PHYSICS

BOOKS - MARVEL PHYSICS (HINGLISH)

FORCE, WORK AND TORQUE

Mcqs

1. Out of the four basic forces in nature, the weakest force is

A. the electromagnetic force

B. the strong nuclear force

C. the gravitational force

D. the weak nuclear force

Answer: C

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2. Out of the four baic (fundamental) forces in nature, the strongest force is

A. the electromagnetic force

B. the stong nuclear force

C. the gravitational force

D. the weak nuclear force

Answer: B

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3. A car is moving along a road with a uniform speed of 20 km/hour. The net force acting on the car is

A. the driving force (P) which drives the car in the forward direction

B. the opposing (frictional) force (f),opposite to the direction of motion of the car

C. zero

D. $P + F$

Answer: C

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4. If a force $200N$ acts on a body, the change in momentum is 100 kg m/s. What is the time for which the force acts on th body?

A. 1 sec

B. 0.75 sec

C. 0.5 sec

D. 0.25 sec

Answer: C

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5. Impulse is

A. a force

B. a scalar

C. equal to rate of change of momentum of a body

D. equal to change in the momentum of a body

Answer: D

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6. The area under the force time curve represents

A. Work

B. Power

C. Momentum

D. Impulse

Answer: D

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7. A batsman hits back a ball of mass 0.2 kg, straight in the direction of the bowler without chaning its initial speed of 6 m/s. What is the impulse impated to the ball?

A. 1.6N-s

B. 2.4N-s

C. 3.2N-s

D. 4 N-s

Answer: B

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8. Swimming is possible on account of

A. first law of motion

B. second law of motion

C. third law of motion

D. law of gravitation

Answer: C

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9. In order to apply Newton's law of motion in an accelerated (non-inertial) frame of reference, we make the use fo

A. electrostatic force

B. gravitationa force

C. pseudo force

D. electromagnetic force

Answer: C

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10. Which one of the following forces is a pseudo force?

A. Force of friction

B. Force between an electron and a proton

C. Centrifugal force

D. Gravitationa force between the planets and the sun

Answer: C

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11. A force acts on the body of mass 50 kg, for 10 second. When the force stops acting on the body, the body covers 80 m in the next 10 second. What is the magnitude of the force?

A. 40N

B. 50N

C. 30N

D. 60N

Answer: A

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12. A body of mass 5 kg is moving in a straight line. The relation between its displacement and time t is given by $x = (t^3 - 2t - 10)$ metre. What is the force acting onit at the end of second?

A. 150 N

B. 120N

C. 100N

D. 80N

Answer: A

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13. A body of mass 10 kg has velocities of 10 m/s, 11m/s and 12 m/s at the end of successive seconds. What is force acting on the body?

A. 15N

B. 20N

C. 10N

D. 5N

Answer: C

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14. A body of mass 2 kg is at rest. Two forces of 6 N and 8 N act on the body at right angles to each other. What is the velocity of the body after 3 second?

A. 10m/s

B. 15m/s

C. 5m/s

D. 20m/s

Answer: B

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15. Two persons greet each other by shaking hands. What kind of force do they exert on each other?

A. Gravitational

B. Nuclear

C. Electromagnetic

D. Weak nuclear force

Answer: C

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16. A force $\overrightarrow{F} = \left(3\hat{i} + 4\hat{j} + 5\hat{k}\right)N$ produces an acceleratioinof $1.414m / s^2$ in a body. What is the mass of the body?

A. 3 kg

B. 4 kg

C. 5 kg

D. 10kg

Answer: C

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17. A body of mass 5 kg is moving with a velocity 20m/s. If a force of 100 N is applied on it for 10s in the same direction as its velocity what will be the velocity of the body?

A. 180m/s

B. 200m/s

C. 220m/s

D. 250 m/s

Answer: C

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18. A force F appllied to a body(A)of mas m_1 produces an acceleratioin of $4m/s^2$. If the same force F is applied to another body (B) of mass m_2, then an acceleratiionof $10m/s^2$, produced in the body. A and B are the tied together and the same force is applied to the combined body. What is the acceleration of the system?

A. $\frac{10}{7}m/s^2$

B. $\frac{20}{7}m/s^2$

C. $\frac{5}{3}m/s^2$

D. $\frac{7}{20}m/s^2$

Answer: B

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19. Which one of the following observers is in an inertial frame?

A. A cyclist negotiating a sharp turn

B. A child revolving in a merry go round

C. The driver of a car moving on a straight road with a constant speed

D. A pilot in an aircraft, which is in take off stage.

Answer: C

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20. A rider on a horse back falls forward if the horse suddenly stops. This is due to

A. the large weight of the horse

B. the inertia of the horse

C. losing the balance

D. the inertia of the rider.

Answer: D

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21. If a consant force acts on a body of mass m, then the body will have uniform

A. velocity

B. displacement

C. acceleration

D. momentum

Answer: C

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22. It is easier to catch a tennis balll as compared to a cricket ball, moving with the same velocity. This is because

A. The tennis balll is lighter than the cricket ball

B. the linear momentum of the tennis ball is less than that of the cricket ball

C. the potential energy of the tennis ball is more than that of the cricket ball

D. both the balls have the same kinetic energy

Answer: B

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23. A player caught a cricket ball of mass 150 g moving at a rate of 20 m/s. The cathcing process is completed in 0.1 second. What is the force exerted by the ball on the hand of the player?

A. 15 N

B. 20 N

C. 30 N

D. 40N

Answer: C

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24. A person is sitting in a travelling train and facing the engine. He tosses up a coin and thhe coin falls behind him. It can be concluded from this that the train is

A. moving forward and gaining speed

B. moving forward with uniform speed

C. moving forward and losing speed

D. moving backward with uniform speed

Answer: A

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25. A bird weighs 0.5 kg and is inside a cage of 2.5 kg. If it starts flying, then what is the weight of the bird an cage assembly?

A. 4 kg

B. 1.5 kg

C. 3 kg

D. 2.5 kg

Answer: C

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26. It is easier to draw up a wooden block along an inclined plane than haul it up vertically because

A. the friction is reduced

B. the mass becomes smaller

C. g becomes smaller

D. only a part of the weight has to be overcome

Answer: D

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27. A railway engine (mass 10^4 kg) is moving with a speed of 72 km/h. The force which should be applied to bring it to rest over a distance of 20m is

A. 7200N

B. 1000N

C. 3600N

D. 100000N

Answer: D

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28. A particle of mass 0.3 kg is subjected to a force $F = -kx$ with $k = 15N/m$. What will be its initial acceleration if it is released from a point 20 cm away from th origin?

A. $5m/s^2$

B. $10m/^2$

C. $3m/s^2$

D. $15m/s^2$

Answer: B

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29. A student sitting on a chair, attempts to lift the chair. He will not succeed

A. as the force exerted is small

B. the weight of the chair opposes the upward force

C. Newton's law of inertia is not applicable to living beings

D. as the force applied by the students is an internal force of the system

Answer: D

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30. If suddenly the gravitational force of attaractiion between the earth and a satellite revolving around it becomes zero, then the satellite will

A. continue to move in its orbit with the same velocity

B. move tangentially to the original orbit with the same velocity

C. become stationary in its orbit

D. move towards the earth

Answer: B

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31. A particle of mass m is moving with a uniform velocity v_1. It is given an impulse such that its velocity becomes v_2. The impulse is equal to

A. $m(v_1 + v_2)$

B. $m[|v_2| - |v_1|]$

C. $\frac{1}{2}(v_2^2 - v_1^2)$

D. $m(v_2 - v_1)$

Answer: D

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32. A ball of mass 150 g moving with an acceleration of $20m/s^2$ is hit by a force, which acts on it for 0.1 s. What is the impulsive force?

A. 0.1N

B. 0.5N

C. 0.3N

D. 1.2N

Answer: C

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33. A player takes 0.1 s in catching a ball of mass 150 g moving with velocity of 20m/s. the force imparted by the ball on the hands of the player is

A. 3N

B. 0.3N

C. 30N

D. 300N

Answer: C

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34. While launching a rocket of mass 2×10^4 kg, a force of $5 \times 10^5 N$ is applied for 20s.

What is the velocity attained by the rocket at the end of 20s?

A. 300m/s

B. 350 m/s

C. 450 m/s

D. 500 m/s

Answer: D

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35. A cricket ball of mass 150g is moving with a velocity of 12 m/s and is hit by a bat so that the ball is turned back with a velocity ishit by a bat so that the ball is turned back with a velocity of 20 m/s. The force of blow acts for 0.01 s on the ball. What is the averate force exerted by the bat on the ball?

A. 240N

B. 300N

C. 380N

D. 480N

Answer: D

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36. A machine gun fires a bullet of mass 50 gram with a velocity of 800 m/s. The man holding the machine gune can exert a maximum force o 200N. What is the maximum number of bullets he can fire per second?

A. 2

B. 3

C. 5

D. Any number of bullets

Answer: C

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37. A block (A) of mass 3 kg in contact with a second block (B) of mass 2 kg rests on a frictionless horizontal surface. A horizontal force of 20 N is applied to push the block A.

What is the force with which the block A pushes the block B?

A. 4N

B. 6N

C. 8N

D. 10N

Answer: C

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38. A force of 75 N is applied to a block of mass 25 kg, resting on a smooth horizontal surface. In how much time, the block will acquire a speed of 12 m/s?

A. 1 sec

B. 2sec

C. 4 sec

D. 8 sec

Answer: C

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39. A ball of mass 500 gram strikes a wall with a velocity of 80 m/s and rebounds with the same velocity. If the tme of contact is 1/30 sec, then the force exerted by the ball on the wall is

A. 2000N

B. 2200 N

C. 2400N

D. 2500N

Answer: C

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40. If a force of 180 N acts on a body, its momentum charnges by 120 kgm/s. What is the time for which the force acts on the body?

A. $\frac{1}{2}s$

B. $\frac{1}{3}s$

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

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

Answer: C

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41. The motion of a rocket is based on the principle of conservation of

A. mass

B. energy

C. angular momentum

D. linear momentum

Answer:

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42. A body of mass 2 kg collides with a wall with speed 100 m / s and rebounds with same speed. If the time of contact was 1/50 second, the force exerted on the wall is

A. $10^4 N$

B. $2 \times 10^4 N$

C. $4N$

D. $8N$

Answer: B

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43. If a force of 250 N act on body, the momentum acquired is 125 $kg - m/s$. What is the period for which force acts on the body

A. 0.5s

B. 0.25s

C. 0.4s

D. 0.2s

Answer: A

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44. The engine of a car produces acceleration $4m/s^2$ in the car. If this acr pulls another car of same mass, what will be the acceleration produced

A. $4m/s^2$

B. $2m/s^2$

C. $8m/s^2$

D. $\frac{1}{2}m/s^2$

Answer: B

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45. A ball of weight 0.1 kg coming with speed 30 m / s strikes with a bat and returns in opposite direction with speed 40 m / s , then the impulse is (Taking final velocity as positive)

A. $0.1 \times (40) + 0.1 + (- 30)$

B. $0.1 \times (40) - 0.1 \times (- 30)$

C. $0.1 \times (40) - 0.1 \times (20)$

D. $-0.1 \times (40) - 0.1 \times 30$

Answer: B

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46. A body is subjected to a froce such that its velocity is doubled ten

A. its potential energy is also doubled

B. its mometum is also doubled

C. its kinetic energy is also doubled

D. its acceleration is also doubled

Answer: B

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47. When a horse pulls a cart, the force that helps the horse to move forward is the force exerted by

A. the horse on the cart

B. the horse on the ground

C. the ground on the horse

D. the ground on the cart

Answer: C

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48. A constant force acts on a body of mass 5 kg at rest for 10s. If the body moves through a distance of 250 m, what is the magnitude of the force?

A. 15N

B. 25N

C. 30N

D. 40N

Answer: B

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49. The momentum of a body is numerically equal to its kinetic energy. What is the velocity of the body in m/s?

A. 2m/s

B. 3m/s

C. 4m/s

D. 1m/s

Answer: A

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50. In non inertial frames,Newton's second law of motion is written as

where $a =$ acceleration of the body, relative to the non-inertial fram and F_p is the pseudo force.

A. $\overrightarrow{F} = m\overrightarrow{a}$

B. $\overrightarrow{F} = m\overrightarrow{a} + \overrightarrow{F}_p$

C. $\overrightarrow{F} = m\overrightarrow{a} - \overrightarrow{F}_p$

D. $\overrightarrow{F} = 2ma$

Answer: C

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51. A body of mass 0.5 kg is moving with a velocity of 2m/s. When a constant force of x newton acts on its fro 2s, its velocity becomes 3m/s. What is the value of x?

A. 1N

B. 5N

C. 0.5N

D. 0.25N

Answer: D

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52. 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. proportional to t^2

B. a constant

C. proportional to t

D. inversely proportional to t

Answer: C

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53. A taxi without any passengers, moving on a frictionless horizontal road, with a velocity u can be stopped in a distance d. Now the passengers and 40% to its weight. What is the stopping distance at veolcity u, if the retardation remains the same?

A. $\sqrt{1.4d}$

B. $(1.4)^2 d$

C. $1.4d$

D. $\left(\frac{1}{1.4}\right)d$

Answer: C

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54. A block of mass 15 kg is held by a string on a smooth inclined plane of inclinatioin 60°. What is the tension T is the string? $(g = 10m / s^{2})$

A. $55N$

B. $60N$

C. $75N$

D. $90N$

Answer: C

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55. A man weighing 60 kg is standing on a trolley weighting 240 kg. The trolley is resting on frictionless horizontal rails. If the man starts walking on the trolley with a velocity of 1 m/s, then after 5s, his displacement relative to the ground is

A. $6m$

B. $4.8m$

C. $3.2m$

D. $2.4m$

Answer: C

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56. A stream of water flowing horizontally with a speed of $15ms^{-1}$ pushes out of a tube of cross sectional area $10^{-2}m^2$ and hits a vertical wall near by what is the force exerted on the wall by the impact of water assuming.that it does not rebound? (Density of water $= 1000 kgm^3$)

A. $4.25 \times 10^3 N$

B. $3.25 \times 10^3 N$

C. $2.25 \times 10^3 N$

D. $1.25 \times 10^3 N$

Answer: C

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57. Water is poured from a height of 10m into a mepty vessel at the rate of 1 litre per second . If the weight of the vessel is 10 kg ten th weight indicated at time $t = 60s$ will be

A. 70 kg

B. more than 70 kg

C. less than 790 kg

D. 50 kg

Answer: B

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58. When forces F_1 , F_2 , F_3 are acting on a particle of mass m such that F_2 and F_3 are mutually prependicular, then the particle remains stationary. If the force F_1 is now rejmoved then the acceleration of the particle is

A. $\dfrac{F_2}{m}$

B. $\dfrac{F_2F_3}{mF_1}$

C. $\dfrac{F_2 - F_3}{m}$

D. $\frac{F_1}{m}$

Answer: D

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59. A ball of mass 0.2 kg thrown vertically upwards with a velcity of 30 m/s, reaces the highest point in 2.5 second. What is the air resistance experienced by the ball during its vertical motion? $\left[g = 10m/s^2\right]$

A. $0.5N$

B. $0.4N$

C. 10N

D. 2.5N

Answer: B

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60. A triangular block of mass M with angle 30 , 60 , 90 rests with its 30 – 90 side on a horizontal smooth fixed table. A cubical block of mass m rests on the 60 – 30 sideofthe triangular block. What horizontal acceleration a must M have relative to the stationary table so that m remains stationary with respect to the triangular block [M = 9 kg, m = 1 kg]

A. g

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

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

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

Answer: C

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61. 500 steel ballls each of mass 1 gram strike normally one sq. cm area of a metal plate per second, with a velocity of 10 m/s and rebound with the same velocity. What is the pressure exerted by the balls on the surface of the plate?

A. $10^4 N/m^2$

B. $10^5 N/m^2$

C. $2 \times 10^5 N/m^2$

D. $4 \times 10^4 N/m^2$

Answer: B

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62. Two balls of same mass are dropped from the same height onto the floor. The first ball bounces upwards from the floor elastically. The second ball stricks to the floor. The first applies an impulse to the floor of I_1 and the second applies an imupulse I_2. The impulses obey :-

A. $I_1 = I_2$

B. $I_1 = \frac{I_2}{2}$

C. $I_1 = 2I_2$

D. $I_1 = \frac{I_2}{4}$

Answer: C

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63. A body with mass 5 kg is acted upon by a force $\vec{F} = \left(-3\hat{i} + 4\hat{j}\right)N$. If its initial velocity at t =0 is $\vec{v} = 6\hat{i} - 12\hat{j}ms^{-1}$, the time at which it will just have a velocity along the y-axis is :

A. 10s

B. 15s

C. 5s

D. 2s

Answer: A

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64. A cricket ball of mass $150g$ moving with a speed of $126km/h$ hits at the middle of the bat, held firmly at its position by the batman. The ball moves straight back to the bowler after hitting the bat. Assuming that collision between ball and bat is completely elastic and the two remain in contact for $0.001s$, the force that the batsman had to apply to hold the bat firmly at its place would be

A. $1.05 \times 10^{4} N$

B. $2.1 \times 10^{4} N$

C. $21 N$

D. $10.5 N$

Answer: A

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65. The tension in the cable of a 1500 kg lift is 1500 kg-wt This implies that the lift

A. is accelerating upwards

B. is accelerating downwards

C. may be at rest or accelerating

D. may be at rest or in uniform motion

Answer: D

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66. A student whose weight is 50 kg is standing in an elevator. The force felt by the feet of the student will be maximum, when the lift is

A. stationary

B. moving downwards with an acceleration of $5m / s^2$

C. moving upwards with an acceleration of $5m / s^2$

D. moving downwards with a velocity of $5m / s$

Answer: C

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67. A lift moving up with an acceleration equal to 1/2th of that due to gravity. What is the apparent weight of a 80 kg man standing in the lift?

A. 80 kg

B. 96 kg

C. 64 kg

D. 88 kg

Answer: B

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68. A rocket with a lift-off mass $3.5 \times 10^4 kg$ is blasted upwards with an initial acceleration of $10m / s^2$. Then the initial thrust of the blast is

A. $17.5 \times 10^5 N$

B. $14.0 \times 10^5 N$

C. $7.0 \times 10^5 N$

D. $3.5 \times 10^5 N$

Answer: C

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

A. g,g

B. g-a,g-a

C. g-a,g

D. a,g

Answer: C

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

A. $3:1$

B. $1:2$

C. $1:3$

D. $2:1$

Answer: A

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71. A lift of mass $1000kg$ is moving with an acceleration of $1m/s^2$ in upward direction.

Tension developed in the string, which is connected to the lift, is.

A. 10000N

B. 10800N

C. 9800N

D. 11000N

Answer: B

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72. A man weighs $80kg$. He stands on a weighing scale in a lift which is moving upwords with a uniform acceleration of $5m/s^2$. What would be the reading on the scale?

A. Zero

B. 1200N

C. 400N

D. 800N

Answer: B

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73. The mass of a lift is $2000kg$. When the tensioon in the supporting cable is $28000N$, then its acceleration is.

A. $30m/s^2$ downwards

B. $4m/s^2$ upwards

C. $14m/s^2$ upwards

D. $4m/s^2$ downwards

Answer: B

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74. A body is kept in a lift may be moving upwards or dowwards. It is found that durig the motion of the lift, the apparent weight of the body becomes twice its real weight. Then the lift is

A. moving up with a unifoirm velocity of 9.8 m/s

B. moving down with a uniform velocity of

9.8 m/s

C. moving up with acceleration g

D. moving down with an acceleration g

Answer: C

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75. The weight of a man standing on a weighing machine in a lift is noted when (i) the lift is moving with a uniform velocity and

(ii) the lift is moving down with an acceleration a. The ratio of the two weights is $\frac{4}{3}$. What is the value of a

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

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

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

D. $a = \frac{g}{5}$

Answer: C

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

A. $0.7kgs^{-1}$

B. $1.4kgs^{-1}$

C. $0.07kgs^{-1}$

D. $10.7kgs^{-1}$

Answer: A

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77. If a body of mass m is carried by a lift moving with an upward acceleration a, then the forces acting on the body are (i) the reaction R on the floor of the lift upwards (ii) the weight mg of the body acting vertically downwards. The equation of motion will be given by

A. $R = ma - mg$

B. $R = mg + ma$

C. $R = mg \times ma$

D. $R = mg - ma$

Answer: B

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78. A man of mass 60 kg records his wt. on a weighing machine placed inside a lift. The ratio of wts. Of man recorded when lift is ascending up with a uniform speed of 2 m/s to when it is descending down with a uniform speed of 4 m/s will be

A. 2

B. 1

C. 0.5

D. none of these

Answer: B

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79. Rocket engines lift a rocket from the earth surface because hot gas with high velocity

A. push against the air

B. push against the earth

C. react against the rocket and push it up

D. heat up the air which lifts the rocket

Answer: C

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80. In an elevator moving vertically up with an acceleration g, the force exerted on the floor by a passanger of mass M is

A. Zero

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

C. Mg

D. $2Mg$

Answer: D

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81. A spring balance is attached to the ceiling of a lift. A man hangs his bag on the spring and the spring reads 49N, when the lift is stationary. If the lift moves downward with an acceleration of $5m/2^2$, the reading of the spring balance will be

A. 15N

B. 49N

C. 24N

D. 74N

Answer: C

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82. An object is suspended from a spring balance in a lift. The reading is 240 N when the lift is at rest. If the spring balance reading now change to 220N, then the lift is moving

A. downward with constant speed

B. downward with decreasing speed

C. downward with increasing speed

D. upward with increasing speed

Answer: C

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83. A lift whose cage is 3 m high is moving up with an acceleration of $2m/s^2$. A piece of stone is dropped from the top of the cage of the lift when its velocity is 8m/s. if $g = 10m/s^2$, then the stone will reach the floor of the lift after

A. 0.7s

B. 0.5s

C. 0.4s

D. 0.3s

Answer: A

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84. A 600 kg rocket is set for vertical firing. If the exhaust speed is 1000m/s, the mass of the gas ejected per second to supply the thrust needed to overcome the weight of rocket is

A. 58.6kg/s

B. 76.4kg/s

C. 6kg/s

D. 117.6kg/s

Answer: C

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85. If the force on a rocket moving with a velocity of 300m/s is 345 N, then the rate of combustion of the fuel is

A. 2.25kg/s

B. 0.75kg/s

C. 1.15 kg/s

D. 0.55kg/s

Answer: C

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86. A body is kept in the pan of a spring balance kept in an elevator. The reading of the spring scale will be maximum when the elevator

A. is at rest

B. moves down with an acceleration a

C. moves upwards with an acceleration a

D. cable breaks and the elevator falls freely under gravity

Answer: C

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87. Liquid fuel is burnt in a rocket and its exhaust gas is rejected from its tail at a velocity of $10 km/s$. The force acting on the rocket is $2 \times 10^4 N$. At what rate the liquid fuel is burnt?

A. 1.5 kg/s

B. 2 kg/s

C. 2.5kg/s

D. 3 kgs

Answer: B

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88. A coin is dropped in a lift. It takes time t_1 to reach the floor when lift is stationary. It takes time t_2 when lift is moving up with costant acceleration. Then

A. $t_1 = t_2$

B. $t_1 > t_2$

C. $t_1 < t_2$

D. $t_1 < \, < t_2$

Answer: B

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89. When a liftman takes 5 persons in a lift, the totla mass of the lilft and the 5 persons becomes 800 kg. What is the tension in the supporting cable, if the lift ascends with an acceleration of $2m / s^2$? $(g = 10m / s^2$

A. 8000N

B. 8400N

C. 9000N

D. 9600N

Answer: D

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90. A Diwali rocket is ejecting 5 gram of gases/second at a velocity of 4m/s. What is the accelerating force acting on the rocket?

A. 0.02N

B. 0.5N

C. 0.08N

D. 0.1N

Answer: A

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91. The rate of mass of the gas emitted from the rear of a rocket is initially $0.1 kg / s$. If the speed of the gas relative to the rocket is

$50 m / s$ and the mass of the rocket is $2 kg$, then the acceleration of the rocket in m / s^2 is

A. 5

B. 2.5

C. 7.5

D. 10

Answer: B

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92. A thief stole a box full of valuable articles of weight W and while carrying it on his back, he jumped down a wall of height ‘ h ’ from the ground. Before he reached the ground he experienced a load of

A. 2W

B. W

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

D. zero

Answer: D

Watch Video Solution

93. (a) A rocket set for vertical firing weighs $50kg$ and contains $450kg$ of fuel. It can have a maximum exhaust velocity of $2km/s$. What should be its minimum rate of fuel consumption

(i) to just lift off the launching pad?

(ii) to give it an initial acceleration of $20m/s^2$?

(b) What will be the speed of the rocket when the rate of consumption of fuel is $10kg/s$

after whole of the fuel is consumed? (Take $g = 9.8 m/s^2$)

A. 2.5 kg/s

B. 10 kg/s

C. 5 kg/s

D. 20 kg/s

Answer: A

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94. The mass of a rocket is 500 kg and the relative velocity of the gases ejecting from it is 250 m/s with respect to the rocket. The rate of burning of the fuel in order to give the rocket an initial acceleration $20m / s^2$ in the vertically upward direction $g = 10\frac{m}{s^2}$, will be -

A. 300 kg/s

B. 60 kg/s

C. 90 kg/s

D. 30 kg/s

Answer: B

Watch Video Solution

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

A. 18 k

B. 37.5 kg

C. 50 kg

D. 67.5 kg

Answer: C

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96. A body of mass 40 kg wants to climb up a rope hanging vertically. The rope can withstands a maximum tension of 500 N. What is the maximum acceleration with which the boy can climb rope? Tak e $g = 10m / s^2$

A. $1.5m / s^2$

B. $2.0m / s^2$

C. $2.5m / s^2$

D. $3.0m / s^2$

Answer: C

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

A. 90N

B. 180N

C. Zer N

D. $-90N$

Answer: C

Watch Video Solution

98. Three wagons, each of mass m are being pulled by an engine exerting a froce F on the lead wagon. What is the fore exerted on the last wagon by the middle wagon?

A. F

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

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

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

Answer: B

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99. Three blocks A,B,C are masses $m_a = 10kg, m_B = 6kg$ and $m_C = 4kg$ are kept on a friction less table. They are connected by massless springs as shwon in the figure. If thye are pulled by a force $F = 60N$, then the tensioni T_2 in the string will be

A. 24N

B. 36N

C. 48N

D. 60N

Answer: C

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100. Two blocks $m_1 = 5g$ and $m_2 = 10g$ are hung vertically over a light frictionless pulley as shown in the figure. What is the acceleration of the masses when left free?

(where g is acceleration due to gravity)

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

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

C. g

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

Answer: A

View Text Solution

101. One end of massless rope, which passes over a massless and frictionless pulley P is tied to a hook C while the other end is free. Maximum tension that the rope can bear is 360 N.With what value of maximum safe acceleration (in ms^{-2}) can a of 60 kg climb on the rope?

A. 8

B. 4

C. 6

D. 16

Answer: B

View Text Solution

102. Two masses $m_1 = 5$ kg and $m_2 = 4.8$ kg tied to a string are hanging over a light frictionless pulley. What is the acceleration of the masses when the system is free to move?

A. $9.8 m / s^2$

B. $0.2m / s^2$

C. $4.8m / s^2$

D. $5m / s^2$

Answer: B

View Text Solution

103. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle

θ should be

A. 60°

B. 45°

C. 30°

D. 0°

Answer: B

View Text Solution

104. What is the value of the tension T_3 in the given system?

A. g

B. $3g$

C. $5g$

D. $6g$

Answer: D

View Text Solution

105. Three blocks of masses m,3m and 5m are connected by massless strings and pulled by a force F on a frictionless surface as shown in the figure below. The tension T_1 in the first string is 16 N.

The value fo T_1' and T_2' shall be

A. 16N, 10N

B. 10N,16N

C. 2N,8N

D. 10N,6N

Answer: C

View Text Solution

106. A light string over a frictionless pulley. To one of its ends, a mass of 6 kg is attached. To its other end a mass of 10 kg is attached, as shown in the figure. What is te tension in the string?

(Take $g = 10m/s^2$)

A. 25N

B. 30N

C. 50N

D. 75N

Answer: D

View Text Solution

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

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

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

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

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

Answer: D

View Text Solution

108. Three masses of 1 kg, 6 kg and 3 kg are connected to each other with strings and are placed on a table as shown in the figure. What is the acceleration with which the system is moving? (Take $g = 10 m / s^2$)

A. Zero

B. $1 m / s^2$

C. $2 m / s^2$

D. $3m / s^2$

Answer: C

View Text Solution

109. Two masses $m_1 = 1kg$ and $m_2 = 2$ kg are connected by a light inextensibkle string and suspended by means of a weightless pulley as shown in the figure. Assuming that both the masses start from rest the distance travelled by the centre of mass in two second is (Take

$g = 10m / s^2)$

A. $\frac{20}{9}m$

B. $\frac{40}{9}m$

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

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

Answer: A

View Text Solution

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

A. 5N, zero

B. Zero, N

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

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

Answer: C

View Text Solution

111. In the following figure, the tension in the horizontal cord is 30 N. What is the weight of the boyd B?

A. 40N

B. 30N

C. 20N

D. 10N

Answer: B

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112. Three blocks A , B and C each of mass m are attached to a stirng, pasing over a smooth pulley. What is the tension in the string connecting A and B?

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

B. mg

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

D. $\frac{5}{3}mg$

Answer: C

View Text Solution

113. Three bodies A,B,C each of mass 2 kg are hanging from a string passing over a fixed frictionless pulley as shown in the figure. What is the tension in the part of the string connecting the bodies B and C?

$\left[g = 10m / s^2\right]$

A. 5N, zero

B. 13N

C. 8.5N

D. 19.6N

Answer: B

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114. A mass of 20 kg is suspended by a rope of length 4 m from the ceiling. A force of 60 N is applied at the midpoint of the rope in the horizontal direction. What is the angle made by the rope with the vertical in equilibrium? Assume that the mass of the rope is negligible and $g = 10m/s^2$

A. $\theta = \tan^{-1}\left(\frac{1}{10}\right)$

B. $\theta = \tan^{-1}\left(\frac{1}{5}\right)$

C. $\theta = \tan^{-1}\left(\frac{3}{10}\right)$

D. $\theta = \tan^{-1}\left(\frac{1}{2}\right)$

Answer: C

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115. Two blocks of masses 2 kg and 4 kg are in close contact on a frictionless horizontal table. A horizontal force of 18 N is applied to the larger mass. What is the force at the surface of contact between the blocks?

A. 4N

B. 5N

C. 6N

D. 8N

Answer: C

Watch Video Solution

116. A mass is hung with a light inextensible string as shown in the figure. What is the tension in the horizontal portion of the string?

A. $T_1 = \frac{Mg}{\sqrt{3}}$

B. $T_1 = \sqrt{3}Mg$

C. $T_1 = \frac{Mg}{3}$

D. $T_1 = \frac{\sqrt{3}}{2}Mg$

Answer: B

View Text Solution

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

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

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

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

D. $\frac{5}{8}F$

Answer: C

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118. Two bodies A and B of masses 10 kg and 15 kg respectively kept on a smooth horizontal surface are tied to the ends of a light string. If T represents the tensiion in the string when a horizontal force $F = 500N$ is applied to A as shown in fig 1 and T' be the tension in the string when it is applied to B fig, which of the following is true?

A. $T = T' = 500N$

B. $T = T' = 250N$

C. $T = 200N, T' = 300N$

D. $T = 300N, T' = 200N$

Answer: D

View Text Solution

119. A 10 kg stone is suspended with a rope of breaking strength 30 kg-wt. The minimum time in which the stone can be raised through a height 10 m starting from rest is (Take, $g = 10Nkg^{-1}$).

A. 2.0sec

B. 1.0sec

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

D. 0.5sec

Answer: B

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120. Two identical blocks eac of mass M are linked by a thread wrapped around a pulley block with a fixed axis. A small mass 'm' is placed on the block B. What is the acceleration with which the two blocks move?

A. $\frac{mg}{M+2m}$

B. $\frac{mg}{2M+m}$

C. $\frac{Mg}{M+2m}$

D. $\dfrac{Mg}{2M+m}$

Answer: D

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121. A and B are two identical pulleys. The ropes over A and B have negligible mass. For pulley A the mass m is lifted up by attaching a mass 2m at the other end (case 1) and produces an acceleration (a_1) in the system. For pulley B, the mass is lifted up by pulling the other end of the rope with a consant doward force $F = 2mg$ (case 2). If a_2 is the acceleration of the system, then

A. $a_1 = a_2$

B. $a_1 = 2a_2$

C. $a_1 = \frac{a_2}{2}$

D. $a_1 = \frac{a_2}{3}$

Answer: D

View Text Solution

122. A mass M of 10 kg is suspended with the use strings A, B and C as shown in the figure below where W is the vertical wall and R is a rigid horizonal rod. What is the tension in the string B?

A. 10gN

B. 0

C. $100\sqrt{2g}N$

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

Answer: A

View Text Solution

123. A light string passes over a frictionless pulley. To one of its ends a mass of 6 kg is attached to its other end a mass of 10 kg is attached as shown in the figure below. The tension in the thread will be

A. 24.5N

B. 2.45N

C. 79N

D. 73.5N

Answer: D

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124. A block A of mass 7 kg is placed on a frictionless table A thread tied to it passes over a frictionless pulley and carries a body B of mass 3 kg at the other end. The acceleration of the system is

(Give: $g = 10m / s^2$)

A. $30m / s^2$ downwards

B. $3m / s^2$

C. $100m / s^2$

D. $10m / s^2$

Answer: B

View Text Solution

125. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m . Force P is applied at one end of rope. The force which the rope exerts on the block is:

A. $\dfrac{P}{M(m+M)}$

B. $\dfrac{P}{M-m}$

C. $\dfrac{Pm}{M-m}$

D. $\dfrac{PM}{m+M}$

Answer: D

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126. Three identical blocks of mass $m = 2$ kg each are drawn by a force $F = 10.2N$ with an acceleration of $0.6m/s^2$ on the frictionlesss surface. What is the tensioni (in N) in the string between the blocks B and C?

A. 7.8N

B. 9.2N

C. 9.N

D. 4N

Answer: A

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127. The law of conservation of linear mometum is a logical consequence of Newton's

A. First law of motion

B. Second law of motion

C. third law of motion

D. All the three laws

Answer: B

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128. A bomb at rest explodes into 3 parts of the same mas. The momenta of the two parts are $-2p\hat{i}$and $p\hat{j}$. What is the magnitude of the momentum of the third part?

A. $\sqrt{3}p$

B. $\sqrt{5}p$

C. $\sqrt{P}$

D. $\sqrt{7}p$

Answer: B

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129. In the motion of a rocket, the quantity which is conserved is

A. Froce

B. mass

C. Linear momentum

D. Kinetic energy

Answer: C

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130. A body of mass m moving with a velocity v strikes a statioinalry body of mass m and sticks to it. What is the speed of the system?

A. 2v

B. v

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

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

Answer: D

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131. A wagon weighing 1000 kg is moving with a velocity 50 km/h on smooth horizontal rails. A mass of 250 kg is dropped into it. The velocity with which it moves now is

A. 50 km/h

B. 12.5 km/h

C. 40 km/h

D. 20 km/h

Answer: C

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132. A bullet of mass 0.1 kg is fired with a speed of 100 $m/\sec$, the mass of gun is 50 kg. The velocity of recoil is

A. 0.2 m/s

B. 0.05 m/s

C. 0.1 m/s

D. 0.5 m/s

Answer: A

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133. A bullet of mass A and velocity B is fried into a block of mass C and sticks to it. The final velocity of the system equals

A. $\frac{A+B}{C}A$

B. $\frac{A}{A+C}B$

C. $\frac{A+C}{B}$

D. $\frac{A}{A+B}B$

Answer: B

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134. Four identical railway wagons each of m, are coupled together and rest on a smooth horizontal track. A fifth wagon of mass 2m and movingk at 5m/s collides and couple with the statioinary wagons. What is the speed of the wagons after the impact?

A. $\frac{5}{6}m/s$

B. $1m/s$

C. $\frac{5}{4}m/s$

D. $\frac{5}{3}m/s$

Answer: D

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135. A body of mass m_1 moving with uniform velocity of 40 m/s collides with another mass m_2 at rest and then the two together begin to moe wit h uniform velocity of 30 m/s. the ratio of their masses $\frac{m_1}{m_2}$ is

A. $3:4$

B. $3:2$

C. $12:1$

D. $3:1$

Answer: D

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136. A body A of mass 5kg is moving along the x-axis with a velocity 2m/s. Another body (B) of mass 10 kg is moving along the y-axis with a velocity $\sqrt{3}m/s$. They collide at the origin and stick together. What is the final velocity of the combined mass?

A. $\sqrt{3}m / s$

B. $(\sqrt{3}+1)m / s$

C. $\frac{4}{3}m / s$

D. $2(\sqrt{3}+1)m / s$

Answer: C

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137. A car of mass 400 kg and travelling at 72 km/h hits a truck of mass 4000 kg and travelling at 9 km/hr in the same direction. The car bounces bact at a speed of 18 km/h. What is the speed of the truck after the impact?

A. 9km/h

B. 18km/h

C. 27km/h

D. 36km/h

Answer: B

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138. A uranium 238 nucleus, originally at rest, emits and α particle. The α particle travels with a speed of v m/s. What is the recoil speed of the residual necleus?

A. $\frac{v}{4}m/s$

B. $-\frac{2v}{117}m/s$

C. $-\frac{117v}{2}m/s$

D. $\frac{4v}{238}m/s$

Answer: B

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139. A particle of mass m moving eastward with a speed v collides with another particle of the same mass moving northward coalesce on collision. The new particle of mass $2m$ will move in the north - easterly direction with a velocity

A. v

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

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

D. $v\sqrt{2}$

Answer: C

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140. A body of mass 1 kg is projected vertically upwards wit a speed of 100 m/s. After 6 s it explodes into two parts. One part of mass 400 g comes back with speed 25 m/s. What is the velocity of other part just after explosion?

A. 83.3 m/s upward

B. 600 m/s upward

C. 100 m/s downward

D. 300 m/s upward

Answer: A

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141. A neutron having a mass of $1.67 \times 10^{-27} kg$ and moving at $10^8 m/s$ collides with a deuteron at rest and sticks to it. If the mass of the deuteron is $3.33 \times 10^{-27} kg$ then the speed of the combination is

A. $0.25 \times 10^8 m/s$

B. $0.5 \times 10^8 m/s$

C. $0.33 \times 10^8 m/s$

D. $0.65 \times 10^8 m/s$

Answer: C

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142. A shell moving with a velocity of 500 m/s, suddenly explodes into two pieces of masses m_1 and m_2. They continue to move with velocities of 600 m/s and 200 m/s in the same direction. What is the ratio $\frac{m_1}{m_2}$ of the two pieces?

A. $2:1$

B. $1:1$

C. $3:1$

D. $4:1$

Answer: C

Watch Video Solution

143. A body of mass M at rest explodes into 3 pieces, A,B and C of masses $\frac{M}{4}$, $\frac{M}{4}$ and $\frac{M}{2}$ respectively. A and B move in perpendicular directions with velocities 5m/s and 12 m/s respectively. What is the speed of the third piece?

A. 3.5m/s

B. 5.5m/s

C. 6.5m/s

D. 8m/s

Answer: C

Watch Video Solution

144. A shell at rest at the origin explodes into 3 fragments A,B and C of masses 1 kg, 2 kg and m kg respectively. A moves along the X-axis with a speed of 12 m/s, B moves along the Y-axis with a speed of 16 m/s and C flies off with a speed of 40 m/s. What is the total mass of the shell before explosion?

A. 3.85 kg

B. 4.6 k

C. 5.35 kg

D. 8.2 kg

Answer: A

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145. A man of $50kg$ mass is standing in a gravity free space at a height of $10m$ above the floor. He throws a stone of $0.5kg$ mass downwards with a speed $2m/s$. When the stone reaches the floor, the distance of the man above the floor will be

A. 10m

B. 10.1m

C. 9.9m

D. 20m

Answer: B

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146. What is the amount of work done by a boy when

(i) he holds a bundle of books of mass 2 kg for

5 minute?

(ii) be lifts up the same bundle of books through 1 metre to keep it on his study table?

A. 0,4.9J

B. 0,19.6J

C. 19.6J,0

D. 0,9.8

Answer: B

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147. The work done by a force is given by W $= \vec{F} . \vec{s}$ if $W = 0$ but $F \neq 0$ and $s \neq 0$ then both $\vec{F}$ and $\vec{s}$ are

A. in opposite directions

B. in te same direction

C. perpendicular to each other

D. parallel to each other

Answer: C

Watch Video Solution

148. A body covers a distance of 5 m along a straight line under the action of a fore of 10N. What is the angle made by the force with the direction of motionof the body if the work done is 25J?

A. 0°

B. 30°

C. 45°

D. 60°

Answer: D

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149. A force $\overrightarrow{F}=6\hat{i}+2\hat{j}-3\hat{k}$ acts on a particle and produces a displacement of $\overrightarrow{s}=2\hat{i}-3\hat{j}+x\hat{k}$. If the work done is zero, the value of x is

A. 4

B. 3

C. -2

D. 2

Answer: D

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150. A block of mass 2 kg is pulled through 3 m by a constnat horizontal force of 10N, along a frictionless horizontal table. What is the work doen by (i) the applied force and (ii) the gravitational force?

A. 20N,60N

B. 30N,15N

C. 30N,zero

D. 10n,5N

Answer: C

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151. A body of mass 10 kg is dropped to the ground from a height of 10 metres. The work done by the gravitational force is $(g = 9.8m/\sec^2)$

A. $-490J$

B. $-980J$

C. $+490J$

D. $+980J$

Answer: D

Watch Video Solution

152. A particle constrained to move along the Y axis of a co-ordinate system is subject to a constant force

$\overrightarrow{F}=\left(5\hat{i}+4\hat{j}-3\hat{k}\right)$ newton.

What is the work done by this force, in movong the particle trough 5 m along the Y-axis?

A. 12J

B. 15J

C. 18J

D. 20J

Answer: D

Watch Video Solution

153. A position dependent force $F = 7 - 2x + 3x^2$ acts on a small body of mass 2 kg and displaced it from $x = 0$ to $x = 5m$. Calculate the work done in joule.

A. 35

B. 70

C. 135

D. 270

Answer: C

Watch Video Solution

154. A force of $3x^2 - 2x + 5$ acts on a body of mass 5 kg and displaces it from $x = 0$ to $x = 4$m. What is the work done by the force?

A. 42J

B. 55J

C. 68J

D. 84J

Answer: C

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155. The work done in taking a body from the floor to the to of table depends upon

A. the speed of the particle

B. the actual path taken

C. the time taken in this work

D. the heigh of the table

Answer: D

Watch Video Solution

156. 300J of work is done in slinding a 2 kg block up an inclined plane of height 10m. Taking g $=10m/s^2$, work done against friction is

A. zero

B. 100J

C. 200J

D. 1000J

Answer: B

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157. A metre scale of mass 200 g, is lying on a horizontal table. What is the work done by student in making it stand vertically on one of its ends?

A. 2J

B. 1.5J

C. 1J

D. 2.5J

Answer: C

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158. A truck and a car are moving with the same K.E. on a straight road. Their engines are simultaneously switched off. Which one will stop at a lesser distance ?

A. $d_1 = d_2$

B. $d_1 > d_2$

C. $d_1 < d_2$

D. $d_1 = 2d_2$

Answer: C

Watch Video Solution

159. A body of mass 10 kg dropped from a height 20 m, acquires a velocity of 10m/s after a falling through a distance of 20m. What is the work done by the air resistance on the body?

A. 750 J

B. 1000J

C. 1500J

D. 2000J

Answer: C

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160. The displacement (x) and time (t) for particle are related as $t = \sqrt{x} + 3$. What is the work done in te first six sexond of its motion?

A. 3J

B. 4J

C. zero

D. 5J

Answer: C

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161. If W_1, W_2 and W_3 represent the work done in movint a particle from A and B along 3 different paths, 1, 2, and 3 (as shown in the figure) in the gravitational field of a point mass m. Then

A. $W_1 > W_2 > W_3$

B. $W_1 < W_2 < W_3$

C. $W_1 = W_2 = W_3$

D. $W_1 > W_2 < W_3$

Answer: C

View Text Solution

162. A block of mass m is kept on a rough horizontal surface. It is moved through a distance (s) by applyig a force F in the horizontal direction. What is the work done by the normal reaction?

A. $R \times s$

B. zero

C. $-R \times s$

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

Answer: B

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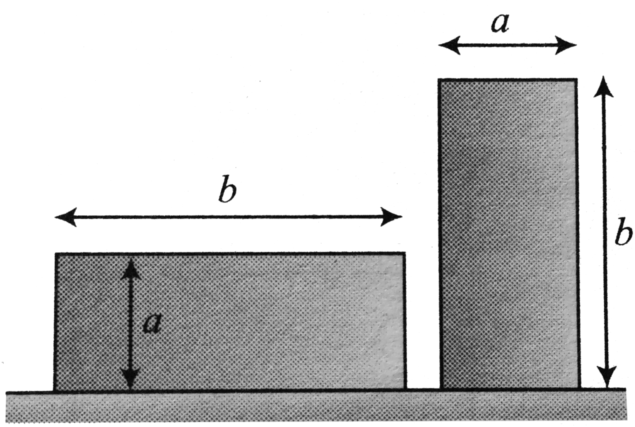
163. A plate of mass m, length b, and breadth a is initially lying on a horizontal floor with length parallel to the floor and breath perpendicular to the floor. Find the work done to erect it on its breadth.



A. $mg\left(\frac{L}{2}\right)$

B. $mg\left(\frac{b}{2}\right)$

C. $mg\left(\frac{L+b}{2}\right)$

D. $mg\left(\frac{L-b}{2}\right)$

Answer: D

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164. A man tries hard to push a loaded truck but fails to move it. In tis case he does

A. negative work

B. postive work

C. zero work

D. maximum +ve work

Answer: C

Watch Video Solution

165. A box of mass 50 k is pulled up on an incline 12 m long and 2m high by a constant force of 100 N from rest. It acquires a velocity of 2m/s on reaching the top. Work done against friction is (Take $g = 10m / s^2$)

A. 50J

B. 100J

C. 150 J

D. 200J

Answer: B

Watch Video Solution

166. A 100 kg elevator rises from rest in the basement to the fourth flor, a distance of 20 m. As it passes the fourth floor its speed is 4m/s. There is a constant frictional force of 500N. The work done by the lifting mechanism is (Take $g = 10m / s^2$)

A. $200 \times 10^3 J$

B. $205 \times 10^3 J$

C. $218 \times 10^3 J$

D. $210 \times 10^3 J$

Answer: C

Watch Video Solution

167. A body of mass 0.5 kg travels in a straight line with velocity $v = 5x^{3/2}$. The work done by the net force during its displacement from $x = 0$ to $x = 2$ m is

A. 50J

B. 45J

C. 25J

D. none of these

Answer: A

Watch Video Solution

168. A body of mass 2 kg, initially at rest, is moved through 3 m along the horizontal by a force of 10 N acting at an angle of 60° with the horizontal. The kinetic energy gained by the body is

A. 15J

B. 20J

C. 25J

D. 30K

Answer: A

Watch Video Solution

169. A 5 kg brick of dimensions $20cm \times 10cm \times 8cm$ is lying on the largest base. It is now made to stand with length vertical. If $g = 10m/s^2$, then the amount of work done is

A. 3J

B. 5J

C. 7J

D. 9J

Answer: A

Watch Video Solution

170. A ball of mass m collides with a wall with speed v and rebounds on the same line with the same speed. If the mass of the wall is taken as infinite, then the work done by the ball on the wall is

A. mv^2

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

C. $2mv$

D. zero

Answer: D

Watch Video Solution

171. A bullet of mass 10 g leaves a rifle at an initial velocit of 1000 m/s and strikes a target at the same level with a velocity of 100 m/s. The work done in joule to overcome the resistance of air will be

A. 5000

B. 3750

C. 500

D. 375

Answer: B

Watch Video Solution

172. A body of mass $3kg$ is under a constant force which causes a displacement s metre in it, given by the relation $s = \frac{1}{3}t^2$, where t is in seconds. Work done by the force in 2 seconds is

A. $\frac{5}{19}J$

B. $\frac{19}{5}J$

C. $\frac{8}{3}J$

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

Answer: C

Watch Video Solution

173. A force acts on a 3.0 gm particle in such a way that the position of the particle as a function of time is given by $x = 3t - 4t^2 + t^3$, where xx is in metres and t is in seconds. The work done during the first 4 seconds is

A. 450 m

B. 490 mJ

C. 570 mJ

D. 528 mJ

Answer: D

Watch Video Solution

174. Under the action of a force a block of mass 2 kg is moved in such a way that its position is given by $x = \frac{t^3}{3}$ metre. What is the work done by the force in the first two second?

A. 8J

B. 12

C. 16J

D. 20J

Answer: C

Watch Video Solution

175. A rain drop of radius 2mm, falls from a height of 500 m above the ground. It falls with decreasing acceleration due to viscous resistance of air until half its original height. It attains its maximum (terminal) speed, and moves with uniform speed there after. What is the work done by the gravitational force on the drop in the first half and second half of its journey ? Take density of water $= 10^3 kg/m^3$. What is the work done by the resistive force in the entire journey if its speed on reaching the ground is $10 ms^{-1}$?

A. $W_1 > W_2$

B. $W_1 < W_2$

C. $W_1 = W_2$

D. $W_1 = \frac{3}{2} W_2$

Answer: C

176. If W_{ac} and W_{ABC} denote the works doen in taking a bdoy of mass m from A to C in the gravitational field via the paths AC and $A \to B \to C$, along a smooth inclined plane.

A. $W_{AC} < W_{ABC}$

B. $W_{AC} t W_{ABC}$

C. $W_{AC} = W_{ABC}$

D. $W_{AC} = \left(\sqrt{L^2 - h^2}\right) W_{ABC}$

Answer: C

View Text Solution

177. The force acting on a bod moving parallel to the X-axis is $F = 3x + 2x^2$. What is the work done in displacing the body from $x = 1$ to $x = 2$?

A. $\frac{65}{6}$ units

B. $\frac{25}{6}$ units

C. $\frac{55}{6}$ units

D. $\frac{35}{6}$ units

Answer: C

Watch Video Solution

178. A uniform chain of length L and mass M is lying on a smooth table and one-third of its length is hanging vertically down over the edge of the table. If g is the acceleration due to gravity, the work required to pull the hanging part on to the table is

A. $\frac{MgL}{18}$

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

C. MgL

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

Answer: A

Watch Video Solution

179. A particle moved from position $\vec{r}_1 = 3\hat{i} + 2\hat{j} - 6\hat{k}$to position $\vec{r}_2 = 14\hat{i} + 13\hat{j} + 9\hat{k}$ undre the action of a force $\left(4\hat{i} + \hat{j} + 3\hat{k}\right)$ newtons . Find the work done .

A. 10j

B. 100

C. 0.01J

D. 1J

Answer: B

Watch Video Solution

180. In one dimensional motin, a 1 kg body experiences a force, which is linear function of time t viz. $F = 2t$ acting in the direction of motion. What is the work done by the force in the first 4 second?

A. 16J

B. 32J

C. 64J

D. 128J

Answer: D

Watch Video Solution

181. A body is being raised to a height h from the surface of earth. What is the sign of work done by

(a) applied force (b) gravitational force ?

A. Positive, Negative

B. Negative, Negative

C. Positive, Positive

D. Negative, Positive

Answer: A

Watch Video Solution

182. When a spring a stretched through a distance x, it exerts a force given by $F = \left(-5x - 16x^3\right)N$. What is the work done, when the spring is stretched from 0.1 m to 0.2 m?

A. $8.1 \times 10^{-1} J$

B. $12.2 \times 10^{-2} J$

C. $12.2 \times 10^{-1} J$

D. $8.1 \times 10^{-2} J$

Answer: D

Watch Video Solution

183. A car moving with a velocity v is stopped within a distance x by applying a retarding force F. If the speed of the car is doubled, then the force required to stop the car with the same distance is

A. 2F

B. 3F

C. 4F

D. $F/4$

Answer: C

184. Two masses of 2 kg and 3 kg are connected at the two ends of a light inxtensible string passing over a frictonless pullye as shown in the figure. Initially the masses are at rest and then they are released. What is the speed of each mass, at the instant, both of them have moved through 50 cm?

A. $1.4m/s$

B. $1.8m/s$

C. $3.2mn/s$

D. $5.5m/s$

Answer: A

View Text Solution

185. A light body and a heavy body have same linear momentum. Which one has a greater kinetic energy ?

A. the heavy body

B. the light body

C. both have equal kinetic energy

D. data given is insufficient

Answer: B

Watch Video Solution

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

A. the heavy body

B. the light body

C. both have equal momentum

D. data given is insufficient

Answer: A

Watch Video Solution

187. Two bodies of masses m and 4 m are moving with equal K.E. The ratio of their linear momentums is

A. $1:1$

B. $1:4$

C. $4:1$

D. $1:2$

Answer: D

Watch Video Solution

188. A bomb of 12 kg explodes into two pieces of masses 4 kg and 8 kg . The velocity of 8 kg mass is 6 m / sec . The kinetic energy of the other mass is

A. 240J

B. 320J

C. 288J

D. 160J

Answer: C

Watch Video Solution

189. Two masses of 1 kg and 9 kg are moving with equal kinetic energies. What is the ratio of the magnitudes of their respective linear momenta?

A. $1:9$

B. $3:1$

C. $9:1$

D. $1:3$

Answer: D

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Watch Video Solution

190. Two masses of 1 kg and 4 kg are moving with equal kinetic energies. What is the ratio of the magnitudes of their momenta?

A. $2:1$

B. $1:2$

C. $1:16$

D. $\sqrt{2}:1$

Answer: B

Watch Video Solution

191. Which one of the following is not a unit of energy?

A. electorn-volt

B. calorie

C. joule

D. watt

Answer: D

Watch Video Solution

192. A ship of mass $3 \times 10^7 kg$ initially at rest, is pulled by a force of $5 \times 10^5 N$ through a distance of 3m. Assuming that the resistance due to water is negligible, the speed of the ship is

A. 0.1 m/s

B. 1.5 m/s

C. 60 m/s

D. 5 m/s

Answer: A

Watch Video Solution

193. A car travelling at a speed of 30 km/hour is brought to a halt in 8 m by applying brakes. If the same car is travelling at 60 km/hour, it can be brought to a halt with the same braking force in

A. 32m

B. 18m

C. 16m

D. 2m

Answer: A

Watch Video Solution

194. A ball of mass $2kg$ and another of mass $4kg$ are dropped together from a 60 feet tall building . After a fall of 30 feet each towards earth , their respective kinetic energies will be the ratio of

A. $\sqrt{2} : 1$

B. $1 : \sqrt{2}$

C. $1 : 2$

D. $1 : 4$

Answer: C

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195. If the momentum of a body is increased by 50%, then the percentage increase in its kinetic energy is

A. 2

B. 1

C. 1.25

D. 0.5

Answer: C

Watch Video Solution

196. If kinetic energy of a body is increased by 300%, then percentage change in momentum will be

A. 1

B. 1.5

C. 0.732

D. 2.5

Answer: A

Watch Video Solution

197. A particle of mass m1 is moving with a velocity v_1 and another particle of mass m_2 is moving with a velocity v2. Both of them have the same momentum but their different kinetic energies are E1 and E2 respectively. If $m_1 > m_2$ then

A. $K_1 < K_2$

B. $K_1 > K_2$

C. $K_1 = K_2$

D. $\frac{K_1}{K_2}$

Answer: A

Watch Video Solution

198. A ball of mass of 500 gram is projected vertically upwards with a speed of 4m/s. What is the maximum gravitational potential energy of the ball?

A. 2.5J

B. 3J

C. 3.5J

D. 4J

Answer: D

Watch Video Solution

199. In an NCC traiign camp, a cadet fired a bullet of mass 50 gram with a speed of 200m/s, on a soft plywood board of thickness 20 mm. It was found that the kinetic energy of the emerging bullet was only 25% of its initial K.E. What is the percentage decrease in the speed of the bullet?

A. 0.25

B. 0.5

C. 0.6

D. 755

Answer: B

Watch Video Solution

200. A constant force of 20N is applied to pull a body of mass 10 k, kept on a smooth horizontal surface. What is the increase in its kinetic energy if the body starts from rest and covers a distance of 5m?

A. 100J

B. 150J

C. 80J

D. 60J

Answer: A

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201. A stone is projected vertically upwards to reac a maximum heiht h. What is the ratio of its kinetic energy to its potential energy at a heigth of $\frac{3}{5}h$?

A. $2 : 3$

B. $4 : 5$

C. $3 : 4$

D. $3 : 2$

Answer: A

Watch Video Solution

202. A spring of force constant $800 N / m$ has an extension of 5cm. The work done in extending it from 5cm to 15cm is

A. 24J

B. 32J

C. 8J

D. 16J

Answer: C

Watch Video Solution

203. A block of mass M moving on a frictionless horizontal surface collides with a spring of spring constant k and compresses it by length L. The maximum momentum of the block after collision is

A. $\frac{ML^2}{k}$

B. zero

C. $\frac{kL^2}{2M}$

D. $\sqrt{Mk}L$

Answer: D

204. A uniform rod of mas m and length l is made to stand at an angle of 60° with the vertical. What is the potential energy of the rod in this position?

A. mgl

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

C. $\frac{mgl}{3}$

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

Answer: D

Watch Video Solution

205. When a long spring is stretched by 2cm, its potential energy is U. If the spring is stretched by 10cm, the potential energy stored in it will be

A. 25U

B. $\frac{U}{25}$

C. $5U$

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

Answer: A

Watch Video Solution

206. Abody of mass of 0.5 kg moving with a speed of 1.5 m/s, on a smooth horizontal surface, colloids with a nearly weightless spring of force constant $K = 50\frac{N}{m}$. The maximum compression of the sprint would be

A. 0.15m

B. 0.25m

C. 0.5m

D. 1.5m

Answer: A

View Text Solution

207. A ball is dropped from a height of 100 m. At the surface of the earth, 20% of its energy is lost. To what height the ball will rise?

A. 80m

B. 20m

C. 40m

D. 60m

Answer: A

Watch Video Solution

208. The kinetic energy of a body of mass 2 kg and momentum of 2 Ns is

A. 1J

B. 3J

C. 2J

D. 4J

Answer: A

Watch Video Solution

209. If a body of mass 3 kg is dropped from the top of a tower, then its kinetic energy after 3 second will be

A. 1296.5J

B. 735J

C. zero

D. 1048J

Answer: A

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210. A body is thrown from a height h with speed, u it hits the ground with speed v

A. the value of v is minimum if the body is thrown horizontally

B. the value of v is maximum if the body is thrown vertically upwards

C. the value of v is maximum if the body is thrown vertically downwards

D. The value of v does not depend on the direction in which it is thrown

Answer: D

Watch Video Solution

211. A body falling with a speed of 2m/s strikes the floor and rebounds with a speed of 1 m/s. The loss of kinetic energy is

A. $12.5\ \%$

B. $50\ \%$

C. $25\ \%$

D. $75\ \%$

Answer: D

Watch Video Solution

212. A block of mass m at rest is acted upon by a force F for a time t. The kinetic energy of block after time t is

A. $\frac{F^2t^2}{2m}$

B. $\frac{2F^2t^2}{m}$

C. $\frac{F^2t^2}{m}$

D. $\frac{F^2t^2}{3m}$

Answer: A

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213. The kinetic energy of a body of mass 5 kg is 100 J. When it is thrown up then the height to which it goes up, is $(g = 10m / s^2)$

A. 5m

B. 1m

C. 2m

D. 10m

Answer: C

Watch Video Solution

214. The decrease in the potential energy of a ball of mass 20 kg which falls from a height of 50 cm is

A. 1980 J

B. 98J

C. 49J

D. 968J

Answer: B

Watch Video Solution

215. If the momentum of a body increases by 0.01%, its kinetic energy will increase by

A. 0.0008

B. 0.0002

C. 0.0004

D. 0.0001

Answer: B

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216. A body of mass 10kg at rest is acted upon simultaneously by two forces 4 N and 3 N at right angles to each other. The kinetic energy of the body at the end of 10 sec is

A. 300J

B. 50J

C. 100J

D. 125J

Answer: D

Watch Video Solution

217. A body swinging on a swing is 1 metre above the ground at the lowest point. He is 2m above the ground at the highest postiion. What is the velocity at the lowest point of the swing?

A. $\sqrt{20}ms^{-1}$

B. $20ms^{-1}$

C. $2ms^{-1}$

D. $1ms^{-1}$

Answer: A

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218. Identify the wrong statement from the following:

A. A body can have energy without momentum

B. Kinetic energy is not conserved in a inelastic collision

C. A body can have momentum without energy

D. The momentum is conserved in an elastic collision

Answer: C

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219. Two bodies of masses 1 kg and 5 kg are dropped gently from the top of a tower. At a point 20 cm from the ground, both the bodies will have the same

A. momentum

B. kinetic energy

C. velocity

D. total energy

Answer: C

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220. A body dropped from a height of 20 m rebounds to a height of 15 m. What is the loss is energy?

A. 0.4

B. 0.3

C. 0.2

D. 0.25

Answer: D

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221. A body is projected vertically upwards with velocity of 10m/s. At a point P in its path, its P.E. and K.E. are equal. What is the height of the point?

A. 2m

B. 4m

C. 5m

D. 6m

Answer: C

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222. A bal is thrown vertically upwards with a velocity of 4 m/s. At what heiht will its K.E. reduce to half its initial value? $\left(g = 10m/^2\right)$

A. 0.1m

B. 0.2m

C. 0.3m

D. 0.4m

Answer: D

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223. The potential energy of a body is given by $U = A - Bx^2$ (where x is the displacement). The magnitude of force acting on the partical is

A. constant

B. proportional to x^2

C. proportional to x

D. inversely proportional to x

Answer: C

Watch Video Solution

224. A ball dropped from a height of 2 m rebounds to a height of 1.5 m after hitting the ground. Then the percentage of energy lost is

A. 0.25

B. 0.3

C. 0.5

D. 0.6

Answer: A

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225. A body of mass $2kg$ is thrown up vertically with kinetic energy of $490J$. If $g = 9.8m/s^2$, the height at which the kinetic energy of the body becomes half of the original value, is

A. 50 m

B. 12.25m

C. 25 m

D. 10 m

Answer: B

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226. A body of mass 4 kg is moving with momentum of $8kgms^{-1}$. A force of 0.2 N acts on it in the direction of motion of the body for 10 s. The increase in kinetic energy is

A. 10

B. 8.5

C. 4.5

D. 4

Answer: C

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227. If K_1 and K_f are the initial and final value of kinetic energy of a body respectively, then the work done by the net force on the body is equal to

A. $\dfrac{K_f K_i}{K_f - K_i}$

B. $K_f + K_i$

C. $\dfrac{K_f + K_i}{2}$

D. $K_f - K_i$

Answer: D

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228. An open water tight railway wagon of mass 5×10^3 kg coasts at initial velocity of $1.2 m / s$ without friction on a railway track. Rain falls vertically downwards into the wagon. What change then occurred in the kinetic energy of the wagon, when it has collected 10^3 kg of water

A. 1200J

B. 300J

C. 600J

D. 900J

Answer: C

Watch Video Solution

229. A stone is projected vertically up to reach maximum height h. The ratio of its potential energy to its kinetic energy at a height $\frac{4}{5}h$, will be

A. $5:4$

B. $4:5$

C. $1:4$

D. $4:1$

Answer: D

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230. A body of mass 5 kg rests on a rough horizontal surface of coefficient of friction 0.2. The body is pulled through a distance of 10 m by a horizontal force of 25 N . The kinetic energy acquired by it is $\left(g = 10ms^2\right)$

A. 200J

B. 150J

C. 100J

D. 50J

Answer: B

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231. A vehicle of mass m is moving on a rough horizontal road with momentum P . If the coefficient of friction between the tyres and the road be μ, then the stopping distance is:

A. $\frac{p}{2\mu mg}$

B. $\frac{p^2}{2\mu mg}$

C. $\frac{p}{2\mu m^2 g}$

D. $\frac{p^2}{2\mu m^2 g}$

Answer: D

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232. A bullet fired into a fixed target loses half of its velocity after penetrating 3 cm . How much further it will penetrate before coming to rest assuming that it faces constant resistance to motion?

A. 1.0cm

B. 1.5cm

C. 2.0cm

D. 3.0cm

Answer: A

Watch Video Solution

233. A particle moves in a straight line with retardation proportional to its displacement. Its loss in kinetic energy for any displacement x is proportional to

A. $\log_e x$

B. x

C. e^x

D. x^2

Answer: D

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234. If the force acting on a body is inversely proportional to its speed, then its kinetic energy is

A. t^2

B. $\sqrt{t}$

C. t

D. t^3

Answer: C

Watch Video Solution

235. A ball falls on the ground from a height of 10m and rebounds to a height of 8m. What is the percentage loss kinetic energy of the ball? $\left(g = 10m/s^2\right)$

A. 0.2

B. 0.3

C. 0.1

D. 155

Answer: A

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236. The $K.E.$ acquired by a mass m in travelling a certain distance d, starting from rest, under the action of a constant force is directly propotional to

A. $\sqrt{m}$

B. $\frac{1}{\sqrt{m}}$

C. m

D. independent of m

Answer: D

Watch Video Solution

237. A child is swinging a swing. Minimum and maximum heights fo swing from the earth's surface are 0.75 m and 2 m respectively. The maximum velocity of this swing is

A. 5m/s

B. 15m/s

C. 10 m/s

D. 20 m/s

Answer: A

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238. A body of mass $1kg$ is thrown upwards with a velocity $20ms^{-1}$. It momentarily comes to rest after attaining a height of $18m$. How much energy is lost due to air friction? $(g = 10ms^{-2})$

A. 20J

B. 10J

C. 30J

D. 40J

Answer: A

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239. A spherical ball of mass 2 kg is stationalry at the top of a hill of height 100 m. It rolls down a smooth surface to the ground, then cilimbs up another hill of height 30 m and finally rolls down on a smooth surface to a horizontal base at a height of 20 m abvoe the ground. What is the final velocity attained by the ball? $\left(g = 10m / s^2\right)$

A. $10\sqrt{30}m/s$

B. $10m/s$

C. $20m/s$

D. $40m/s$

Answer: D

Watch Video Solution

240. A particle is released from height H. At cartain height from the ground its kinetic energy is twice its gravitational potential energy. Find the height and speed of particle at that height.

A. $x = \frac{h}{3}$ and $v = \sqrt{\frac{gh}{3}}$

B. $x = \frac{2h}{3}$ and $v = \sqrt{\frac{2gh}{3}}$

C. $x = \frac{h}{3}$ and $v = 2\sqrt{\frac{gh}{3}}$

D. $x = \frac{2h}{3}$ and $v = \sqrt{2gh}$

Answer: C

Watch Video Solution

241. A bullet is fired at a target with a velocity v. It is found that its velocity decreases from v to $v/2$ when it penetrates 30 cm in the target. Through what thickness it will penetrate further in the targer, before coming to rest?

A. 5 cm

B. 10 cm

C. 15 cm

D. 20 cm

Answer: B

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242. A waterfall whose vertical height is $100m$ discharges water into a pool below the fall. Calculate the rise in temperature of water assuming that all the heat remains in the water. (Specific heat capacity of water $= 4200 J kg^{-1} K^{-1}$)

A. $0.15^{\circ} C$

B. $0.75^{\circ} C$

C. $0.24^{\circ} C$

D. $0.48^{\circ} C$

Answer: C

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243. A body of mass$5kg$ is moving with a momentum of $10kgm/s$. A force of $0.2N$ acts on it in the direction of motion of the body for $10\sec$. The increase in its kinetic energy.

A. 3.8 joule

B. 2.8 joule

C. 3.2 joule

D. 4.4 joule

Answer: D

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244. A vertical spring with force constant k is fixed on a table. A ball of mass m at a height h above the free upper end of the spring falls vertically on the spring , so that the spring is compressed by a distance d. The net work done in the process is

A. $mg(h+d)+\frac{1}{2}kd^2$

B. $mg(h-d)+\frac{1}{2}kd^2$

C. $mg(h-d)-\frac{1}{2}kd^2$

D. $mg(h+d)-\frac{1}{2}kd^2$

Answer: D

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245. From a waterfall, water is falling down at the rate of 100kg / s on the blades of turbine. If the height of the fall is 100 m , then the power delivered to the turbine is approximately equal to

A. 100W

B. 10kW

C. 100kW

D. 20kW

Answer: C

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246. A lift weighing 900 kg is to be lifted at a constant speed of 0.5 m/s. What shoud be the horse power of the motor used for running the lift?

[Use $g = 10m / s^2$ and 1 Horse power $= 750$ watt]

A. 2.5

B. 4

C. 5

D. 6

Answer: D

Watch Video Solution

247. A body is initially at rest. It undergoes one dimensional motion with constant acceleration. The power delivered to it at time t is proportional to

A. $\sqrt{t}$

B. t

C. $t^{3/2}$

D. t^2

Answer: B

Watch Video Solution

248. A motor car needs an engine of 7.5 kilowat to keep it moving with a constant velocity of 72 km/h on a rough horizontal road. What is the force of friction between the tyres of the car and the ground?

A. $1.5 \times 10^3 N$

B. $375N$

C. $650N$

D. $250N$

Answer: B

Watch Video Solution

249. An engine can develop a power of 5kW. How much time it will take to lift a mass of 100 kg to a height of 80 m?

$(g = 10m/s^2)$

A. 5s

B. 10s

C. 12s

D. 16s

Answer: D

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250. A body of mass 1000 kg is lifted up by a crane through a distance 15 min 1 minute. A second crane does the same job in two minute. What is the amount of work done by each crane and what is the ratio of their powers? $(g = 10m/s^2)$

A. $15 \times 10^4 J, 1:2$

B. $15 \times 10^3 J, 2:1$

C. $15 \times 10^4 J, 2:1$

D. $10 \times 10^4 J, 1:2$

Answer: C

Watch Video Solution

251. Water falls from a height of $60m$ at the rate $15kg/s$ to operate a turbine. The losses due to frictional forces are 10% of energy . How much power is generated to by the turbine? (g=10 m//s^(2))`.

A. 8.1 kW

B. 7.0 kw

C. 10.2 kW

D. 12.3 kW

Answer: A

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252. The engine of a water pump develops a power of 5 kW. How much time it will takes to lit 500 litre of water from the bottom of the building to the terrace at a height of 20 m?

$\left[g = 10m / s^2\right]$

A. 8s

B. 12s

C. 16s

D. 20s

Answer: D

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253. A boy climbs up a hill, which rises 1 in every 25, on his bicycle. The mass of the boy and his bicycle is 120 kg. What is the power applied by the body if he is cycling at the rate of 6 km/h hour? (Assume the friction is absent and $g = 10m/s^2$)

A. 80 watt

B. 70 watt

C. 100 watt

D. 120 watt

Answer: A

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254. if a particle F is applied on a body and it moves with a velocity v , the power will be

A. Fv^2

B. F/v

C. Fv

D. $\frac{1}{2}Fv^2$

Answer: C

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255. What is the power of a pump which can pump 300 kg of water to the terrace of a building of height 20m, in 10s?

A. 4kW

B. 5kW

C. 6kW

D. 8kW

Answer: C

Watch Video Solution

256. A car manufacturer claims that his car can be accelerated from rest to a velocity of 10 m/s in 5s. If the total mass of the car and its occupants is 1000 kg, then the average horse power developed by the engine is

A. $\frac{10^3}{746}$

B. $\frac{10^4}{746}$

C. $\frac{10^5}{746}$

D. 8

Answer: B

Watch Video Solution

257. A truck of amss 10 ton is movng up an incline of 1 in 50 with a uniform velocity of 72 km/h. If the resistance opposing the motion of the truck due to friction is 5 kg per ton, the power of the engine is $\left(g = 10m / s^2\right)$

A. 35kW

B. 40kW

C. 45kW

D. 50kW

Answer: D

Watch Video Solution

258. The average work done by a human heart while it beats once is $0.5J$. Calculate the power used by heart if it beats 72 times in a minute.

A. 0.4W

B. 0.6w

C. 0.8W

D. 0.2W

Answer: B

Watch Video Solution

259. A machine gun fires 240 bullets per minute. If the mass of each bullet is 10 g and the velocity of the bullets is $600 ms^{-1}$, then find power (in kW) of the gun.

A. 12

B. 72

C. 7.2

D. 4.32

Answer: C

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260. A body of mass m is acceleratad uniformaly from rest to a speed v in a time T. The instanseous power delivered to the body as a function of time is given by

A. $\frac{1}{2}\frac{mv^2}{T^2}t^2$

B. $\frac{1}{2}\frac{mv^2}{T^2}t$

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

D. $\frac{mv^2}{T^2}t$

Answer: D

Watch Video Solution

261. A man weighing 50 kg, climbs up a staircase carrying a bag of 10 kg on bis head. The staircase has 15 steps and each steps has a height of 20 cm. What is the power required by the man, if he takes 10 seconds to climb the staircase?

A. 120w

B. 150.5W

C. 176.4w

D. 200W

Answer: C

Watch Video Solution

262. An electric pump is used to pump water to fill a water tank of volume $30m^3$ in 20 minute. The pump is on the ground floor and the tank is one the terrace of the building. The centre of the tank is at 400 m above the ground. How much electric power is consumed by the pump, in filling the tank, if the efficiency of the pump is 50%?

$(g = 10m/s^2$ and density of water $= 10^3 kg/m^3)$

A. 100kW

B. 125kW

C. 150kW

D. 200kW

Answer: D

Watch Video Solution

263. Power supplied to a mass $2kg$ varies with time as $P = \frac{3t^2}{2}$ watt. Here t is in second . If velocity of particle at $t = 0 is v = 0$, the velocity of particle at time $t = 2s$ will be:

A. $2m/s$

B. $3m/s$

C. $1.5m/s$

D. $4.5m/s$

Answer: A

Watch Video Solution

264. An engine pumps up 1 quintal of coal from a coal mine 100 m deep in 0.5 seocnd. If its efficienty is 60% then the power of the engine is

(take $g = 10m / s^2$)

A. 250kW

B. 330kW

C. 400kW

D. 70kW

Answer: B

Watch Video Solution

265. A man cycling up a smooth inclne road, climbs the road at a constant spped of 2m/s. The total mass of the man and the cycle is 150 kg and the inclination of the road with the horizonal is 30°. What is the minimum horse power spend by the man?

[Take $g = 10m/s^2$ and 1 horse power $= 750$

watt]

A. 1.25H.P

B. 1.5H.P

C. 2H.P

D. 5H.P

Answer: C

Watch Video Solution

266. A force F acting on a body depends on its displacement S as $F \propto S^{-1/3}$. The power delivered by F will depend on displacement as

A. $S^{-5/3}$

B. $S^{2/3}$

C. $S^{1/2}$

D. S°

Answer: D

Watch Video Solution

267. A car of mass m is driven with acceleration a along a straight level road against a constant external resistive force R. When the velocity of the car V, the rate at which the engine of the car is doing work will be

A. Rv

B. mav

C. $(R + ma)v$

D. $(ma - R)v$

Answer: C

Watch Video Solution

268. A car of mass m has an engine which can deliver power P. The minimum time in which car can be accelerated from rest to a speed v is :-

A. Pmv^2

B. $\dfrac{mv^2}{2P}$

C. $2Pmv^2$

D. mv^2P

Answer: B

Watch Video Solution

269. An elevator can carry a maximum load of $1800kg$ (elevator + passengers) is moving up with a constant speed of $2ms^{-1}$. The friction force opposite the motion is $4000N$.What is minimum power delivered by the motor to the elevator?

A. 24kW

B. 32kW

C. 44kW

D. 52kW

Answer: C

Watch Video Solution

270. The power of a motor pump is 2kW. How much water per minute the pump can raise to a heiht of 10 m ? (Given $g = 10m / s^2$)

A. 100L

B. 1200L

C. 1000L

D. 2000L

Answer: B

Watch Video Solution

271. A car drives along a straight level frictionless road by an engine delivering constant power. Then velocity is directly proportional to

A. t^2

B. t

C. $\sqrt{t}$

D. $\frac{1}{\sqrt{t}}$

Answer: C

Watch Video Solution

272. Water enter in a turbine at a speed of 500 m/s and leaves at 400 m/s. If $2 \times 10^3 kg / s$ of water flows and efficiency is 75% then output power is

A. $6.75 \times 10^7 W$

B. $100kW$

C. $1000kW$

D. $400W$

Answer: A

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273. The coefficient of restitution e for a perfectly elastic collision is

A. 1

B. -1

C. zero

D. infinite

Answer: A

Watch Video Solution

274. Two identical balls A and B having velocity of $0.5 m / s$ and $-0.3 m / s$ 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. -0.3 and $+0.5$ m/s

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

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

Answer: B

Watch Video Solution

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

A. 1 km/h

B. 3km/h

C. 2km/h

D. 4km/h

Answer: A

Watch Video Solution

276. A metal ball of mass 2 kg moving with a velocity of $36km/h$ has a head on collision with a stationery ball of mass 3 kg. If after the collision, the two balls move together, the loss in kinetic energy dur to collision is

A. 40J

B. 100J

C. 60J

D. 140J

Answer: C

Watch Video Solution

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

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

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

C. $+4$ m/s for both

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

Answer: D

Watch Video Solution

278. A bomb of mass $30kg$ at rest explodes into two pieces of mass $18kg$ and $12kg$. The velocity of mass $18kgis6m/s$. The kinetic energy of the other mass is

A. 524J

B. 486J

C. 324J

D. 256J

Answer: B

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

A. 5 kg

B. 3 kg

C. 7 kg

D. 17 kg

Answer: A

Watch Video Solution

280. A body dropped from a certain height strikes the ground and rises to a height of 108 cm , after striking the ground . The Coefficient of restitution is 0.6 . What is the height form which the body was dropped ?

A. 2m

B. 3m

C. 3.5m

D. 4m

Answer: B

Watch Video Solution

281. A ball kept at a height of 5m,, is allowed to tall freely. It hits the ground. The coefficient of restitution is 0.6. What is the time interval between the first and second rebound? ($g = 10m/s^2$)

A. 1s

B. 1.1s

C. 1.2s

D. 1.5s

Answer: C

Watch Video Solution

282. There is a head on collision between two bodies A and B. The mass of A is 5 kg and it is moving with a velocity of 4m/s towards right. The mass of B is 4 kg and it is moving with a velocity of 5m/s in the opposite direction. After collision, they stick together. What is their common velocity after collision?

A. 1 m/s towards left

B. $\frac{5}{4}$ m/s towards right

C. $\frac{4}{5}$ m towards left

D. zero

Answer: D

Watch Video Solution

283. During an elastic collision between two bodies, both of the exert forces on each other. These forces are

A. conservative

B. non conservative

C. nuclear

D. either conservative or non conservative

Answer: A

Watch Video Solution

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

A. only kinetic energy is conserved

B. only linear momentum is consrved

C. neither linear momentum nor kinetic energy is conserved

D. both linear momentum and K.E.are conserved

Answer: B

Watch Video Solution

285. If e is the coefficient of restitution, then which one of the following condition represents a perfectly elastic collision?

A. $e = 0$

B. $e = 0.5$

C. $e = 1$

D. $e = 0.75$

Answer: C

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286. Two masses m_A and m_B moving with velocities v_A and v_B in opposite direction collide elastically after that the masses m_A and m_B move with velocity v_B and v_A respectively. The ratio (m_A / m_B) is

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

B. 1

C. $\frac{V_a + V_b}{V_a - V_b}$

D. $(V_a - V_b)(V_a + V_b)$

Answer: B

Watch Video Solution

287. In an inelastic collision

A. momentum, kinetic energy and total energy are conserved

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

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

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

Answer: D

View Text Solution

288. A bullet of mass a and velocity b is fired into a large block of mass c. The final velocity of the system is

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

B. $\frac{M}{M+\alpha}\alpha$

C. $\frac{m+M}{m}\alpha$

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

Answer: D

Watch Video Solution

289. A body falls on a surface of coefficient of restitution 0.6 from a height of 1 m . Then the body rebounds to a height of

A. 1m

B. 0.4m

C. 0.6m

D. 0.36m

Answer: D

Watch Video Solution

290. A body of mass 2 kg moving with a velocity of 3 m/sec collides head on with a body of mass 1 kg moving in opposite direction with a velocity of 4 m/sec. After collision, two bodies stick together and move with a common velocity which in m/sec is equal to

A. $\frac{3}{4}$ m/s

B. $\frac{1}{4}$ m/s

C. $\frac{2}{3}$ m/s

D. $\frac{1}{3}$ m/s

Answer: C

Watch Video Solution

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

A. 3 km/h

B. 2 km/h

C. 1 km/h

D. 4 km/h

Answer: C

Watch Video Solution

292. A particle is projected with a velocity $200m/s$ at an angle of 60°. At the highest point it explodes into three particle of equal masses. One goes vertically upward with a velocity $100m/s$ the second particle goes vertically downwards at same speed. What is the velocity of the third particle?

A. 120 m/s with 60° angle

B. 200 m/s

C. 300 m/s

D. 200 m/s with 30° angle

Answer: C

Watch Video Solution

293. A billiard ball moving with a speed of $5m/s$ collides with an identical ball, originally at rest. If the first ball stop dead after collision, then the second ball will move forward with a speed of:

A. 1.0 m/s

B. 5 m/s

C. 10 m/s

D. 2.5m/s

Answer: B

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294. A shell of mass m moving with velocity v suddenly breaks into 2 pieces. The part having mass m /4 remains stationary. The velocity of the other shell will be

A. $2v$

B. v

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

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

Answer: D

Watch Video Solution

295. A bullet $(m_1 = 25g)$ is fired with a velocity 400 m/s gets embedded into a bag of sand $(m_2 = 4.975g)$ suspended by a rope. The velocity gained by the bag is

A. 0.2 m/s

B. 3 m/s

C. 4 m/s

D. 2 m/s

Answer: D

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296. A srtone of mass m_1 moving at uniform speed v suddenly explodes into two fragments. If the fragment of mass m_2 is at rest, the speed of the other fragment is

A. $\frac{m_1 v}{(m_1 - m_2)}$

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

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

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

Answer: A

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297. Which one of the following is true?

A. Both momentum and kinetic energy are conserved in all collisions

B. Neither momentum nor kinetic energy is conserved in inelastic collisions

C. Momentum is conserved in all collisions but not kinetic energy

D. Momentum is conserved in all collisions but kinetic energy is conserved only in inelastic collisions.

Answer: C

Watch Video Solution

298. A particle of mass m moving with velocity $\overrightarrow{V}$ makes a head on elastic collision with another particle of same mass initially at rest. The velocity of the first particle after the collision will be

A. $-2\overrightarrow{v}$

B. $\overrightarrow{v}$

C. $-\overrightarrow{v}$

D. zero

Answer: D

Watch Video Solution

299. A bullet of mass m hits a block of mass M. The transfer of energy is maximum when

A. $M' = M$

B. $M' > > M$

C. $M' = 2M$

D. $M' < < M$e

Answer: A

Watch Video Solution

300. A bob A of a simple pendulum is released when the string makes an angle of 45° with the vertical. It hits another bob B of the same material and same mass kept at rest on the table. If the collision is perfectly elastic then

A. B will rise to a height equal to A and A comes to rest

B. B moves first and A follows it with half of its initial velocity

C. both A and B come to rest at B

D. both A and B move with the same velocity of A

Answer: A

View Text Solution

301. A 5 kg stationary bomb explodes in three parts having mass 1:1:3 respectively. Parts having same mass move in perpendicular directions with velocities 30 m/s and 30 m/s. The velocity of the bigger part will be

A. $10\sqrt{2}m / s$

B. $\frac{10}{\sqrt{2}} \frac{m}{s}$

C. $15\sqrt{2}m / s$

D. $\frac{15}{\sqrt{2}} m / s$

Answer: A

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302. Consider the following statements A and B identify the correct choice in the give answers.

a. n a one -dimensional perfectly elastic collision between two moving bodies of equal masses, the bodies merely exhange their velocities after collision.

b.If a lighter body at rest suffers perfectly elastic collision with a very heavy body moving with a certain velocity, after collision both travel with same velocity.

A. A and B are correct

B. Both A and B are wrong

C. A is correct B is wrong

D. A is wrong, B is correct

Answer: C

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303. For inelastic collsion between two spherical rigid bodies

A. the total kinetic energy is conserved

B. the total potential energ is conserved

C. the linear momentum is not conserved

D. the linear momentum is conserved

Answer: D

Watch Video Solution

304. Which of the following is not a perfectly inelastic collision

A. an electron captured by a proton

B. a bullet striking a ball of sand

C. striking of two glass balls

D. a man jumping into a moving cart

Answer: C

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305. A rubber ball is dropped on the ground from a height of 1m. What is the height to which the ball will rebound, if the coefficient of restitution between the ball and the ground is 0.8?

A. 0.5m

B. 0.25n

C. 0.64m

D. 0.8m

Answer: C

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306. Two masses m_A and m_B moving with velocities v_A and v_B in opposite direction collide elastically after that the masses m_A and m_B move with velocity v_B and v_A respectively. The ratio (m_A / m_B) is

A. $\frac{v_a - v_b}{v_a + v_b}$

B. $\frac{v_a + v_b}{v_a - v_b}$

C. 1

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

Answer: C

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307. A particle of mass m moving with a speed v hits elastically another stationary particle of same mass m on a smooth horizontal circular tube of radius r, as shown in figure. The time in which in the next collision will take place is equal to

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

B. $\frac{2\pi r}{v}$

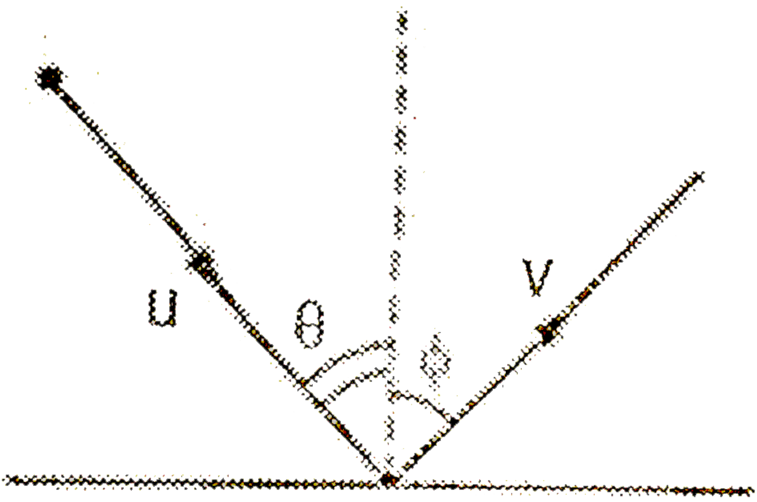
C. $\frac{3\pi r}{2v}$

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

Answer: B

View Text Solution

308. A particle strikes a horizontal frictionless floor with a speed u, at an angle θ to the vertical, and rebounds with a speed v, at an angle ϕ to the vertical. The coefficient of restitution between the particle and the floor is e. The magnitude of v is



A. eu

B. $(1 - e)u$

C. $u\sqrt{e^2 \sin^2 \theta + \cos^2 \theta}$

D. $u\sqrt{\sin^{2( )} \theta + e^2 \cos^2 \theta}$

Answer: D

Watch Video Solution

309. A stationary partical explodes into two partical 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. $\frac{m_1}{m_2}$

B. 1

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

D. $\frac{m_1 v_2}{m_2 v_1}$

Answer: C

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310. A ball A of mass 3 kg and a ball B of mass 4 kg are moving alogn the same straight line with speeds of 7m/s and 5 m/s respectively. They approach each other and collide. What is the speed of B after collision, If the coefficient of restitution is $\frac{3}{4}$?

A. 4 m/s

B. -5 m/s

C. -4 m/s

D. `6m/s

Answer: A

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311. A boy throws a rubber ball vertically downwards. He wants the ball to rebound from the floor and touch the ceiling of the room which is at a height of 5m. The coefficient of restitution is 0.9. With what velocity should the ball strike the floor?

A. 8 m/s

B. 10 m/s

C. 11 m/s

D. 15 m/s

Answer: C

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312. Two spheres of masses 1 kg and 2 kg are moving with velocities of 10 m/s and 5 m/s respectively in the same direction. After the collision the velocity of the lighter sphere decreases by 4 m/s. What is the coefficient of restitution?

A. 0.1

B. 0.15

C. 0.2

D. 0.25

Answer: C

Watch Video Solution

313. A small metal spehre is released from a height of 2m. After striking the ground, it rises to a height of 1.28 m. What is the coefficient of restitution?

A. 0.8

B. 0.6

C. 0.5

D. 0.4

Answer: A

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314. A ball released from a certain height strikes the ground after 2 second. After bouncing from the ground it rises to the highest point in 1 second. What is the coefficient of restitution?

A. 0.3

B. 0.4

C. 0.5

D. 0.6

Answer: C

Watch Video Solution

315. A ball collides impinges directly on a similar ball at rest. The first ball is brought to rest after the impact. If half of the kinetic energy is lost by impact, the value of coefficient of restitution (e) is

A. $\sqrt{2}$

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

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

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

Answer: C

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316. A ball is dropped from a height 'h' on to a floor of coefficient of restitution 'e'. The total distance covered by the ball just before second hit is

A. $h[1+e^2]$

B. he^2

C. $h[1-2e^2]$

D. $h[1+2e^2]$

Answer: D

Watch Video Solution

317. A shell is fires from a cannon with a velocity v at an angle θ with the horiziontal. At the highetst point in its path it explodes into two pieces of equal mass. One of the pieces retraces its path to the canon. What is the speed of the other piece immediately after the explosion?

A. $2v\cos\theta$

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

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

D. $3v\cos\theta$

Answer: D

View Text Solution

318. A particle of mass 4 m which is at rest explodes into three fragments. Two of the fragments each of mass m are found to move with a speed v each in mutually perpendicular directions. The total energy released in the process of explosion is ....

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

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

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

D. $4mv^2$

Answer: A

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319. A body of mass $5m$ initially at rest explodes into 3 fragments with mass ratio $3:1:1$. Two of fragments each of mass $'m'$ are found to move with a speed $60m/s$ in mutually perpendicular direction. The velocity of third fragment is

A. $60\sqrt{2}m / s$

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

C. $10\sqrt{2}m / s$

D. $20sqrst(2)m / s$

Answer: D

Watch Video Solution

320. A ball of mass M falls from a height on a floor for which the coefficient of restitution is

e. The height attained by the ball after two rebounds is

A. $e^2 h$

B. eh^2

C. $e^4 h$

D. h / e^2

Answer: C

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321. A bomb of mass $3.0kg$ explodes in air into two pieces of masses $2.0kg$ and $1.0kg$. The smaller mass goes at a speed of $80m/s$. The total energy imparted to the two fragments is :

A. 1.07kJ

B. 2014kJ

C. 2.4kJ

D. 4.8kJ

Answer: D

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322. A ball of mass m moving with a constant velocity strikes against a ball of same mass at rest. If $e =$ coefficient of restitution, then what will the the ratio of the velocities of the two balls after collision?

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

B. $\frac{e-1}{e+1}$

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

D. $\frac{2+e}{e-1}$

Answer: A

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323. 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

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

B. $\frac{1}{3}$

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

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

Answer: B

Watch Video Solution

324. A ball of mass moving with a velocity u collides head on with a ball B of mass m at rest. If the coefficient of restitution is e. the ratio of final velocity of B to the initial velocity of A is

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

B. $\frac{1+e}{1-e}$

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

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

Answer: C

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325. A block of mass $0.50kg$ is moving with a speed of $2.00m/s$ on a smooth surface. It strikes another mass of $1kg$ at rest and they move as a single body. The energy loss during the collision is

A. $0.67J$

B. $1.00J$

C. $0.16J$

D. $0.34J$

Answer: A

Watch Video Solution

326. The bob a of a simple pendulum of length 1 m, is released from the position X. It hits another bob B of the same mass at rest on a table as shown in the figure. After the collision, A comes to rest. What is the speed with which bob B starts moving? Neglect the size of the bobs and assume that the collisioni is elastic.

A. 5.47m/s

B. 6.47m/s

C. 3.47m/s

D. 4.47m/s

Answer: D

View Text Solution

327. A particle of mass m, collides with another stationary particle of mass M. If the particle m stops just after collision, then the coefficient of restitution for collision is equal to

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

B. $\frac{M-m}{M+m}$

C. 1

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

Answer: A

Watch Video Solution

328. A mass m moving horizontal (along the x-axis) with velocity v collides and stricks to mass of $3m$ moving vertically upward (along the y-axis) with velocity $2v$. The final velocity of the combination is

A. $\frac{v}{4}\hat{i} + \frac{3}{2}v\hat{j}$

B. $\frac{2}{3}v\hat{i} + \frac{v}{3}\hat{j}$

C. $\frac{v}{3}\hat{i} + \frac{v}{4}\hat{j}$

D. $\frac{v}{3}\hat{i} + \frac{2}{3}v\hat{j}$

Answer: A

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329. The dimensional equaltion of torque is

A. $[\tau[=[L^1M^1T^{-2}]$

B. $[\tau]=[L^2M^1T^{-2}]$

C. $[\tau]=[L^2M^2T^2]$

D. $[\tau]=[L^2M^1T^{-1}]$

Answer: B

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330. A water tap can be opperated easily using two fingers because

A. the force by one finger overcomes the friction and the other finger provides the force for operation

B. the force available for operation will be more

C. the rotational effect is produced by the couple formed by the fingers

D. none of these

Answer: C

Watch Video Solution

331. A see-saw of length 6m is pivoted at its centre. A child (A) of mass 20 kg is sitting at one end of the see-saw. Where should anolther child (B) of mass 30 kg, sit, so that the see saw is balanced?

A. 1m

B. 1.5m

C. 2 m

D. 2.5 m

Answer: C

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332. A metre scale is supported on a wedge at its centre of gravity. A body of weight w is suspended from the 15 cm mark and another weight of 30 gram suspended from 71 cm mark balances it the metre scale remains perfectly horizontal. What is the weight of the body? Neglect the weight of the centre scale.

A. 15 gram wt

B. 18 gram wt

C. 20 gram wt

D. 25 gram wt.

Answer: B

Watch Video Solution

333. A metre scale is balanced on a knife edge at its centre. When a coin of mass 15 g is kept at the 12 cm mark, the scale is found to be balanced at 45 cm. What is the mass of the metre scale?

A. 33 gr

B. 99 gr

C. 66 gr

D. 45 gr

Answer: B

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334. Two equal and opposite parallel forces, each of magnitude 40 N form a couple. The magnitude of the couble is 100 Nm. What is the perpendicular distance between their lines of action?

A. 2m

B. 2.5m

C. 3m

D. 3.5m

Answer: B

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335. A force of 100N is applied tangentially to the rim of a wheel of diameter 120 cm. The wheel rotates about an axis passing through its centre. What is the torque acting on the wheel?

A. 40 Nm

B. 50 Nm

C. 60 Nm

D. 70 Nm

Answer: C

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336. A horizontal beam is pivoted at O as shown in the figure. What is the value of the mass m to make the beam horizontal?

A. 2kg

B. 1kg

C. 4kg

D. 2.5kg

Answer: C

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337. A uniform metre scale is balanced horizontally on a knife edge at a distance of 10 cm from its centre of gravity, when masses of

50 gm and 30 g are suspended from the 5 cm and 90 cm marks of the rod. What is the weight of the rod?

A. 20 gram weight

B. 25 gram weight

C. 40 gram weight

D. 10 gram weight

Answer: B

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338. Two children weighing 15 kg, wt and 25 kgwt. sit at the ends of a see-saw, pivoted at its centre. The see-saw is 4 m long. Where should a third child, weighing 20 kg wt. sit, in order to balance the see-saw? (Neglect the weight of the see-saw)

A. 1.5 m from A

B. 1 m from A

C. 1.25 m from A

D. 0.75 m from A

Answer: B

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339. A force $\overrightarrow{F} = \left(\hat{i} + 3\hat{j}\right)N$ acts on a body at a point P, which is at a distance given by $\overrightarrow{r} = \left(3\hat{i} + \hat{j}\right)m$ from the axis of rotation. What is the direction of the torque acting on the body?

A. Positive X axis

B. Positive Y axis

C. Positive Z axis

D. Negative Z axis

Answer: C

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340. Three bodies of masses 3kg, 2kg and 1 kg kept at points $\left(3\hat{i}+2\hat{j}\right),\left(5\hat{j}+\hat{k}\right)$ and $\left(2\hat{i}+\hat{k}\right)$ respectively. Then the position vector of their centre of mass is given by

A. $\vec{R}_{cm} = \frac{11\hat{i}}{6} + \frac{3}{8}\hat{j} + 2\hat{k}$

B. $\vec{R}_{cm} = \frac{11\hat{i}}{6} + \frac{8}{3}\hat{j} + \frac{\hat{k}}{2}$

C. $\vec{R}_{cm} = \frac{7\hat{i}}{6} + \frac{5}{8}\hat{j} + 2\hat{k}$

D. $\vec{R}_{CM} = \frac{11\hat{i}}{6} + \frac{8}{5}\hat{j} + 3\hat{k}$

Answer: B

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341. A body has its centre of maas at the origin. The x-coordinates of the particles

A. all positive

B. al negative

C. zero

D. positive for some particles and negative for some particles

Answer: D

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342. The centres of three spherical masses of 1 kg, 2 kg and 3 kg have co-orinates (4,0) m, (0,3)m and (-2,5)m respectively. What is the position vector of its centre of mass is terms of its x and y co-ordinates?

A. $\overrightarrow{R}_{cm} = 2\hat{i} + 3\hat{j}$

B. $\overrightarrow{R}_{cM} = \frac{1}{3}\hat{i} + \frac{5}{2}\hat{j}$

C. $veR_{cm} = \equiv -\frac{1}{3}\hat{i} + 3.5\hat{j}$

D. $\overrightarrow{r}_{cm} = \frac{2}{3}\hat{i} - \frac{5}{3}\hat{j}$

Answer: C

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343. Three particles of masses $m_1 = 1kg, m_2 = 2kg$ and $m_3 = 3kg$ are kept at the vertices of an equilateral triangle of side 1 m. What is the x co-ordinate of its centre of mass?

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

B. $\frac{4}{5}m$

C. $\frac{6}{7}m$

D. $\frac{7}{12}m$

Answer: D

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344. The front wheels of a truck together support 1000N and its rear wheels together support 15000N. The distance between the axies is 4m. At what distance behind the front axle, the centre of gravity of the truck is situated?

A. 2.5m

B. 3m

C. 3.25m

D. 3.75m

Answer: D

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345. Centre of mass is point

A. which is the orign of refernece frame

B. which is the geometric centre of a body

C. where the whole mass of the body is supposed to be centred

D. from which distances of all particles are the same

Answer: C

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346. Three identical metal balls each of radius r are placed touching each other on a horizontal surface such that an equilateral triangle is formed, when the center of three balls are joined. The center of mass of system is located at the

A. centre of one of the balls

B. line joining centres of any two balls

C. horizontal surface

D. point of intersection of medians

Answer: D

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347. Which is the correct statement about the centre of gravity and centre of mass?

A. Centre of mass changes but centre of gravity always remains the same

B. Centre of gravity changes as one goes away from the earth but centre of mass remains the same

C. they are always at the same point

D. none of these

Answer: B

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348. The centre of mas of a system

A. is always at its geometrical centre

B. is always somewhere inside it

C. is always outside it

D. may be inside or outside it

Answer: D

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349. A system consisting of two masses connected by a massles rod, lies along the X axis. A body of mass 0.4 kg is kept at a distnce $x = 2m$ and another body of mass 0.6 kg is kept at the distance $x = 6$ m from the origin.

What is the x-coordinate of the centre of mass?

A. 3m

B. 4m

C. 4.5m

D. 4.4m

Answer: D

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350. The motion of the centre of mass is the result of

A. Attractive forces

B. Repulsive forces

C. External forces

D. Internal forces

Answer: C

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351. The center of mass of a system of two particles divides the distance between them.

A. in direct ratio of their masses

B. in inverse ratio of their masses

C. in inverse ratio of the squares of their masses

D. in direct ratio of the squares of their masses

Answer: B

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352. A system consists of 3 particles each of mass 'm' are located at (1, 1) (2, 2) and (3, 3). The co-ordinates of the centre of mass are

A. (1,1)

B. (2,2)

C. (3,3)

D. (4,4)

Answer: B

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353. Two bodies of mass $1kg$ and $3kg$ 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 vector.

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

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

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

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

Answer: A

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354. Five the masses are placed in a plane as shown in the figure. The co-ordinates of the centre of mass are nearest to

A. 1..2,1.4

B. 1.3,1.1

C. 1.15,1.25

D. 1.1,1.1

Answer: C

View Text Solution

355. A metre scale is balanced on a knife edge at its centre. When a mass of 10 kg is kept at the 12 cm mark, the scale is balanced at 45 cm. What is the mass of the metre scale?

A. 56 g

B. 76 g

C. 86 g

D. 66 g

Answer: D

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356. Consider a sytem of two particles 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 would the particle of mass m_2 move so as to keep the mass centre of particles at the original position?

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

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

C. $\sqrt{m_1 m_2}x$

D. $(m_1 + m_2 x$

Answer: A

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357. You are given a U shaped uniform wire ABCD of slides of length, L,2L and L as shown in the figure. Let m, 2m and m be the masses of the sections AB,BC and CD respectively. What are the x and y co-ordinates of the centre of mass of wire?

A. (L,L)

B. $\left(\frac{L}{4}, L\right)$

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

D. $\left(L, \frac{L}{4}\right)$

Answer: B

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358. Consider a system of two spheres of masses 5 kg and 25 kg. The distance between their centres is 1.2 m. What is the distance of their centre of mass from the centre of the sphere of mass 5 g?

A. 0.5m

B. 0.6m

C. 08m

D. 1m

Answer: D

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359. Two homogeneous spheres P and Q of different materials and masses 1 kg and 2 kg are kept in contact. The radii of A and B are 20 cm and 10 cm respectively. What is the distance of their centre of mass from the centre of A?

A. 0.1m

B. 0.15m

C. 0.2m

D. 0.25m

Answer: C

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360. Two spheres A and B of masses 500 g and 10 kg are connected by a light rod of length 21 m. What is the position of the centres of mass? [Treat the spheres as particles]

A. At 10 m from A

B. At 15 m from A

C. At 20 m from A

D. At 5 m from A

Answer: C

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361. A coolie pushes a box on a railway platform, having a rough surface. He applies a force F over a distance of 20 m as show in the graph. What is the done by the coolie?

A. 2000J

B. 1750 J

C. 2250 J

D. 1500J

Answer: B

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362. Four forces produced by strings are aciong at a point P, as shown in the figure. What are magnitude of the forces F_1 and F_2. If P is at rest?

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

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

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

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

Answer: C

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363. The magnitude of the force (in newton) acting on a body varies with time t (in micro - second) as is shown in the figure. AB,BC and CD are straigt line segments. The magnitude of total impulse of the force on the body from

$t = 4ms$ and $t = 16\mu s$ is

A. $\frac{1}{500} Ns$

B. $5000 Ns$

C. $5 Ns$

D. $5 \times 10^{-3} Ns$

Answer: D

View Text Solution

364. A 10 kg block moves in a straight line on a horizontal frictionless surface under the influenece of force that varies with position as shown in the figure. The work done by the force as it moves from the orign to a point $x = 10$ m is

A. $-10J$

B. $30J$

C. $22J$

D. $5J$

Answer: B

View Text Solution

365. Figure 1 and 2 give (x, t), (y, t) diagrams of a body of mass 0.5 kg moving in 2 dimensions.

What is the force acting on the body?

A. 0.5 N along x-axis

B. 1 N along y-axis

C. 0.5 along y-axis

D. 1 N along x-axis

Answer: B

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366. A particle is acted by a force $F = kx$, where k is a +ve constant. Its potential energy at $x = 0$ is zero. Which curve correctly represents the variation of potential energy of the block with respect to x?

A. 1

B. 2

C. 3

D. 4

Answer: D

View Text Solution

367. The figure shows the position time (x-t) graph of onc-dimensional motion of body of mass 0.4 kg. The magnitude of each impulse is

A. 0.2Ns

B. 0.4Ns

C. 0.8Ns

D. 1.6Ns

Answer: C

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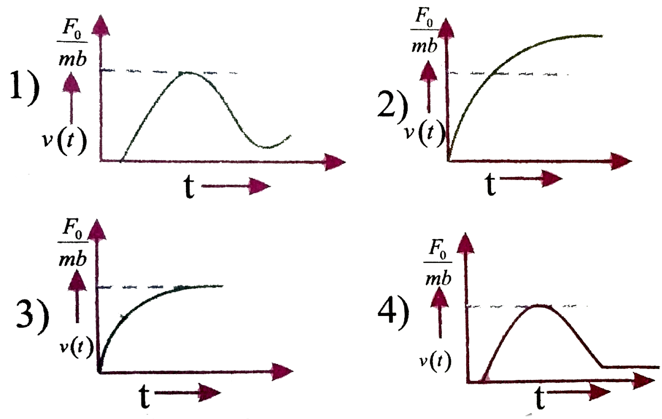
368. A particle of mass m is at rest at the origin at time $t=0$ It is subjected to a force $F(t)=F_0 e^{-bt}$ in the X-direction. Its speed $V(t)$ is depicted by which of the following curves



A.

B.

C.

D.

Answer: B

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369. A force time graph for the linear motion of a particle is as shown in the figure. What is the change in linear momentum of the particle between 0 and 8 second?

A. $-2\pi N - S$

B. $4\pi N - S$

C. Zero

D. $-4\pi N - S$

Answer: C

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370. A body of mas 5 kg is acted upon by a force F which varies with time t as shown in the figure. The momentum gaind by the body at the end of 10 seconds is

A. 0 kg m/s

B. 40 kg m/s

C. 100 kgm/s

D. 140 kgm/s

Answer: D

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371. Figure I, II III and IV represent the variation of force with time.

The impulse is highest in the case of situations depicted in figure

A. IV

B. II

C. III

D. I

Answer: C

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372. Force is applied to a body of mass 2 kg at rest on a friction horizontal surfaces as shown in the (F-t) graph. What is the speed of the body after Is?

A. 7.5 m/s

B. 12.5 m/s

C. 15 m/s

D. 10 m/s

Answer: A

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373. The position time graph of a particle of mass 50 gram is as shown in the figure. What is the impulse at $t = 2s$?

A. -0.2 kgm/s

B. -0.1 kgm/s

C. $+0.1$ kgm/s0.5 kgm/s

D.

Answer: B

View Text Solution

374. A force is applied to pull a block kept on a smooth horizotnal surface. The force time graph for its motion is as shown in the figure.

Then the find the wrong conclusion from the following

A. At O the block is at rest

B. The force is constant along AB

C. along OA the acceleration is constant

D. The block stops after time $t = OC$

Answer: C

View Text Solution

375. The figure below shows the force displacement grapoh of a moving body. What is the work done in displacing the body from $x = 0$ to $x = 35m$?

A. 200J

B. 50J

C. 250J

D. 25J

Answer: C

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376. Which one of the following physical quantities is represented by the shaded area in given graph?

A. impulse

B. power

C. torque

D. work done

Answer: D

View Text Solution

377. A force F acting on an object varies with distance x as shown in the figure. The force is in N and x is in m. What is the work done by the force in moving the object from $x=0$ to $x=6$ m?

A. 18.0J

B. 13.5J

C. 4.5J

D. 9.0J

Answer: B

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378. A body of mass 0.1 kg is subjected to a force which varies with distance as shown below.If it starts its journey from rest at $x = 0$

its velocity at $x = 12m$ is

A. $20\sqrt{2}m/s$

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

C. $0m/s$

D. $40m/s$

Answer: D

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379. The work done by a force acting on a body is as shown in the graph. What is the total doen in covering an initial distance of 20 m?

A. 400J

B. 200J

C. 175 J

D. 225 J

Answer: B

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380. If the distance is plotted on the x-axis and kinetic energy is plotted on the y-axis, then the slope of the graph so obained is proportional to

A. Distance

B. kinetic energy

C. velocity

D. acceleration

Answer: D

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381. Consider a rubber ball freely falling from a height $h = 4.9m$ onto a horizontally elastic plate. Assume that the duration of collision is negligible and the collisions with the plate is totally elastic .

Then the velocity as a function of time and the height as a function of time will be :

A.

B.

C.

D.

Answer: C

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Test Your Grasp

1. A ball of mass 500 gram strikes a wall with a velocity of 80 m/s and rebounds with the same velocity. If the tme of contact is 1/30 sec, then the force exerted by the ball on the wall is

A. 2000 N

B. 2200 N

C. 2400 N

D. 2500 N

Answer: C

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2. A spring balance is attached to the ceiling of a lift. A man hangs his bag on the spring and the spring reads 49N, when the lift is stationary. If the lift moves downward with an acceleration of $5m/2^2$, the reading of the spring balance will be

A. 15 N

B. 49 N

C. 24 N

D. 74 N

Answer: C

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3. Liquid fuel is burnt in a rocket and its exhaust gas is rejected from its tail at a velocity of $10km/s$. The force acting on the rocket is $2 \times 10^4 N$. At what rate the liquid fuel is burnt?

A. 1.5 kg /s

B. 2 kg/s

C. 2.5 kg /s

D. 3 kg /s

Answer: B

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4. Two masses $m_1 = 5kg$ and $m_2 = 4.8kg$ tied to a string are hanging over a light friction less pulley. What is the acceleration of the massess when the system is free to move ?

A. $9.8 m / s^2$

B. $0.2 m / s^2$

C. $4.8 m / s^2$

D. $5 m / s^2$

Answer: B

View Text Solution

5. A particle constrained to move along the Y axis of a coordinate system in subject to a constant force .

$\overrightarrow{F} = \left(5\hat{\imath} + 4\hat{\jmath} + 3\hat{k}\right)$ newton.

What is the work done by this force is moving the particle throught 5 m along the Y axis ?

A. 12 J

B. 15 J

C. 18 J

D. 20 J

Answer: D

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6. A light body and a heavy body have same linear momentum. Which one has a greater kinetic energy ?

A. the heavy boby

B. the light body

C. both have equal kinetic energy

D.

Answer: B

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7. An electric pump is used to pump water to fill a water tank of volume $30m^3$ is 20 minute. The pump is on the ground floor and the tank is on the terrace of the builiding. The centre of the tank is at 40 m above the ground . How much electric power is consumed by the pump, in filing the tank , if the efficiecy of the pump is 50 ?

$(g = 10m/s^2$ and density of water $10 =^3 kg/m^3)$

A. 10 kW

B. 12.5 kW

C. 15 kW

D. 20 KW

Answer: D

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8. A body dropped form a certain height strikes the ground and rises to a height of 108 cm , after striking the ground . The Coeffiednt of restitution is 0.6 . What is the height form which the body was dropped ?

A. 2 m

B. 3 m

C. 3.5 m

D. 4 m

Answer: B

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9. A metre scale is supported on a wedge at its centre of gravity. A body of weight w is suspended from the 15 cm mark and another weight of 30 gram suspended from 71 cm mark balances it the metre scale remains perfectly horizontal. What is the weight of the body? Neglect the weight of the centre scale.

A. 15 gram wt.

B. 18 gram wt.

C. 20 gram wt.

D. 25 gram wt.

Answer: B

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10. A force $\overrightarrow{F}=\left(\hat{i}+3\hat{j}\right)N$ acts on a body at a point P , which is at a distance , give by $\overrightarrow{r}=\left(3\hat{i}+\hat{j}\right)$ m form the axis of rotation . What is the direction of the torque acting on the body ?

A. Positive X axis

B. Positive Y axis

C. Positive Z axis

D. Negative Z axis

Answer: C

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