m\,s^{-1}}$ as it penetrates mud at a distance of 12 cm is

A. $5.2 \times 10^3 N$

B. $750N$

C. 625 N

D. 520 N

Answer:

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85. A rider on the horse back falls backwards when horse starts running all of a sudden because

A. of inertia of motion.

B. of pseudo force acting on the rider.

C. inerti of rest keeps the upper part of body at rest whereas lower part of the body moves forward with the horse.

D. of losing balance.

Answer:

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86. The masses of 10 kg and 20 kg respectively are connected by a massless spring as shown in figure. A force of 200 N acts on the 20 kg mass. At the instant shown, the 10 kg mass has acceleration $12\ \mathrm{m/s^2}$. What is the acceleration of 20 kg mass?

A. $12m/s^2$

B. $10m/s^2$

C. $4m/s^2$

D. `zero

Answer:

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87. 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:

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88. The linear momentum p of a body moving in one dimension varies with time according to the equation $p = a + bt^2$, where a and b are positive constants. The net force acting on the body is

A. a constant

B. proportional to t_2

C. inversely proportional to t

D. proportional to t

Answer:

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89. A particle moves in the xy-plane under the action of a force F such that the components of its linear momentum p at any time t and $p_x = 2\cos t, p_y = 2\sin t$. the angle between F and p at time l is

A. 90°

B. 0°

C. 180°

D. 30°

Answer:

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

i. All blocks move with the same acceleration

ii. The net froce on each block is the same

Which of these statements are/is correct ?

A. (i) only

B. (ii) only

C. Both (i) and (ii)

D. Neither (i) nor (ii)

Answer:

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91. Ten one-rupee coins are put on top of each other on a table. Each coin has a mass m. Which statement of the following is not true?

A. The force on the 6^th coins (counted from the bottom) ue to all the coins on its top isequal to 4 mg (downwards).

B. The force on 6^th coin due to 7^th coin is 4 mg (downards).

C. The reaction of the 6^th coin on the 7^th coin is 4mg (upwards).

D. The total force on the 10^th coin is 9 mg (downwards).

Answer:

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92. A reference frame attached to the earth

A. is an inertial frame by definition.

B. cannot bean inertial frame because earth isrevolvinground the sun.

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

D. is aninertial frame because the earth is rotating about it own axis.

Answer:

93. Newton's law of gravitation is universal because

A. it is always attractive.

B. it cts on all hevenly bodies and particles.

C. it acts on all masses at all the distances and is not affected by the medium.

D. it is accepted by all the scientist.

Answer:

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94. which of the following is correct order for forces?

A. Weak lt gravitational forces lt strong forces (nuclear) lt electrostatic

B. Gravitational lt weak lt (electrostatic) lt strong force

C. Gravitational lt electrostatic lt weak lt strong force

D. Weak lt gravitational lt electrostatic lt strong forces

Answer:

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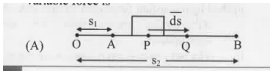
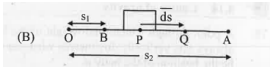
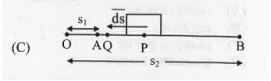
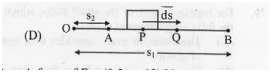
95. The CORRECT diagram for the work done is moving a body from A to B under the action of variableforce is

A. 

B. 

C. 

D. 

Answer:

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96. Choose the correct options

A force $F = (0.5x + 12)$ N acts on a particle. If x is in metres, calculate the work done by the force during the displcement of the particle from x= 0 to x = 4 m

A. 128 J

B. 80 J

C. 64 J

D. 52 J

Answer:

Watch Video Solution

97. A labourer is carrying a stone of mass 25 kg on his head on a level road. Work done by him against the gravity is

A. 100 joule

B. 50 joule

C. 25 joule

D. zero

Answer:

Watch Video Solution

98. Choose the correct options

A force $F = (0.5x + 12)$ N acts on a particle. If x is in metres, calculate the work done by the force during the displcement of the particle from x= 0 to x = 4 m

A. 128 J

B. 80 J

C. 64J

D. 52 J

Answer:

Watch Video Solution

99. If the unit of length and force be increased four times, the unit of energy is

A. 16 times

B. 8 times

C. 4 times

D. 2 times

Answer:

Watch Video Solution

100. A 1.5 kg block is initially at rest on a horizontal frictionless surface when a horizontal force in the positive direction of X-axis is applied to the block. The force is given by $\overrightarrow{F} = \left(4 - x^2\right)\hat{i}N$, where x is in metre and the initial position of the block is x = 0. The maximum kinetic energy of the block between x = 0 and x = 2.0 m is

A. 2.33 J

B. 3.33 J

C. 5.33 J

D. 6.67 J

Answer:

Watch Video Solution

101. A force of 5 N, making an angle 0 with the horizontal, acting on an object displaces it by 0.4 m along the horizontal direction. If the object gains kinetic energy of 1 J, the horizontal component of the force is

A. 1.5 N

B. 2.5 N

C. 3.5 N

D. 4.5 N

Answer:

Watch Video Solution

102. The displacement x of a particle moving in one dimension under the action of a constant force is related to the time t by the equation $t = \sqrt{x} + 3$, where x is in metre and t is in second. The work done by the force in the first 6 second is

A. 9 J

B. 6 J

C. 3 J

D. 0 J

Answer:

Watch Video Solution

103. The momentum of a system is conserved _____.

A. always

B. never

C. in the absence of an external force on the system

D. in linear motion only

Answer:

Watch Video Solution

104. A collision of two objects occurs in an inertial frame of reference A. It is also observed by an observed in another inertial frame of reference B moving uniformly with respect to the frame A along the z-axis. Which one of the following is correct?

A. The momentum is conserved in both the frames but the energy may not.

B. The energy is conserved in both the frames but the momentum may no .

C. Momentum along the z-axis only is conserved in the two frames.

D. Both energy and momentum are conserved in the both the frames.

Answer:

Watch Video Solution

105. Assertion: A bullet is fired from a rifle. If the rifle recoils freely, the kinetic energy of rifle is more than that of the bullet.

Reason: In the case of rifle bullet system, the law of conservation of momentum violates.

A. Assertion is True, Reason is True, Reasn is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason i not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is False.

Answer:

Watch Video Solution

106. A body of mass M at rest explodes into three pieces, two of which of mass M/4 each, are thrown off in perpendicular directions with velocities of 3 m/s and 4 m/s respectively. The third piece will be thrown off with a velocity of

A. 1.5 m/s

B. 2.0 m/s

C. 2.5 m/s

D. 3.0 m/s

Answer:

Watch Video Solution

107. A body of mass explodes at rest break up into three parts. If two parts having equal masses fly off perpendicularly to each other with a velocity of $18m/s$, then calculate the velocity of the third part which has a mass 3 times the mass of each part.

A. $6\sqrt{m}/\sec ond135^\circ$ from either

B. $6\sqrt{2}m/\sec ond$ and 45° from either

C. $\frac{6}{\sqrt{2}}m/\sec ond$ and 45° from either

D. $\frac{6}{\sqrt{2}}m/\sec ond$ and 45° from either

Answer:

Watch Video Solution

108. A bullet moving with a speed of 400 m/s penetrates a sand bag and drops dead inside it. The masses of the bullet and the sand bag are 0.25 kg and 4.75 kg respectively. If the bag is free to move, its velocity shall be (in m/s)

A. 10

B. 15

C. 21

D. 50

Answer:

Watch Video Solution

109. A stationary body of mass 3 kg explodes into three equal pieces. Two of the pieces fly off at right angles to each other, one with a velocity $2\hat{i}$ m/s and the other with a velocity $3\hat{j}$ m/s. If the explosion takes place in 10^{-5} s, the average force acting on the third piece in newton is

A. $\left(2\hat{i}+3\hat{j}\right)\times 10^{5}$

B. $-\left(2\hat{i}+3\hat{j}\right)\times 10^{5}$

C. $(3j-2i)\times 10^{-5}$

D. $\left(2\hat{i}-3\hat{j}\right)\times 10^{-5}$

Answer:

Watch Video Solution

110. A ball moving with a speed of $10\ \mathrm{m\,s^{-1}}$ strikes an identical ball such that after the collision the direction of each ball makes an angle 45° with the original line of motion. Find the speeds of the two balls after the collision.

A. $v_1 = f\sqrt{2}m/s, v_2 = 10\sqrt{2}m/s$

B. $v_1 = 10\sqrt{2}m/s, v_2 = 10\sqrt{2}m/s$

C. $v_1 = 5\sqrt{m}/s, v_2 = 5\sqrt{2}m/s$

D. $v_1 = 3\sqrt{2}m/s, v_2 = 10\sqrt{2}m/s$

Answer:

Watch Video Solution

111. A bullet hits and gets embedded in solid block resting on a frictionless surface. In this process which one of the following is correct?

A. Only momentm is conserved

B. Only kinetic energy is conserved

C. Neither momentum nor kinetic energy is conserved.

D. Both momentum and kinetic energy is conserved

Answer:

Watch Video Solution

112. In inelastic collision,

A. momentum, kinetic energy and total energy are conserved.

B. momentum, kinetic energy and total energy and total energy are not conserved.

C. momentum and kinetic eergy are conserved but total energy is not conserved.

D. total energy and momentum are conserved but kinetic energy is not conserved

Answer:

Watch Video Solution

113. One metallic sphere is at rest. Another metallic sphere hits the first and comes to rest and second sphere moves. The ratio of their masses is

A. $\frac{m_1}{m_2} < 1$

B. $\frac{m_1}{m_2} > 1$

C. $\frac{m_1}{m_2} = 1$

D. $\frac{m_1}{m_2} = 2$

Answer:

Watch Video Solution

114. Choose the correct options

A body of mass 2 kg, travelling at 4 m/s makes a head-on collision with a body of mass 1 kg travelling in the opposite direction with a velocity of 2 m/s, the velocities of the two bodies after collision are____

A. v 1 = 6 m / s , v 2 = 6 m / s

B. v 1 = 0 , v 2 = 0

C. v 1 = 0 m / s , v 2 = 6 m / s

D. v 1 = 6 m / s ,v 2 =0`

A. $v_1 = 6m/s, v_2 = 6m/s$

B. $v_1 = 0, v_2 = 0$

C. $v_1 = 0m/s, v_2 = 6m/s$

D. $v_1 6m/s, v_2 = 0$

Answer:

Watch Video Solution

115. A ball of mass 0.1 kg makes an elastic head on collision with a ball of unknown mass, initially at rest. If the 0.1 kg ball rebounds at one third of its original speed, the massof the other ball is

A. 0.1 kg

B. 0.2 kg

C. 0.3 kg

D. 0.4 kg

Answer:

Watch Video Solution

116. A body of mass 1 kg moving with velocity 5 m/s collides with another body of mass 2 kg moving with velocity 1.5 m/s in opposite direction. If the coefficient of restitution is 0.8, their velocities aftter collision respectively are

A. $-2.8m/s,\ +2.4m/s$

B. $+2.8m/s,\ -2.4m/s$

C. $-1.67m/s,\ -2.4m/s$

D. $+2.8m/s,\ -6.87m/s$

Answer:

Watch Video Solution

117. A 100 g iron ball having velocity 10 m/s collides 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 experienced by the wall is

A. 10 N

B. 100 N

C. 1.0 N

D. 0.1 N

Answer:

Watch Video Solution

118. If two balls each of mass 0.06 kg moving in opposite directions with speed 4 m/s collide and rebound with the same speed, then the impulse imparted to each ball due to other is

A. 0.48 kg m/s

B. 0.24 kg m/s

C. 0.81 kg m/s

D. Zero

Answer:

 Watch Video Solution

119. A ball weighing 10 g hits a hard surface vertically with a speed of 5 m s^{-1} and rebounds with the same speed. The ball remains in contact with the surface for 0.01 s. The average force exerted by the surface on ball is

A. 100 N

B. 10 N

C. 1 N

D. 0.1 N

Answer:

Watch Video Solution

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

A. accelertion

B. momentum

C. energy

D. velocity

Answer:

Watch Video Solution

121. A cricket ball of mass 0.5 kg strikes a circket bat normally with a velocity of $20\ \mathrm{m\,s^{-1}}$ and rebounds with a velocity of $10\ \mathrm{m\,s^{-1}}$. The impulse of the force exerted by the ball on the bat is

A. 15 N s

B. 25 N s

C. 30 N s

D. 10 N s

Answer:

Watch Video Solution

122. When a torwue acting upon a system is zero, then which of the following will be constant?

A. Force

B. Linear mometum

C. Angular momentum

D. Linear impulse

Answer:

Watch Video Solution

123. Let F be the force acting on a particle having position vector $\overrightarrow{r}$ and $\overrightarrow{\tau}$ be the torque of this force

about the origin, then

A. $\vec{r} . \vec{\tau} = 0$ and $\vec{F} . \vec{\tau} = 0$

B. $\vec{r} . \vec{\tau} \neq 0$ and $\vec{F} . \vec{\tau} \neq 0$

C. $\vec{r} . \vec{\tau} \neq 0$ and $\vec{F} . \vec{\tau} = 0$

D. $\vec{r} . \vec{t} a \neq 0$ and $\vec{F} \times \vec{\tau} = 0$

Answer:

Watch Video Solution

124. A force of $-F\hat{k}$ acts on O, the origin of the coordinate system. The torque about the point (1, -1) is

A. $-F\left(\hat{i} + \hat{j}\right)$

B. $F\left(\hat{i}+\hat{j}\right)$

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

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

Answer:

Watch Video Solution

125. A force $\overrightarrow{F}=4\hat{i}-5\hat{j}+3\hat{k}$ is acting a point $\overrightarrow{r_1}=\hat{i}+2\hat{j}+3\hat{k}$. The torque acting about a point $\overrightarrow{r_2}=3\hat{i}-2\hat{j}-3\hat{k}$ is

A. zero

B. $42\hat{i}-30\hat{j}+6\hat{k}$

C. $42\hat{i} + 30\hat{j} + 6\hat{k}$

D. $42\hat{i} + 30\hat{j} - 6\hat{k}$

Answer:

Watch Video Solution

126. A couple produces

A. purely linear motion

B. purcly rotational motion.

C. linear and rotational motion.

D. no motion.

Answer:

Watch Video Solution

127. Two men A and B support the ends of a uniform beam 2 m long and weighing 50 kg. A weight of 50 kg hangs from the beam from a point 0.5 m from A. Assuming the bar is horizontal, the load shared by each man is

A. A = 37.5 kg wt and B = 62.5 kg wt

B. A = 50 kg wt and B = 50 kg wt

C. A = 62.5 kg wt and B = 37.5 kg wt

D. A = 72.5 kg wt and B = 27.5 kg wt

Answer:

Watch Video Solution

128. A uniform bar RS weighs 100 g and is 80 cm long. From the end R, two masses 50 g and 100 g are hung from the bar at a distance of 10 cm and 60 cm respectively. If the bar is to remain horizontal when balanced on a knifeedge, its position is

A. 42 cm from S

B. 38 cm from R

C. 38 cm form G

D. 42 cm from R

Answer:

Watch Video Solution

129. The centre of mass of a body

A. lies always outside the body.

B. may lie within, outside on the surface of the body.

C. lies always inside the body.

D. lies always on the surface of the body.

Answer:

Watch Video Solution

130. Where will be the centre of mass on combining two masses m and $M(M > m)$?

A. Towards m

B. Towards M

C. Between m and M

D. Anywhere

Answer:

Watch Video Solution

131. The centre of mass of a system of two particles divides the distance between them

A. in inverse ratio of square of masses of particles.

B. in direct ratio of square of masses of particles.

C. in inverse ratio of masses of particles

D. in direct ratio of masses of particles.

Answer:

Watch Video Solution

132. A body A of mass M while falling vertically downwards under gravity brakes into two parts, a body B of mass $\frac{1}{3}$ M and a body C of mass $\frac{2}{3}$ M. The center of mass of bodies B and C taken together shifts compared to that of body A towards

A. body C

B. body B

C. depends on height of breaking

D. does not shift.

Answer:

Watch Video Solution

133. Four bodies of equal mass start moving with same speed as shown in the figure. In which of the following combination the centre of mass will remain at origin ?

A. c and d

B. a and b

C. a and c

D. b and d

Answer:

Watch Video Solution

134. Two bodies of mass 1 kg and 3 kg have position vectors $\hat{i}+2\hat{j}+\hat{k}$ and $-3\hat{i}-2\hat{j}+\hat{k}$, respectively. The centre of mass of this system has a position vecotr

A. $-2\hat{i}+2\hat{k}$

B. $-2\hat{i}-\hat{j}+\hat{k}$

C. $2\hat{i}-\hat{j}-\hat{k}$

D. $-\hat{i}+\hat{j}+\hat{k}$

Answer:

Watch Video Solution

135. Centre of mass of 3 particles 10 kg, 20 kg and 30 kg is at (0, 0, 0). Where should a particle of mass 40 kg be placed so that the combination centre of mass will be at (3,3,3)

A. (0,0,0)

B. (7.5, 7.5, 7.5)

C. (1,2,3)

D. (4,4,4)

Answer:

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136. Identify the correct statement for the rotational motion of a rigid body.

A. Individual particles of the body do not undergo accelerated motion.

B. The centre of mass of the body remains unchanged

C. The centre of mass of the body moves uniformly in a circularp path

D. Individual particles and centre of mass of the body undergo an accelerated motion.

Answer:

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137. Two persons of masses 55 kg and 65 kg respectively, are at the opposite ends of boat. The length of the boat is 3.0 m and wighs 100 kg. The 55 kg man walks up to the 65 kg man and sits with him. If the boat is in still water, the centre of mass of the system shifts by

A. 3.0 m

B. 2.3 m

C. zero

D. 0.75 m

Answer:

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138. Particle of masses m, 2m, 3m, ..., nm grams are placed on the same line at distance l, 2l, 3l, ... , n/cm from a fixed point. The distance of centre of mass of the particles from the fixed point in centimetres is

A. $\frac{2n+1}{l}(3)$

B. $\frac{l}{n+1}$

C. $\frac{n\left(n^2+1\right)l}{}$

D. $\frac{2l}{n(n^2+1)}$

Answer:

Watch Video Solution

139. Two blocks of masses 10 kg and 4 kg are connected by a spring of negligible mass and placed on a frictionless horizontal surface. An impulse gives a velocity of 14 m/s to the heavier block in the direction of the lighter block. The velocity of the centre of the mass is

A. 30m/s

B. 20 m/s

C. 10 m/s

D. 5 m/s

Answer:

Watch Video Solution

140. In the HCl molecule, the separation between the nuclei of the two atoms is about 1.27 Å $\left(1\text{Å} = 10^{-10}m\right)$. The approximate location of the centre of mass of the molecule, assuming the chlorine atom to be about 35.5 times massive as hydrogen, is

A. $1overst \circ A$

B. $2.5\overset{\circ}{A}$

C. $1.24\overset{\circ}{A}$

D. $1.5\overset{\circ}{A}$

Answer:

Watch Video Solution

141. A 2 kg body and a 3 kg body are moving along the x-axis. At a particular instant the 2 kg body has a velocity of $3 \ \ ms^{-1}$ and the 3 kg body has the velcity of $2 \ \ ms^{1}$. The velocity of the centre of mass of the that instant is

A. $5ms^{-1}$

B. $1ms^{-1}$

C. 0

D. $2.4ms^{-1}$

Answer:

Watch Video Solution

142. Look at the drawing given in the figure which has been drawn with inkl of uniform line-thickness. The mass of ink used to draw each of the two inner circle, and each of the two line segments is m. The mass of the ink used to draw the outer circle is 6m. The coordinates of the centres of the different parts are: outer circle (0, 0), left inner circle (-a, a), right ineer circle (a, a), verticle line (0, 0) and 1 horizontal line (0, -a). The y-coordinate of the centre of mass of the ink in this drawing is

A. $\frac{a}{10}$

B. $\frac{a}{8}$

C. $\frac{a}{12}$

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

Answer:

Watch Video Solution

143. A cricket bat is cut at the location of its centre of mass as shown. Then

A. The two pieces will have the same mass.

B. The bottom piece will have larger mass.

C. The handle peice will have larger mass.

D. Mass of handle piece is double the mass of bottom piece.

Answer:

Watch Video Solution

144. When a bus is climbing on hilly road, a standing passenger, balances himself by keeping legs apart to achieve balance by keeping C.G._____.

A. left side of him

B. right side of him

C. back side of him

D. within the legs

Answer:

Watch Video Solution

145. A man weighing 80 kg is standing on a trolley weighing 320 kg. The trolley is resting on frictionless horizontal rails. If the man starts walking on the trolley with a speed of 1 m/s, then after 4 seconds his displacement relative to the ground will be

A. 5 m

B. 4.8 m

C. 3.2 m

D. 3.0 m

Answer:

Watch Video Solution

146. In a gravitational force field a particle is taken from A t B alog different paths as shown in figure. Then

A. Work done along path I willbe maximum.

B. Work done along path III will be minimum.

C. Work done along along path IV will be minimum.

D. Work done along all the paths will be the same.

Answer:

Watch Video Solution

147. A shell is fired from a cannon with a velocity v (m/s) at an angle θ with the horizontal direction. At the highest point in its path it explodes into two pieces of equal mass. One of the pieces retraces its path to the cannon with speed v $\cos\theta$ then the speed (in m/s) of the other piece immediately after the explosion is

A. $3v\cos\theta$

B. $2v\cos\theta$

C. $\frac{3}{2}v\cos\theta$

D. $\frac{\sqrt{3}}{2}v\cos\theta$

Answer:

Watch Video Solution

148. A machine gun has a mass 5 kg. It fires 50 gram bullets at the rate of 30 bullets per minute at a speed of $400\ \ \mathrm{m\,s^{-1}}$. What force is required to keep the gun in positon ?

A. 10 N

B. 5 N

C. 15 N

D. 30 N

Answer:

Watch Video Solution

149. A rocket of initial mass $6000kg$ ejects mass at a constant rate of $16kg/s$ with constant relative speed of $11km/s$ What is the acceleration of the rocket one minute after blast ?

A. $25m/s^2$

B. $50m/s^2$

C. $1-m/s^2$

D. $35m/s^2$

Answer:

Watch Video Solution

150. A machine gun fires a bullet of mass 40 gram with velocity 1200 m/s. The man holding it can exert a maximum force of 144 N on the gun. How many bullets can he fire per second at the most?

A. only one

B. 3

C. any number of bullets

D. 144×48

Answer:

Watch Video Solution

151. A solid sphere of mass 2 kg is resting inside a cube as shown in the figure. The cube is moving with a velocity $v = \left(5t\hat{i} + 2t\hat{j}\right)\mathrm{m/s}$. Here t is the time in second. All surface are smooth. The sphere is at rest with respect to the cube. What is the total force

exerted by the sphere on the cube? (Take $g = 10 \ \ \mathrm{m}/\mathrm{s}^2$)

A. $\sqrt{29}N$

B. 29 N

C. 26 N

D. $\sqrt{89}N$

Answer:

Watch Video Solution

152. Consider the following statement: When jumbing from some height, you should bend your knees as you come to rest, instead of keeping your legs stiff. Which of the following relations can be useful in explaining the statement?

A. $\Delta \overrightarrow{p}_1 = -\Delta \overrightarrow{p}_2$

B. $\Delta E = \Delta(PE + PK) = 0$

C. $\overrightarrow{F}\,\Delta t = m\Delta \overrightarrow{v}$

D. $\Delta \overrightarrow{x} \propto Dela\overrightarrow{F}$

Answer:

Watch Video Solution

153. Which of the following has maximum momentum ?

A. A 100 kg vehicle moving at $0.02ms^{-1}$.

B. A 4 g weight moving at 1000 cm s^-1`

C.

$A200gweightmov \in gwithk \in etice \neq rgyof10^{-6}J$

.

D. A 200 g weight after falling through once kilometre.

Answer:

Watch Video Solution

154. With what minimum acceleration can a fireman slide down a rope while breaking strength of the rope is $\frac{2}{3}$ of his wieght ?

A. g

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

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

D. $zero$

Answer:

Watch Video Solution

155. A cold soft drink is kept on the balance. When the cap is open, then the weight _____.

A. increase

B. decrease

C. first increases then decreases

D. remains same

Answer:

Watch Video Solution

156. 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 $3\hat{i}\ \ \mathrm{m\,s^{-1}}$. And the other with a velocity of $4\hat{j}\ \ \mathrm{m\,s^{-1}}$. If the explosion occurs in $10^{-4}\ \ \mathrm{s}$, the average force acting on the third piece in newton is

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

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

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

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

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

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157. A steel bar AB of mass 10 kg and length 1 m is kept horizontal by supporting it at the two ends. Two weights of 4 kg and 6 kg are suspended from points of the bar at distances 30 cm and 80 cm respectively from the end A. The reaction at the end A is

A. 107.8 N

B. 97.8 N

C. 88.2 N

D. 78.2 N

Answer:

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158. Three blocks with masses m, 2m and 3m, are connected by strings, as shown in the figure. After an upward fforce 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. zero

B. 2 mg

C. 3 mg

D. 6 mg

Answer:

Watch Video Solution

159. Three forces start acting simultaneously on a particle moving with velocity $\overrightarrow{v}$. These forces are represented in magnitude and direction by three sides of a triangle taken in the same order. The particle will now move with a velocity

A. $\leq ssthen\overrightarrow{v}$

B. m or $ethen\overrightarrow{v}$.

C. $\overrightarrow{v}only.$

D. cannot say.

Answer:

Watch Video Solution

160. A rocket with a life-off mass 3.5×10^4 kg is blasted upwards with an initial acceleration of $10 \ \mathrm{m/s^2}$. Then the initial thrust of the blast is

A. $1.75 \times 10^5 N$

B. $3.5 \times 10^5 N$

C. $7.0 \times 10^5 N$

D. $14.0 \times 10^5 N$

Answer:

Watch Video Solution

161. A body of mass 50 kg is suspended using a spring balance inside a lift at rest. If the lift starts falling freely, the reading of the spring balance is

A. lt50 kg

B. $= 0kg$

C. $> 50kg$

D. $= 0$

Answer:

Watch Video Solution

162. A stone of mass 0.05 kg is thrown vertically upwards. What is the direction and magnitude of net force on the stone during its upward motion?

A. 0.98 N vertically downwards.

B. 0.49 N vertically upwards.

C. 9.8 N vertically downward.

D. 0.49 N vertically downwards.

Answer:

Watch Video Solution

163. A man weighing 60 kg is in a lift moving down with an acceleration of $1.8 \ \mathrm{ms}^{-2}$. The force exerted by the floor on him is

A. 588 N

B. 480 N

C. Zero

D. 696 N

Answer:

Watch Video Solution

164. A balloon has 5 g of air. A small hole is pierced into it. The air escapes at a uniform rate with a velocity of 4 cm/s. If the balloon shrinks completely in 2.5 s, then the average force acting on the balloon is

A. 2 dyne

B. 2 N

C. 8 dyne

D. 8 N

Answer:

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165. Three blocks A, B and C of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is

A. 2 N

B. 6 N

C. 8 N

D. 18 N

Answer:

Watch Video Solution

166. Three blocks of mass 3 kg, 2 kg and 1 kg are placed side-by-side on smooth surface as shown in figure. If a horizontal force of 24 N is applied on 3 kg block, then the net force on 2 kg block will be

A. 2 N

B. 4 N

C. 8 N

D. 12 N

Answer:

Watch Video Solution

167. Three masses m, 2m and 3m are attached with light string passing over a fixed frictionless pulley as shown in the figure. The tension in the string between 2m and 3m is (g is acceleration due to gravity)

A. 6 mg

B. 3 mg

C. 2 mg

D. 1 mg

Answer:

Watch Video Solution

168. A mass of 1 kg is suspended by means of a thread. The system is (i) lifted up with an acceleration of $4.9\ \mathrm{ms}^{-2}$. (ii) lowered with an acceleration of $4.9\ \mathrm{ms}^{-2}$. The ratio of tension in the first and second case is

A. $3:1$

B. $1:2$

C. $1:3$

D. $2:1$

Answer:

Watch Video Solution

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

B. $\frac{g}{3}, (g)$

C. g, g

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

Answer:

Watch Video Solution

170. When a force F is applied to a mass m_1, its acceleration is $6\ \mathrm{m/s^2}$. If the same force is applied to another mass m_2, it gives an acceleration $3\ \mathrm{m/s^2}$. If the two masses are tied together and if the same force is applied to the combination it gives an acceleration

A. $1m/s^2$

B. $3m/s^2$

C. $2m/s^2$

D. $1.5m/s^2$

Answer:

Watch Video Solution

171. A body slides down in a time ‘f from rest along a smooth inclined plane making an angle of 45° with the horizontal. When the same body slides down from rest along a rough inclined plane of same length making the same angle, it takes time ‘pt then the coefficient of friction between the body and the rough plane is (p is a constant)

A. $p^2 - 1$

B. $1 - \frac{1}{p^2}$

C. $\frac{1}{p^2}$

D. $\frac{20^2}{1-p^2}$

Answer:

Watch Video Solution

172. In the arrangement shown in the figure, the coefficient of friction between two blocks is 0.5. The force of friction between the two blocks is (Assume that the 4 kg block is placed on a smooth horizontal surface) (Acceleration due to gravity = $10ms^{-2}$)

A. 8 N

B. 10 N

C. 6 N

D. 4 N

Answer:

Watch Video Solution

173. The upper half of an inclined plane of inclination θ is perfectly smooth while the 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 the lower half of the plane is given by

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

B. $\mu = \tan\theta$

C. $\mu = \dfrac{2}{\tan\theta}$

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

Answer:

Watch Video Solution

174. For a truck with 14 tyres, only rear 8 wheels are power driven and can produce acceleration. These 8 wheels support half the entire load. If the coefficient of friction between road and each tyre is 0.6, the maximum attainable acceleration by this truck would be (Acceleration due to gravity = 10 ms^{-2})

A. $6ms^{-2}$

B. $3ms^{-2}$

C. $10ms^{-2}$

D. $24ms^{-2}$

Answer:

Watch Video Solution

175. Two particles of mass m_1 and m_2, approach each other due to their mutual gravitational attraction only. Then

A. acceleration of both the particles are equal.

B. acceleration of the particle of mass m_1 is proportional to m_1

C. acceleration of the particle of mass m_1 is proportional to m_2

D. acceleration of the particle of mass m_1 is inversely proportional to m_1.

Answer:

Watch Video Solution

176. A particle moves from a point $\left(-2\hat{i}+5\hat{j}\right)$ to $\left(4\hat{j}+3\hat{k}\right)$ when a force of

$\left(4\hat{i}+3\hat{j}\right)$ N How much work has been done by this force?

A. 2 J

B. 8 J

C. 11 J

D. 5 J

Answer:

Watch Video Solution

177. A particle moves from (1,0,3) to the point (-3,4,5), when a force $\overrightarrow{F}=\left(\hat{i}+5\hat{k}\right)$ acts on it. Amount of

work done in joule is

A. 14

B. 10

C. 6

D. 15

Answer:

Watch Video Solution

178. A uniform force of $\left(3\hat{i}+\hat{j}\right)$ newton acts on a particle of mass 2 kg. Hence the particle is displaced from position $\left(2\hat{i}+\hat{k}\right)$ metre to position

$\left(4\hat{i}+3\hat{j}-\hat{k}\right)$ metre. The work done by the force on the particle is

A. 9 J

B. 6 J

C. 13 J

D. 15 J

Answer:

Watch Video Solution

179. Consider a particle on which constant forces $\overrightarrow{F}=\hat{i}+2\hat{j}+3\hat{k}$ N and $\overrightarrow{F_2}=4\hat{i}-5\hat{j}-2\hat{k}$ N

act together resulting in a displacement from position $\overrightarrow{r_1} = 20\hat{i} + 15\hat{j}$ cm to $\overrightarrow{r_2} = 7\hat{k}$ $cm.$ The total work done on the particle is

A. $-0.48J$

B. $+0.48J$

C. $-4.8J$

D. $+4.8J$

Answer:

Watch Video Solution

180. A particle moves in one dimension from rest under the influence of a force that varies with the distance travelled by the particle as shown in the figure. The kinetic energy of the particle after it has travelled 3 m is:

A. 4 J

B. 2.5 J

C. 6.5 J

D. 5 J

Answer:

Watch Video Solution

181. An object of mass 500 g, initially at rest, is acted upon by a variable force whose X-component varies with x in the manner shown. The velocities of the object at the points x = 8 m and x = 12 m, would have the respective values of (nearly)

A. 18 m/s and 20.6 m/s

B. 18 m/s and 24.4 m/s

C. 23 m/s and 24.4 m/s

D. 23 m/s and 20.6 m/s

Answer:

Watch Video Solution

182. A block of mass 10 kg moving in x direction with a constant speed of $10\ \mathrm{ms}^{-1}$, is subjected to a retarding force $F = 0.1x\ \ \mathrm{J/m}$ during its travel from x = 20 m to 30 m. Its final KE will be

A. 475 J

B. 450 J

C. 275 J

D. 250 J

Answer:

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183. A body of mass 2.4 kg is subjected to a force which varies with distance as shown in figure. The body starts from rest at x = 0. Its velocity at x = 9 m is

A. $5\sqrt{3}m/\sec$

B. $20\sqrt{3}m/\sec$

C. $10m/\sec$

D. 40 m/sec

Answer:

Watch Video Solution

184. A time dependent force F = 6t acts on a particle of mass 1 kg. If the particle starts from rest, the work done by the force during the first 1 sec. will be

A. 9 J

B. 18 J

C. 4.5 J

D. 22 J

Answer:

Watch Video Solution

185. Force acting on a particle moving in a straight line varies with the velocity of the particle v as $F = \frac{K}{v}$, where K is a constant. The work done by this force in time t is

A. $\frac{K}{v^2}t$

B. $\frac{2K}{v^2}t$

C. Kt

D. 2Kt

Answer:

Watch Video Solution

186. A force $F_y = (3x + 2)\ \mathrm{N}$ is acting on a body. The work done by this force if it tends to displace the body from x = 0 m to x = 4 m will be

A. 32 J

B. 16 J

C. 0 J

D. (12 x +8) J

Answer:

Watch Video Solution

187. A body of mass 6 kg is under a force which causes displacement in it given by $s = \frac{t^2}{4}$ metre where t is time. The work done by the force in 2 seconds is

A. 12 J

B. 9 J

C. 6 J

D. 3 J

Answer:

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188. Consider a drop of rain water having mass 1 g falling from a height of 1 km. It hits the ground with a speed of $50\ \mathrm{m}/s$. Take 'g' constant with a value $10\ \mathrm{m}/\mathrm{s}^2$. The work done by the (i) gravitational force and the (ii) resistive force of air is :

A. (i) -10 J (ii) -8.25 J

B. (i) 1.25 J (ii) -8.25 J

C. (i) 100 J (ii) 8.75 J

D. (i) 10 J (ii) -8.75 J

Answer:

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189. 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 $12 \ \mathrm{m\,s^{-1}}$ and the second part of mass 2 kg moves with $8 \ \mathrm{m\,s^{-1}}$ speed. If the third part flies off with $4 \ \mathrm{m\,s^{-1}}$ speed, then its mass is

A. 3 kg

B. 5 kg

C. 7 kg

D. 17 kg

Answer:

Watch Video Solution

190. A bomb at rest explodes into 3 parts of same mass. The momentum of two parts is $-3P\hat{i}$ and $2P\hat{j}$ respectively. The magnitude of momentum of the third part is

A. P

B. $\sqrt{5}P$

C. $\sqrt{11}P$

D. $\sqrt{13}P$

Answer:

Watch Video Solution

191. A bullet fired from gun with a velocity 30 m/s at an angle of 60° with horizontal direction. At the highest point of its path, the bullet explodes into two parts with masses in the ratio 1 : 3. The lighter mass comes to rest immediately. Then the speed of the heavier mass is

A. 30 m/s

B. 20 m/s

C. 10 m/s

D. 5 m/s

Answer:

Watch Video Solution

192. A body of mass 1 kg, initially at rest explodes and breaks into three parts. The masses of the parts are in the ratio 1:1:3. The two pieces of equal mass fly off perpendicular to each other with speed of $30\ \mathrm{m/s}$ each. The velocity of the heavier part in m/s is

A. $10\sqrt{2}$

B. 6

C. 3

D. $6\sqrt{2}$

Answer:

Watch Video Solution

193. As shown in figure, a 16 g bullet is fired horizontally into a 4 kg block of wood suspended by a long cord. The bullet sticks in the block. If the block goes 10 cm above its initial level, then velocity of bullet is nearly

A. 180 m/s

B. 251 m/s

C. 351.4 m/s

D. 471.4 m/s

Answer:

Watch Video Solution

194. A bullet of mass $10g$ moving horizontally with a velocity of $400ms^{-1}$ strikes a wooden block of mass $2kg$ which is suspended by a light inextensible string of length $5m$. As a result, the center of gravity of the block is found to rise a vertical distance of $10cm$. The speed of the bullet after it emerges out hirizontally from the block will be

A. $160ms^{-1}$

B. $100ms^{-1}$

C. $80ms^{-1}$

D. $120s^{-1}$

Answer:

Watch Video Solution

195. The kinetic energy of a body of mass 4 kg and momentum 6 Ns will be

A. 4.5 J

B. 2.5 J

C. 5.5 J

D. 3.5 J

Answer:

Watch Video Solution

196. Two particles of masses m_1 and m_2 have equal kinetic energies. The ratio of their momenta is

A. $m_1 : m_2$

B. $m_2 : m_1$

C. $\sqrt{m}_1 : \sqrt{m}_2$

D. $m^2\_1 : m^2\_2$

Answer:

Watch Video Solution

197. A stationary particle explodes into two particle of a masses m_1 and m_2 which move in opposite direction

with velocities v_1 and v_2. The ratio of their kinetic energies E_1 / E_2 is

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

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

C. $\frac{2m_2}{m_1}$

D. $\frac{2m_1}{m_2}$

Answer:

Watch Video Solution

198. A 12 kg bomb at rest explodes into two pieces of 4 kg and 8 kg. If the momentum of 4 kg piece is 20 Ns,

the kinetic energy of the 8 kg piece is

A. 25 J

B. 20 J

C. 50 J

D. 40 J

Answer:

Watch Video Solution

199. A ball of mass m is moving towards a batsman at a speed v. The batsman strikes the ball and deflects it by

an angle θ without changing its speed. The impulse imparted to the ball is given by

A. $mv\cos\theta$

B. $mv\sin\theta$

C. $2mv\cos\left(\frac{\theta}{2}\right)$

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

Answer:

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200. A soccer ball is travelling at a velocity $20ms^{-1}$ due south. At the end of its travel, it moves with a velocity

$2ms^{-1}$ due south. If the change in the linear momentum of the ball is $18kgms^{-1}$ due north, then the mass of the ball is

A. 3.0 kg

B. 0.81 kg

C. 1.0 kg

D. 0.5 kg

Answer:

Watch Video Solution

201. A rigid ball of mass m strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure below. The value of impulse imparted by the wall on the ball will be

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

B. mV

C. 2mV

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

Answer:

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202. An object flying in air with velocity $\left(20\hat{i}+25\hat{j}-12\hat{k}\right)$ suddenly breaks into two pieces whose masses are in the ratio 1 : 5. The smaller mass flies off with a velocity $\left(100\hat{i}+35\hat{j}+8\hat{k}\right)$. The velocity of the larger piece will be,

A. $-20\hat{i}-15\hat{j}-80\hat{k}$

B. $4\hat{i}+23\hat{j}-16\hat{k}$

C. $-100\hat{i}-35\hat{j}-8\hat{k}$

D. $20\hat{i}+15\hat{j}-80\hat{k}$

Answer:

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203. A ball of mass M_1 collides elastically and head on with another ball of mass M_2 initially at rest. In which of the following cases the transfer of momentum will be maximum?

A. $M_1 > M_2$

B. $M_1 = M_2$

C. $M_1 < M_2$

D. Data is insufficient to predict it.

Answer:

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204. Two identiacal balls A and B having velocities of 0.5 m/s and $-0.3\ \mathrm{m/s}$ respectively collide elastically in one dimension. The velocities of B and A after the collision respectively will be

A. 0.3 m/s and 0.5 m/s

B. $-0.5m/s$ and $0.3m/s$

C. $0.5m/s$ and $-0.3m/s$

D. $-0.3m/s$ and $0.5m/s$

Answer:

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205. Two particles A and B, move with constant velocities $\vec{v_1}$ and $\vec{v_2}$. At the initial moment their position vectors are $\vec{r_1}$ and $\vec{r_2}$ respectively. The condition for particle A and B for their collision is

A. $\vec{r}_1 - \vec{r}_2 = \vec{v}_1 - \vec{v}_2$

B. `vec r_1 - vec r_2 =

C. $\vec{r}_1 . \vec{v}_1 = \vec{r}_2 . \vec{v}_2$

D. $\vec{r}_1 \times \vec{v}_1 = \vec{r}_2 \times \vec{v}_2$

Answer:

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206. Two particles of masses m_1, m_2 move with initial velocities u_1 and u_2. On collision, one of the particles get excited to higher level, after absorbing energy ε. If final velocities of particles be v_1 and v_2 then we must have

A. $m_1^2 u_1 + m_2^2 u_2 - \varepsilon = m_1^2 v_1 + m_2^2 v_2$

B. $\frac{1}{2} m_1 u_2^1 + \frac{1}{2} m_2 u_2^2 = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 - \varepsilon$

C. $\frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2 - \varepsilon = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2$

D. $\frac{1}{2} m_1^2 u_1^2 + \frac{1}{2} m_2^2 u_2^2 + \varepsilon = \frac{1}{2} m_1^2 v_1^2 + \frac{1}{2} m_2^2 v_2^2$

Answer:

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207. Dimensional formula for coefficient of restitution

A. $\left[MLT^{-2}\right]$

B. $\left[M^0L^0T^0\right]$

C. $\left[MLT^{-1}\right]$

D. $\left[MT^{-2}\right]$

Answer:

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208. A sphere of mass 'm' moving with velocity 'v' collides head-on on another sphere of same mass which is at rest. The ratio of final velocity of second

sphere to the initial velocity of the first sphere is (e is coefficient of restitution and collision is inelastic)

A. $\frac{e-1}{2}$

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

C. $\frac{e+1}{2}$

D. e

Answer:

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209. A moving block having mass m, collides with another stationary block having mass 4m. The lighter

block comes to rest after collision. When the initial velocity of the lighter block is v, then the value of coefficient of restitution (e) will be

A. 0.5

B. 0.25

C. 0.8

D. 0.4

Answer:

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210. A particle falls from a height h on a fixed horizontal surface and rebounds. If e is the coefficient of restitution, then the total distance travelled by the particle before it stops rebounding is

A. $\frac{h(1+e^2)}{1-e^2}$

B. $\frac{h(1-e^2)}{1+e^2}$

C. $\frac{h(1-e^2)}{2(1+e^2)}$

D. $\frac{h(1+e^2)}{2(1-e^2)}$

Answer:

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211. 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:

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212. A ball moving with velocity 2 m/s collides head on with another stationary ball of double mass. If the coefficient of restitution is 0.5, then their velocities (in m/s) after collision will be

A. 0.1 kg

B. 1,1

C. 1,0.5

D. 0,2

Answer:

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213. A ball is thrown vertically down from height of 40 m from the ground with an initial velocity 'v'. The ball hits the ground, loses $\frac{1}{3}rt$ of its total mechanical energy and rebounds back to the same height. If the acceleration due to gravity is 10 ms^{-2}, the value of 'v' is

A. $5m^{-1}$

B. $10ms^{-1}$

C. $15ms^{-1}$

D. $20ms^{-1}$

Answer:

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214. A ball is thrown vertically downwards from a height of 20 m with an initial velocity v_0. It collides with the ground, loses 50 percent of its energy in collision and rebounds to the same height. The initial velocity v_0 is (Take $g = 10 \ \ \mathrm{ms}^{-2}$)

A. $10ms^{-1}$

B. $14ms^{-1}$

C. $20ms^{-1}$

D. $28ms^{-1}$

Answer:

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215. On a frictionless surface, a block of mass M moving at speed v collides elastically with another block of same mass M which is initially at rest. After collision the first block moves at an angle θ to its initial direction and has a speed $\frac{v}{3}$. The second block's speed after the collision is

A. $\frac{\sqrt{3}}{2}v$

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

C. $\frac{3}{4}v$

D. $\frac{3}{\sqrt{2}}v$

Answer:

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216. In a collinear collision, a particle with an initial speed v_0 strikes a stationary particle of the same mass. If the final total kinetic energy is $50\,\%$ greater than the original kinetic energy, the magnitude of the relative velocity between the two particles, after collision, is:

A. $\frac{v_1}{2}$

B. $\frac{v_0}{\sqrt{2}}$

C. $\frac{v_0}{4}$

D. $\sqrt{2}v_0$

Answer:

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217. A 1 kg ball moving with a speed of $6 \ \mathrm{ms}^{-1}$ collides head - on with a 0.5 kg ball moving in the opposite direction with a speed of $9 \ \mathrm{ms}^{-1}$. If the coefficient of restitution is $\frac{1}{3}$, the energy lost in the collision is

A. $303.4J$

B. $66.7J$

C. $33.3J$

D. $67.8J$

Answer:

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218. A particle of mass m moving in the x direction with speed 2v is hit by another particle of mass 2m moving in the y direction with speed v. If the collision is perfectly inelastic, the percentage loss in the energy during the collision is close to

A. 0.44

B. 0.5

C. 0.56

D. 0.62

Answer:

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219. Two bodies of masses 3 kg and 2 kg collide head-on. Their relative velocities before and after collision are 15 m/s and 5 m/s respectively. The loss of kinetic energy of the system is

A. 120 J

B. 100 J

C. 80 J

D. 240 J

Answer:

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220. Choose the correct options

A block of mass m moving at a speed of u collides with another block of mass 2 m at rest. The lighter block comes to rest after the collision. The coefficient of restitution is

A. $\frac{4}{9}$

B. $\frac{5}{9}$

C. $\frac{1}{9}$

D. $\frac{8}{9}$

Answer:

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221. The force 'F' acting on a particle of mass 'm' is indicated by the force-time graph shown below. The change in momentum of the particle over the time interval from zero to 8 s is -

A. 24 N s

B. 20 N s

C. 12 N s

D. 6 N s

Answer:

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222. The position-time (x - t) graph of a moving body of mass 2 kg is shown in the figure. The impulse on the body at t = 4s is

A. $1.5kgms^{-1}$

B. $-1.5kgms^{-1}$

C. $1kgms^{-1}$

D. $2kgms^{-1}$

Answer:

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223. A rod of weight W is supported by two parallel knife edges A and B and is in equilibrium in a horizontal position. The knives are at a distance d from each other. The centre of mass of the rod is at distance x from A. The normal reaction on A is

A. $\frac{Wx}{d}$

B. $\frac{Wd}{x}$

C. $\frac{W(d-x)}{x}$

D. $\frac{W(d-x)}{d}$

Answer:

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224. Which of the points is likely position of the centre of mass of the system shown in the figure?

A. A

B. D

C. B

D. C

Answer:

Watch Video Solution

225. Two bodies of masses m_1 and m_2 are separated by a distance R. The distance of the centre of mass of the bodies from the mass m_1 is

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

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

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

D. $\frac{m_1 + m_2}{m_1} R$

Answer:

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226. Three identical spheres each of mass 1 kg are placed touching one another with their centres in a straight line. Their centres are marked as A, B, C respectively. The distance of centre of mass of the system from A is

A. $\frac{AB + AC}{2}$

B. $\frac{AC + AB}{2}$

C. $\frac{AC - AB}{3}$

D. $\frac{AB + AC}{3}$

Answer:

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227. A system of two particles is having masses m_1 and m_2. If the particle of mass m_1 is pushed towards the centre of mass of particles through a distance d, by what distance the particle of mass m_2 should be moved so as to keep the centre of mass of particles at the original position?

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

B. d

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

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

Answer:

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228. The centre of mass of a system of three particles of masses 1 g, 2 g and 3 g is taken as the origin of a coordinate system. The position vector of a fourth particle of mass 4 g such that the centre of mass of the four particle system lies at the point $(1, 2, 3)$ is $\alpha\left(\hat{i} + 2\hat{j} + 3\hat{k}\right)$, where α is a constant. The value of α is

A. $\frac{10}{3}$

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

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

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

Answer:

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229. Three particles of the same mass lie in the x-y plane. The (x, y) coordinates of their position are $(1, 1), (2, 2)$ and $(3, 3)$ respectively. The (x, y) coordinates of the centre of mass are

A. (1,2)

B. (2,2)

C. (4,2)

D. (6,6)

Answer:

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230. A loaded gun of mass M fires a bullet of mass m with a velocity v at an angle of elevation θ. The gun is initially at rest on a horizontal frictionless surface. After, the centre of mass of the gun-bullet system

A. Moves witha velocity $\frac{v}{M-m}\Big)(M+m)$ n the horizontal direction

B. Moves with velocity $\frac{mv\cos\theta}{(M+m)}$

C. $Moveswithavelocity$v(frac(m)(M + m))`

D. $Moveswithavelocity$(frac(mvsintheta)(M + m))`

Answer:

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231. A large number of particles are placed around the origin, each at a distance R from the origin. The distance of the centre of mass of the system from the origin is

A. $= R$

B. $\leq R$

C. $> R$

D. $\geq R$

Answer:

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232. Distance of the centre of mass of a solid uniform cone from its vertex is z_0. If the radius of its base is R and its height is h then z_0 is equal to

A. $\frac{h^2}{4R}$

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

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

D. $\frac{3h^2}{8R}$

Answer:

Watch Video Solution

233. The centr of mass of a right circular coneof height h, radius R and constant density ρ is at

A. $\left(0, \frac{h}{4}, 0\right)$

B. $\left(0, 0, \frac{h}{3}\right)$

C. $\left(0, 0, \frac{h}{2}\right)$

D. $\left(0, 0, \frac{3h}{8}\right)$

Answer:

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234. Four particles A, B, C and D with masses $m_A = m, m_B = 2m, m_c = 3m$ and $m_D = 4m$ are at the comers of a square. They have accelerations of equal magnitude with directions as shown. The acceleration of the centre of mass of the particles

A. $\frac{a}{5}\left(\hat{i} - \hat{j}\right)$

B. $a\left(\hat{i} + \hat{j}\right)$

C. zero

D. $\frac{a}{5}\left(\hat{i} + \hat{j}\right)$

Answer:

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235. Which of following statements are correct ? ltbgt

(a) Centre of mass of a body always coincides with the centre of gravity of the body

(b) Central of mass of a body is the point at which the total gravitational torque on the body is zero

(c) Couple on a body produces both translational and rotation motion in a body

(d) Mechanical advantage greater than one means that small efforts can be used to lift a large load

A. (b) and (d)

B. (a) and (b)

C. (b) and (c)

D. (c) and (d)

Answer:

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236. n small balls, each of mass m, impinge elastically each second on a surface with velocity u. The force experienced by the surface will be

A. mnu

B. 2mnu

C. 4mnu

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

Answer:

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237. 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 $k = 1 \ \ \mathrm{Ns}^{-1}$. The distance, the block will travel in 6 seconds is

A. 36 m

B. 72 m

C. 108 m

D. 18 m

Answer:

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238. A body of mass 3 kg moving with a velocity $\left(2\hat{i}+3\hat{j}+3\hat{k}\right)$ m/s collides with another body of mass 4 kg moving with a velocity $\left(3\hat{i}+2\hat{j}-3\hat{k}\right)$ m/s. The two bodies stick together after collision. The velocity of the composite body is

A. $\frac{1}{7}\left(4\hat{i}+6\hat{j}-3\hat{k}\right)$

B. $\frac{1}{7}\left(18\hat{i}+17\hat{j}-3\hat{k}\right)$

C. $\frac{1}{7}\left(6\hat{i}+4\hat{j}-6\hat{k}\right)$

D. $\frac{1}{7}\left(9\hat{i}+8\hat{j}-6\hat{k}\right)$

Answer:

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239. A particle moves in the x-y plane under the influence of a force such that the linear momentum is $\vec{p}(t)=A\left[\hat{i}\cos kt-\hat{j}\sin kt\right]$ where, A and k are constants. The angle between force and momentum is

A. 0°

B. 30°

C. 45°

D. 90°

Answer:

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240. A particle of mass m is projected from the ground with an initial speed u_0 at an angle α with the horizontal. At the highest point of its trajectory, it makes a completely inelastic collision with another identical particle, which was thrown vertically upward from the ground with the same initial speed u_0. The

angle that the composite system makes with the horizontal immediately after the collision is

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

B. $\frac{\pi}{4} + \alpha$

C. $\frac{\pi}{4} - \alpha$

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

Answer:

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241. A balloon with mass 'm' is descending down with an acceleration 'a' (where $a < g$). How much mass

should be removed from it so that it starts moving up with an acceleration 'a' ?

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

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

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

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

Answer:

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242. A body of mass 10 kg is upon by a force given by equation $F = \left(3t^2 - 30\right)$ newtons. The initial velocity

of the body is 10 m/s. The velocity of the body after 5 sec. is

A. 4.5 m/s

B. 6 m/s

C. 7.5 m/s

D. 5 m/s

Answer:

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243. 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. $F \propto \frac{1}{x^3 \div 2}$

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

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

D. $F \propto x$

Answer:

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244. A body of mass $m = 10^2 kg$ is moving in a medium and experiences a frictional force $F = -Kv^2$. Its

initial speed is $v_0 = 10ms^{-2}$. If , after $10s$, its energy is $\frac{1}{8}mv_0^2$, the value of k will be

A. $10^{-14}kgm^{-1}$

B. $10^{-1}kgm^{-1}s^{-1}$

C. $10^{-3}kgm^{-1}$

D. $10^{-3}kgs^{-1}$

Answer:

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245. A nucleus of uranium decays at rest into nuclei of thorium and helium. Then

A. the helium nucleus has less kinetic energy than the thorium nucleus.

B. the helium has more kinetic energy than the thorium nucleus.

C. the helium nucleus has less momentum than the thorium nucleus.

D. the helium nucleus has more momentum than the throium nucleus.

Answer:

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246. Two spherical bodies of mass M and 5M and radii R and 2R respectively are released in free space with initial separation between their centres equal to 12R. If they attract each other due to gravitational force only, then the distance covered by the smaller body just before collision is

A. 2.5 R

B. 4.5 R

C. 7.5 R

D. 1.5 R

Answer:

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247. A ball (initially at rest) is released from the top of a tower. The ratio of work done by the force of gravity in the first, second and third seconds is

A. $1:3:5$

B. $1:4:25$

C. $1:9:25$

D. $1:2:3$

Answer:

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248. Hammer of mass M strikes a nail of mass 'm' with a velocity 20 m/s into a fixed wall. The nail penetrates into the wall to a depth of 1 cm. The average resistance of the wall to the penetration of the nail is

A. $\left(\frac{M^2}{M+m}\right) \times 10^3$

B. $\frac{2M^2}{M+m} \times 10^4\Big)$

C. $\frac{M+m}{M^2} \times 10^2$

D. $\frac{M^2}{M+m} \times 10^2$

Answer:

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249. Two particle A and B initially at rest, move towards each other under mutual force of attraction. At the instant when the speed of A is V and the speed of B is 2V, the speed of the centre of mass of the system is

A. Zero

B. v

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

D. $-\frac{3v}{2}$

Answer:

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250. Two particles of equal masses have velocity $\overrightarrow{v_1} = 2\hat{i}$ m/s and $\overrightarrow{v_2} = 2\hat{j}$ m/s. The first particle has an acceleration $\overrightarrow{a_1} = \left(3\hat{i} + 3\hat{j}\right)\mathrm{m/s^2}$ while the acceleration of the other particle is zero. The centre of mass of the two particles moves in a

A. circle

B. parabola

C. ellipse

D. straight line

Answer:

Watch Video Solution

251. Assertion: A table cloth can be pulled from a table without dislodging the dishes.

Reason: To every action there is an equal and opposite reaction.

A. Assertion is True, Reason is True, Reasn is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason i not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is True.

Answer:

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252. A block of mass m is placed on a smooth inclined wedge ABC of inclination θ as shown in the figure. The wedge is given an acceleration 'a' towards the right. The relation between a and θ 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:

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253. Two blocks of equal mass are released on two smooth sides of a duble inclined plane with a fixed base as shown in the figure. If each angle of inclination is 45°, the acceleration of the centre of mass of the system of the two blocks is (Acceleration due to gravity $= 10 \ \ \mathrm{ms}^{-2}$)

A. $10ms^{-2}$ vertically downward.

B. $10ms^{-2}$ vertically upward.

C. $5ms^{-2}$ vertically downward

D. $5ms^{-2}$ vertically upward.

Answer:

Watch Video Solution

254. A body of mass (4m) is lying in x-y plane at rest. It suddenly explodes into three pieces. Two pieces, each of mass (m) move perpendicular to each other with equal speeds (v). The total kinetic energy generated due to explosin is

A. mv^2

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

C. $2mv^2$

D. $4mv^2$

Answer:

Watch Video Solution

255. A particle of mass m is driven by a machine that delivers a constant power k watts. If the particle starts from rest the force on the particle at time t is

A. $\left(\sqrt{\frac{mk}{2}}t^{\frac{-1}{2}}\right)$

B. $\sqrt{mk}t^{\frac{-1}{2}}$

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

D. $\frac{1}{2}\sqrt{mkt}^{\frac{-1}{2}}$

Answer:

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256. The mass of a hydrogen molecule is 3.32×10^{-27} kg. If 10^{23} hydrogen molecules strike, per second, a fixed wall of area $2\ \mathrm{cm}^2$ at an angle of 45° to the normal and rebound elastically with a speed of $10^3\ \mathrm{m/s}$, then the pressure on the wall is nearly:

A. $2.35 \times 10^2 N/m^2$

B. $4.70 \times 10^2 N/m^2$

C. $2.35 \times 10^3 N/m^2$

D. $4.70 \times 10^3 N/m^2$

Answer:

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257. A lift weighing 250 kg is to be lifted up at a constant velocity of 0.20 m. What would be the minimum horse power of the motor to be used ?

A. 1.3 hp

B. 0.65 hp

C. 1.5 hp

D. 0.75 hp

Answer:

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258. It is found that if a neutron suffers an elastic collinear collision with deuterium at rest, fractional loss of its energy is P_d, while for its similar collision with carbon nucleus at rest, fractional loss of energy is P_c. The values of P_d and P_c are respectively :

A. (0,0)

B. (0,1)

C. (0.89,0.28)

D. (0.28, 0.89)

Answer:

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259. A 100 N force acts horizontally on a block of 10 kg placed on horizontal rough table of coefficient of friction $\mu = 0.5$. If g at the place is $10ms^{-2}$, the acceleration of the block is

A. 24 N s

B. 25 N

C. 12 N s

D. 13 N

Answer:

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260. A person trying to lose weight by burning fat lifts a mass of $10kg$ upto a height of $1mis1000$ time . Assume that the potential energy lost each time be lower the mass is dissipated . How much far will be use up considering the work done only when the weight is lifted up ? Far supplies $3.8 \times 10^7 J$ of energy per kg

wich is canverted to mechanical energy with $x20\,\%$ efficiency rate Take $= 9.8ms^{-2}$

A. $6.45 \times 10^{-3}kg$

B. $9.89 \times 10^{-3}kg$

C. $12.89 \times 10^{-3}kg$

D. $2.45 \times 10^{-3}kg$

Answer:

Watch Video Solution

261. A ball moving with a momemtum 5 kg ms^{-1} strikes a wall. If the initial and final momenta make equal

angles of 45°, then magnitude in change in momentum is

A. $5.05 kgms^{-1}$

B. $7.07 kgms^{-1}$

C. $10.00 kgms^{-1}$

D. $0 kgms^{-1}$

Answer:

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262. A bullet of mass 4.2×10^{-2} kg, moving at speed of $300 \ \ \mathrm{ms}^{-1}$, gets stuck into a block with a mass 9 times

that of the bullet. If the block is free to move without any kind of friction, the heat generated in the process will be

A. 45 cal

B. 405 cal

C. 450 cal

D. 1701 cal

Answer:

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263. A hammer of mass m_1 falls from a height h and drives a pile of mass m_2 into the ground to a distance d. What is the opposition to penetration by the ground ?

A. $\frac{m_1^2 gh}{(m_1+m_2)d} + (m_2+m_1)g$

B. $(m_1+m_2)gd$

C. $\frac{m_1^2 gh}{(m_1+m_2)d}$

D.

Answer:

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264. The momentum of a body of mass 8 kg is 20 kg m/s. A force of 12 N acts on the body in the direction of motion for 4 s, the increase in the kinetic energy is

A. 398 J

B. 264 J

C. 113 J

D. 75.5 J

Answer:

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265. A 1 kg ball moving with a speed of 20 m/s strikes a hard wall at an angle of 30° with the wall. It is reflected with the same speed at the same angle. If the ball is in contact with the wall for 0.5 seconds, the average force acting on the wall is

A. 96 N

B. 48 N

C. 24 N

D. 40 N

Answer:

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266. A particle moves in the x-y plane under the influence of a force such that the linear momentum is $\overrightarrow{p}(t) = A\left[\hat{i}\cos kt - \hat{j}\sin kt\right]$ where, A and k are constants. The angle between force and momentum is

A. 0°

B. 30°

C. 45°

D. 90°

Answer:

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267. A system of two particles is having masses m_1 and m_2. If the particle of mass m_1 is pushed towards the centre of mass of particles through a distance d, by what distance the particle of mass m_2 should be moved so as to keep the centre of mass of particles at the original position?

A. d

B. $\sqrt{2}d$

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

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

Answer:

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268. Three masses of 2 kg, 12 kg and 4 kg are connected to each other with threads and ae placed on a table as shown in figure.

If $g = 10ms^{-2}$, the acceleration with which the system is moving is

A. $1.67m/s^2$

B. $3.2m/s^2$

C. $1.11m/s^2$

D. $4m/s^2$

Answer:

Watch Video Solution

269. Two balls of masses 4 g and 10 g are moving with kinetic energies in the ratio of 5 : 2. What is the ratio of their linear momenta ?

A. $1:1$

B. $2:1$

C. $1:2$

D. $3:1$

Answer:

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270. A rope of mass 0.2 kg is connected at the same height of two opposite walls. It is allowed to hang under its own weight. At the contact point between the rope and the wall, the rope makes an angle $\theta = 30\,\%^{\circ}$ with respect to horizontal. The tension in the rope at its midpoint between the walls is

A. 1.78N

B. 1.56 N

C. 1.82 N

D. 1.96 N

Answer:

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271. At t=0, force F =kt is applied to a small body of mass m resting on a smooth horizontal plane (k is a constant). The force is at an angle θ with the horizontal

Then the velocity of the body when its breaking off the plane is

A. $\frac{mg^2 \cos\theta}{2k \sin^2\theta}$

B. $\frac{mg \cos\theta}{2k \sin^2\theta}$

C. $\frac{mgk \sin\theta}{2 \cos^2\theta}$

D. $\frac{mg^2 \tan\theta}{k}$

Answer:

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272. A body of mass 4m is split into two equal parts by an internal explosion which generates a kinetic energy E. If, after the explosion, the parts move in the same line as before, then what is their relative speed?

A. $\sqrt{E}/m$

B. $\sqrt{2}E/m$

C. $\sqrt{4}E/m$

D. 0

Answer:

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273. Assertion : The centre of mass of a body may lie where there is no mass.

Reason : The centre of mass has nothing to do with the mass.

A. Assertion is True, Reason is True, Reasn is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason i not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is True.

Answer:

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274. Particle A makes a perfectly elastic collision with anther particle B at rest. They fly apart in opposite direction with equal speeds. If the masses are $m_A \& m_B$ respectively, then the ratio of their masses is

A. $1:3$

B. $1:1$

C. $1:\sqrt{3}$

D. $\sqrt{3}:1$

Answer:

Watch Video Solution

275. Assertion: For the object moving on the earth, earth is non-inertial frame of reference.

Reason: Newton's first law of motion does hot hold good for the earth.

A. Assertion is True, Reason is True, Reasn is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason i not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is True.

Answer:

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276. 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 $12 \ \mathrm{m\,s^{-1}}$ and the second part of mass 2 kg moves with $8 \ \mathrm{m\,s^{-1}}$ speed. If the third part flies off with $4 \ \mathrm{m\,s^{-1}}$ speed, then its mass is

A. 7 kg

B. 4 kg

C. 3 kg

D. 5 kg

Answer:

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277. Three identical spheres each of radius r, and mass m are placed touching each other on a horizontal floor. The position of centre of mass of the system is

A. r,r

B. $r. . \sqrt{3}, r / \sqrt{3}$

C. $r, r / \sqrt{3}$

D. *[Math Processing Error]*

Answer:

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278. A circket ball of mass m is bowled at a batsman and gets to the bat travelling at v m/s. The batsman hits the ball and it leaves his bat after t seconds at a speed of v/2 m/s. The magnitude of the force on the ball in newtons is

A. $\frac{9}{m}v\Big)(2t)$

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

C. $\frac{2mv}{t}$

D. $\frac{3mv}{2t}$

Answer:

Watch Video Solution

279. There blocks of masses m_1, m_2 and m_3 are connected by massless strings as shown in figure on a frictionless table. They are pulled with a force $T_3 = 50$ N. If $m_1 = 10$ kg, $m_2 = 6$ kg and $m_3 = 2$ kg, the tension T_2 will be

A. 20 N

B. 45 N

C. 10 N

D. 32 N

Answer:

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280. Two glass balls, two ivory balls, two cork balls, two cast iron balls, two lead balls collide.

A. Coefficient of restitution is maximum for glass balls.

B. Coefficient of restitution is maximum for ivory balls.

C. Coefficient of restitution is maximum for lead balls.

D. Coefficient of restitution is least for cork balls.

Answer:

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281. A hollow metallic bob is filled with a liquid. A small hole is drilled just below the centre of gravity of bob so that liquid slowly drops out of it. Water drops out

continuously and the bob gets empty of liquid. In this entire process C.G.

A. remains at the centre of the bob throughout.

B. first shifts downwards from centre of the bob, then upwards and returns back to centre when the bob gets completely empty.

C. first shifts upwards from centre of the bob, then downwards and returns back to centre when the bob gets completely empty.

D. keeps moving upward and downward periodically.

Answer:

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