PHYSICS

BOOKS - MODERN PUBLICATION PHYSICS (KANNADA ENGLISH)

WORK , POWER , ENERGY AND COLLISIONS

Multiple Choice Questions Level I

1. A body of mass 2 kg is thrown vertically with K.E. 490 J. Taking $g = 10m/s^2$. The height at which K.E. is reduced to half will be :

A. 10 m

B. 12.25 m

C. 20 m

D. 25 m

Answer: b

Watch Video Solution

2. A body acted upon by a variable force F = 3 +0.5.x. Work done in moving the body from x=0 to x = 4m is:

A. 8 J

B. 32 J

C. 24 J

D. 16 J

Answer: d

Watch Video Solution

3. A force of 200N is required to move a body with a velocity of 20 ms. The power developed is :

A. 100 walls

B. 500 walls

C. 1000 walls

D. 4000 walls

Answer: d

Watch Video Solution

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

A. $m_1 : m_2$

B. $m_2 : m_1$

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

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

Answer: c

Watch Video Solution

5. A bomb of 12 kg explodes into two parts 4 kg and 8 kg. The velocity of 8 kg mass is 6 ms^{-1}.The the other is :

A. 4.8 J

B. 288 J

C. 48 J

D. 24 J

Answer: b

View Text Solution

6. A coolie lifts a box and walks on horizontal smooth surface, the work done by him against gravity is :

A. Zero

B. Product of weight and distance travelled

C. Product of weight and height of the box

D. None of these

Answer: a

Watch Video Solution

7. A long spring is stretched by 2 cm having potential energy as V. If the spring is stretched by 10 cm, the potential energy would be

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

B. 5u

C. 10u

D. 25u

Answer: d

Watch Video Solution

8. A body is under the action of a force 5 newton moves through 10 m in a straight line. If work done is 25 joule, what is the angle at which force acts with the direction of motion ?

A. Zero

B. 30°

C. 90°

D. 60°

Answer: d

Watch Video Solution

9. Under the action of a constant force, a 2 kg body moves such that its position along X-axis is given by $x = \frac{t^2}{3}$ where x is in metres and in seconds and x is function time. The work done in 2 sec is:

A. 1.6 J

B. $\frac{16}{9} J$

C. $\frac{9}{16} J$

D. 160 J

Answer: b

Watch Video Solution

10. The momentum of body decreases by 20% The percentage decrease in kinetic energy of the body is :

A. 0.36

B. 0.24

C. 0.12

D. None of these

Answer: a

Watch Video Solution

11. Given the displacement of the body as x = (2t^4 + 5)m and mass is 2 kg. What is the increase in K.E. in one second :

A. 8 J

B. 16 J

C. 32 J

D. 64 J

Answer: d

Watch Video Solution

12. A chain is placed on smooth table with $\frac{1}{4}$th of its length hanging over the edge. If the length is 2 m and weight is 4 kg, the energy needed to pull it back to the surface of table is $\left(g = 10ms^{-2}\right)$:

A. 0.25 J

B. 2.5 J

C. 25 J

D. 50 J

Answer: b

Watch Video Solution

13. Two bodies and having masses in the ratio of 1:4 have K.E. in the ratio of 4: 1. The ratio of linear momentum of P&Q is :

A. $1:4$

B. $1:2$

C. $1:1$

D. $1:16$

Answer: c

 Watch Video Solution

14. If two electrons are forced to come closer to each other, the P.E. of the system of 2 electrons will:

A. Becomes zero

B. Increases

C. Decreases

D. Becomes α

Answer: b

Watch Video Solution

15. A ball moving with speed u collides with an identical ball at rest. The velocities of two balls after collision are (If the collision is elastic):

A. (0,v)

B. $\left(\frac{v}{2}, \frac{v}{2}\right)$

C. (v,0)

D. (-v,0)

Answer: a

Watch Video Solution

16. The momentum of a body is p. and its K.E. is E. If its momentum, becomes 2p its K.E. will be

A. $\frac{€}{2}$

B. E

C. E

D. 4E

Answer: d

Watch Video Solution

17. If the linear momentum of a body is increased by 50% then the kinetic energy of that body increases by

A. 0.5

B. 1

C. 1.25

D. 0.25

Answer: c

 Watch Video Solution

18. Under the action of a constant force, a 2 kg body moves such that its position along X-axis

is given by $x = \frac{t^2}{3}$ where x is in metres and in seconds and x is function time. The work done in 2 sec is:

A. 1600 J

B. 169 J

C. 16 J

D. 1.6 J

Answer: c

Watch Video Solution

19. A machine which is 75 % efficient uses 12 J of energy lifting up a 1 kg mass through a certain distance . The mass is then allowed to fall through that distance. What will be its velocity at end of fall:

A. $\sqrt{24}m/s$

B. $\sqrt{32}m/s$

C. $\sqrt{18}m/s$

D. $\sqrt{19}m/s$

Answer: c

Watch Video Solution

20. A ship of mass 3×10^7 kg at rest is pulled by a force of 5×10^4 N through a distance of 3m. Neglecting water resistance, the speed of ship is:

A. 1.5 m/sec

B. 16 m/sec

C. 0.1 m/sec

D. 5 m/sec

Answer: c

Watch Video Solution

21. A car travelling at the speed of 30 km/hr brakes and is brought to halt in 8m.If the same car is travelling at 60 km/hr, then it can be brought to rest with the same breaking power in:

A. 5 m

B. 15 m

C. 24 m

D. 32 m

Answer: d

Watch Video Solution

22. The resistance offered by the stream of water on motor boat moving with uniform velocity of $30m\,\sec^{-1}$ is 5000 N. The power of motor boat is:

A. 1.50 kw

B. 15 kw

C. 1.5 kw

D. 150 kw

Answer: d

 Watch Video Solution

23. The air resistance for a particular vehicle is proportional to square of its velocity. The ratio

of power required at 40 km/hr to that reqd.at 80 km/hr is:

A. $1:1$

B. $1:2$

C. $1:4$

D. $1:8$

Answer: d

Watch Video Solution

24. A bomb of mass 9 kg explodes into two pieces of mass 3 kg and 6 kg. The velocity of mass 3 kg is $16ms^{-1}$ The K.E. of mass 6 kg is:

A. 96 J

B. 192 J

C. 354 J

D. 768 J

Answer: b

Watch Video Solution

25. A spring is hanging from a rigid support. A force of 2000 dynes applied verticlly downwards at the lower end of the spring, extends it by 5 cm. The work done is given by:

A. 5×10^3 erg

B. 5×10^4 erg

C. 10^6 erg

D. 1 Joule

Answer: a

Watch Video Solution

26. The enrgy The energy reqduired to accelerate a car from 10 m/s to 20 m/s compared with that required to accelerate from 0 to 10 m/sec in the same interval of time overcoming same resistance is :

A. twice

B. 4 times

C. 3 times

D. same

Answer: c

Watch Video Solution

27. The P.E. of a spring is E_P when is stretched through 1cm. When stretched through 2 cm, ils P.E. is

A. E_P

B. $2E_P$

C. $3E_P$

D. $4E_P$

Answer: d

Watch Video Solution

28. The power of motor pump is 2 KW. The water raised by the pump per minute to a height of 10 m. is nearly :

A. 500 kg

B. 7000 kg

C. 1200 kg

D. 0

Answer: c

Watch Video Solution

29. A person weighing 30 kg walks on a level platform with a speed of 2 m/sec. The work done by the person against force of gravity is:

A. Zero

B. 2 ergs

C. 60 ergs

D. 60 Joules

Answer: a

Watch Video Solution

30. A body of mass 1 kg strikes elastically with another body at rest and continues to move in the same direction with one fourth of its initial velocity. The mass of other body is :

A. 3 kg

B. 0.6 kg

C. 2.4 kg

D. 4 kg

Answer: b

Watch Video Solution

31. A uniform chain of length L and mass m is lying on a smooth table. One third of its length is hanging verti cally down over the edge of the table. How much work need to be done to pull the hanging part back to the table ?

A. mgl/25

B. mgl/50

C. mgl/5

D. mgl/10

Answer: b

Watch Video Solution

32. A metre stick of mass 400 gm is pivoted at one end and displaced through an angle of 60°. The increase in its P.E. is:

A. 1 Joule

B. 10 J

C. 100 J

D. 1000 J

Answer: a

Watch Video Solution

33. A body of mass m at rest gets exploded into 3 parts, having masses in the ratio 1: 1:3. Its two parts having equal masses move at

right angles to each other with 15 m/s each. The velocity of third is:

A. $5\sqrt{2}ms^{-1}$

B. $5ms^{-1}$

C. $10\sqrt{2}ms^{-1}$

D. $\sqrt{2}ms^{-1}$

Answer: a

Watch Video Solution

34. A neutron with velocity v suffers head on elastic collision with the nucleus of an atom of mass number A at rest. The fraction of energy retained by neutron is

A. $\left(\frac{A+1}{A}\right)^2$

B. $\left(\frac{A+1}{A-1}\right)^2$

C. $\left(\frac{A-1}{A+1}\right)^2$

D. $\left(\frac{A-1}{A}\right)^2$

Answer: c

Watch Video Solution

Watch Video Solution

35. A motor has an electrical input of 30 kJ and is used to raise 100 kg load to a height of 25 m when fitted to a crane winch. What is the efficienty of winch ?

$\left(g = 10ms^{-1}\right)$

A. 0.0075

B. $83.5\ \%$

C. 0.75

D. $17.5\ \%$

Answer: b

Watch Video Solution

36. A boy and a man carry a uniform rod of length L,horizontally in such a way that the boy gets $\frac{1}{4}$th of the load. If the boy is at one end, the distance of the man from the other end is :

A. L/4

B. L/3

C. 2 L/3

D. 2 L/4

Answer: b

Watch Video Solution

37. A body is moved along a straight line by a machine delivering constant power, the distance moved by the body in time in proportional to :

A. $t^{1/2}$

B. $t^{3/4}$

C. $t^{3/2}$

D. t^2

Answer: c

Watch Video Solution

38. A uniform chain of length L and mass m is lying on a smooth table. One third of its length is hanging verti cally down over the

edge of the table. How much work need to be done to pull the hanging part back to the table ?

A. mgl/25

B. Mgl/3

C. Mgl/9

D. Mgl/18

Answer: d

Watch Video Solution

39. A rifle bullet loses th of its velocity in passing through a plank. The least number of planks required just to stop the bullet is :

A. 10

B. 11

C. 5

D. 15

Answer: b

View Text Solution

40. A ball is dropped from a height 'h'. If the coefficient of restitution is 'e', the height to which the ball rise after the nth rebound is:

A. $h.\ e^n$

B. $h\ /\ e^{2n}$

C. $e^{2n}\ /\ h$

D. $h.\ e^{2n}$

Answer: d

Watch Video Solution

41. A block of mass 2 kg is dropped from a height of 0-4 mon a spring whose force constant is 1960 N/m. What will be the maximum distance x of the compression of the spring ?

A. 0.5 m

B. 0.1 m

C. 0.01 m

D. 1 m

Answer: b

Watch Video Solution

42. If P.v and E denotes the momentum velocity and K.E. of a particle then

A. $p = \frac{dE}{dt}$

B. $p = \frac{dv}{dt}$

C. $p = \frac{dE}{dv}$

D. $p = \frac{d^2E}{dt^2}$

Answer: c

Watch Video Solution

43. A body is dropped from a certain height. At the instant it loses P.E.U. It acquires a velocity 'v' the mass of the body is :

A. $U^2 / 2V$

B. $2V / U$

C. $2V / U^2$

D. $2U / V^2$

Answer: d

Watch Video Solution

44. A simple pendulum of length 1 m has a bob of 200 g suspended to a fixed point. It is displaced through 60° and then released. What is K.E. when its inclination is 30° with the vertical ? $\left(g = 10ms^{-2}\right)$

A. 0.73 J

B. 1 J

C. 0.54 J

D. 1.73 J

Answer: a

Watch Video Solution

45. A bullet moving with a speed of $150ms^{-1}$ strikes a wooden plank. After passing through the plank its speed becomes $125ms^{-1}$. Another bullet of the same mass and size strikes the plank with a speed of $90ms^{-1}$. Its speed after passing through the plank would be:

A. $50ms^{-1}$

B. $35ms^{-1}$

C. $25ms^{-1}$

D. $70ms^{-1}$

Answer: b

Watch Video Solution

46. A bullet of mass 10g strikes a fixed target and penetrates 8 cm into it before coming to rest. If the average force of resistance offered

by the target is 100 N with what velocity does it strike ? :

A. $10ms^{-1}$

B. $20ms^{-1}$

C. $30ms^{-1}$

D. $40ms^{-1}$

Answer: d

Watch Video Solution

47. A pendulum bob of mass 5×10^{-2} kg is raised to a height of 5×10^{-2} m and then released. At the bottom of its swing it picks up a mass 10-kg and sticks to it. To what height the combined mass rise

A. 0.24 m

B. 0.48 m

C. 0.96 m

D. 1.44 m

Answer: b

View Text Solution

48. A body of mass 5 kg moves along X-axis with $2ms^{-1}$ A second body of mass 10 kg moves along y-axis with velocity $\sqrt{3}ms^{-1}$. They collide at the origin and stick together. The velocity of the combined mass is :

A. $\frac{4}{3}ms^{-1}$

B. $\frac{8}{3}ms^{-1}$

C. $\frac{3}{4}ms^{-1}$

D. $\frac{3}{8}ms^{-1}$

Answer: a

Watch Video Solution

49. A ball weighing 1 kg is moving horizontally at $12ms^{-1}$. It collides head on with another of double the mass moving in oppssite direction with double the speed. If the coefficient of restitution is 2/3, the energy lost in the collision is given by :

A. 60 J

B. 120 J

C. 240 J

D. 480 J

Answer: c

 Watch Video Solution

50. If a body of mass m moving with velocity v collides with another body of mass m at rest. If

e is the coefficient of restitution then find the ratio of final velocities of two bodies :

A. $\frac{v_1}{v_2} = \frac{1-e}{1+e}$

B. $\frac{v_1}{v_2} = \frac{1+e}{1-e}$

C. $\frac{v_1}{v_2} = e$

D. None of these

Answer: a

Watch Video Solution

51. A uniform chain of length L and mass m is lying on a smooth table. One third of its length is hanging verti cally down over the edge of the table. How much work need to be done to pull the hanging part back to the table ?

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

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

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

D. Mgl

Answer: c

Watch Video Solution

52. The change in potential energy of the body when it is taken from the earth's surface to a height above its surface is :

A. (n-1) mgR

B. nmgR

C. $\frac{n}{n+1}mgR$

D. $\frac{n}{n-1}mgR$

Answer: c

Watch Video Solution

53. An engine develops 10 kW power. How much time will it take to lift a mass of 200 kg to a height of 40 m ?

A. 10 s

B. 8 s

C. 5 s

D. 4 s

Answer: b

Watch Video Solution

54. A ball is dropped from a height of 20 m. If coefficient of restitution is 0-5. The ball rebounds to a height of:

A. 5 m

B. 10 m

C. 20 m

D. 2.5 m

Answer: a

Watch Video Solution

55. A metal ball of mass 2 kg moving with a velocity of 36 km./h has a head on collision with a stationary ball of mass 3 kg. If after the collision the two balls move together, the loss in K.E. due to collision is :

A. 140 J

B. 100 J

C. 40 J

D. 60 J

Answer: d

 Watch Video Solution

56. A box is dragged along a horizontal floor by a rope which makes an angle of 60° with the horizontal. How much work is done if the tension in the rope is 150 N and the box is dragged through a distance of 10 m.

A. 750 J

B. 1500 J

C. $750\sqrt{3}J$

D. None of these

Answer: a

Watch Video Solution

57. A man of mass 60 kg, carrying a load of mass 40 kg on his head, climbs up a 15 m long

staircase to the top of a building 5 m high. What is the work done by the man?

A. 49 KJ

B. 4 KJ

C. 4.9 KJ

D. None of these

Answer: c

 Watch Video Solution

58. A man of 55 kg is holding a bucket of mass 25 kg. He walks 50 m on a level road at a constant speed of 3 ms" and then climbs up a hill of height 20 m. What is the work done by the man ?

A. 16 KJ

B. 12 KJ

C. 3.5 KJ

D. 2 KJ

Answer: a

Watch Video Solution

59. A body is subjected to a constant force $\overrightarrow{F}$ in newton given by : $\overrightarrow{F} = 2\hat{i} + 9\hat{j} + 12\hat{k}$, where $\hat{i}$, $\hat{j}$and $\hat{k}$ are unit vectors along x,y and z-axis respectively. What is the work done by this force in moving the body through a distance of 2 m along 2-axis ?

A. 24 J

B. 18 J

C. 12 J

D. 6 J

Answer: a

Watch Video Solution

60. A particle of mass 01 kg is subjected to a force which varies with distance as shown in figure. If starts its journey from rest at x = 0, then its velocity at x = 12 m is:

A. 0

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

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

D. $40m/s$

Answer: d

View Text Solution

61. If a 10 kg body falls to the ground from a height of 15 m and if all its mechanical energy is convetred into heat the heat produced will be : (5 = 4.2 J/cal)

A. 6 cal

B. 60 cal

C. 150 cal

D. 350 cal

Answer: d

Watch Video Solution

62. A body of mass 10 kg is raised to height 10 m above the ground with an acceleration of

$1.5m/s^2$. The work done in this case taking $g = 10ms^{-2}$ is:

A. 1000 J

B. 1100 J

C. 1150 J

D. None of these

Answer: c

Watch Video Solution

63. For the same, kinetic energy the momentum will be maximum for :

A. a proton

B. an α particle

C. a deutron

D. an electron

Answer: b

Watch Video Solution

64. Two masses of 4 kg and 9 kg are moving with equal kinetic energies. The ratio of magnitudes of their linear momenta is:

A. $\sqrt{2}:1$

B. $4:9$

C. $2:3$

D. $4:1$

Answer: c

Watch Video Solution

65. The momentum of a body is numerically equal to its kinetic energy. The velocity of the body is :

A. $1ms^{-1}$

B. $2ms^{-1}$

C. $4ms^{-1}$

D. $8ms^{-1}$

Answer: b

Watch Video Solution

66. A body of mass 1 kg is thrown vertically upwards with initial K.E. of 98 joule. The height at which its energy is reduced to half will be

A. 2.5 m

B. 1.25 m

C. 5 m

D. 10 m

Answer: c

Watch Video Solution

67. A motor car needs an engine of 3000 watts to keep it moving with a constant velocity of 10 m/sec on horizontal road. The force of friction between the car tyres and the ground is :

A. 300 dyne

B. 300 newtons

C. 3×10 Newton

D. 3×10 dyne

Answer: b

Watch Video Solution

68. A bullet moving with a velocity of 800 ms^{-1} strikes two wooden plates of width x_1 and x_2 and in pasing through each of them loses 200 ms^{-1} of its velocity. Assuming the resistance of the plates to be uniform the ratio n_1/n_2 is :

A. 15/13

B. $9/7$

C. $7/5$

D. $5/3$

Answer: c

Watch Video Solution

69. A rifle bullet loses half of its velocity in penetrating 24 cm in a wooden plank. The further distance covered by the bullet in coming to rest is:

A. 8 cm

B. 12 cm

C. 24 cm

D. None of these

Answer: a

 Watch Video Solution

70. A running man has half the kinetic energy of that of a boy of half his mass. The man speeds up by one metre per second and then has the same kinetic energy as that of the boy.

What are the original speeds of the boy and man?

A. $(4.8 : 2.4) ms^{-1}$

B. $(3.6 : 1.8) ms^{-1}$

C. $(2.4 : 1.2) ms^{-1}$

D. $(9.8 : 4.9) ms^{-1}$

Answer: a

Watch Video Solution

71. A moving particle of mass m makes a head on elastic collision with a particle of mass 2 m which is initially at rest. What fraction of energy of the colliding particle is lost after collision ?

A. $8/9$

B. $7/8$

C. $4/5$

D. $2/3$

Answer: a

Watch Video Solution

72. A body of mass 5 kg moves along X-axis with $2ms^{-1}$ A second body of mass 10 kg moves along y-axis with velocity $\sqrt{3}ms^{-1}$. They collide at the origin and stick together. The velocity of the combined mass is :

A. $\frac{3}{4}ms^{-1}$

B. $\frac{4}{3}ms^{-1}$

C. $\frac{3}{8}ms^{-1}$

D. $\frac{8}{3}ms^{-1}$

Answer: b

Watch Video Solution

73. A 0.01 kg block collides with a horizontal massless spring of force constant k = 2N/m. The spring gets compressed by 0.4 m. If the coefficient of kinetic friction between the block and the surface is 0.5. The speed of the block

at the time of the collision is:

A. $3ms^{-1}$

B. $1.5ms^{-1}$

C. $6ms^{-1}$

D. $4.5ms^{-1}$

Answer: c

View Text Solution

74. A block of mass 'm' initially at rest is dropped from a height 'h' into a spring whose constant is k. The maximum distance through which the spring is compressed is :

A. $\frac{2mgh}{k}$

B. $\frac{2mg(h+k)}{3}$

C. $\frac{mg-\sqrt{m^2g^2+2mghk}}{2k}$

D. $\frac{mg+\sqrt{m^2g^2+2mghk}}{k}$

Answer: d

Watch Video Solution

Watch Video Solution

75. A bullet of mass m moving with a horizontal velocity u strikes a stationary block of mass M suspended by a string of length L. If the bullet gets embedded, to what maximum angle, with vertical, the block would risc ?

A. $\cos^{-1}\left[\frac{m^2v^2}{2gL(M+m)^2}\right]$

B. $\frac{\tan^{-1}(m^2v^2)}{2gL(M+m)^2}$

C. $\cos^{-1}\left[1-\frac{m^2v^2}{2gL(M+m)^2}\right]$

D. None of these

Answer: c

Watch Video Solution

76. Speeds of two indentical cars are u and 4u at a specific instant. The ratio of the respective distances in which the two cars are stopped from that instant is :

A. $1:1$

B. $1:4$

C. $1:8$

D. $1:16$

Answer: d

Watch Video Solution

77. A spring of force constant 800 N/m has an extension of 5 cm. The workdone in extending it from 5 cm to 15 cm is :

A. 16 J

B. 8 J

C. 32 J

D. 24 J

Answer: b

Watch Video Solution

78. A car moving with a speed of 50 km/h, can be stopped by brakes after at least 6 m. If the same car is moving at a speed of 100 km/h, the minimum stopping distance is :

A. 6 m

B. 12 m

C. 18 m

D. 24 m

Answer: d

Watch Video Solution

79. Consider the following two statements.

a. Linear momentum of a system of particles is zero.

b. Kinetic energy of a system of particles is zero. Then

A. a implies b and b implies a.

B. a does not imply b and b does not imply a

C. a implies b but b does not imply a

D. a does not imply b but b implies a

Answer: d

 Watch Video Solution

80. A body is moved along a straight line by a machine delivering constant power, the distance moved by the body in time in proportional to :

A. $t^{1/2}$

B. $t^{3/4}$

C. $t^{3/2}$

D. $t^{1/4}$

Answer: c

 Watch Video Solution

81. A spring of constant 5×10^3 N/m is stretched initially by 5 cm from the unstretched position. Then the work required to stretch it further by another 5 cm is :

A. 6.25 N-m

B. 12.50 N-m

C. 18.75 N-m

D. 25.00 N-m

Answer: c

Watch Video Solution

82. An automobile travelling with a speed of 60 km/h, can brake to stop within a distance of 20 m. If the car is moving twice as fast i.e. 120 km/h, the stopping distance will be

A. 20 m

B. 40 m

C. 60 m

D. 80 m

Answer: d

Watch Video Solution

83. A uniform chain of length 2 m is kept on a table such that a length of 60 cm hangs freely from the edge of the table. The total mass of the chain is 4 kg. What is the work done in pulling the entire chain on the table ?

A. 7.2 J

B. 3.6 J

C. 120 J

D. 1200 J

Answer: b

Watch Video Solution

84. A force $\vec{F} = \left(5\hat{i} + 3\hat{j} + 2\hat{k}\right)N$ is applied over a particle which displaces it from its origin to the point $\vec{r} = \left(2\hat{i} - \hat{j}\right)$ m. The work done on the particle in joules is :

A. -7

B. $+7$

C. $+10$

D. $+13$

Answer: b

Watch Video Solution

85. A body of mass m, accelerates uniformly from rest to v_1 in time t_1. The instantaneous

power delivered to the body as a function of time is :

A. $\frac{mv_1 t}{t_1}$

B. $\frac{mv_1^2 t}{t_1^2}$

C. $\frac{mv_1 t^2}{t_1}$

D. $\frac{mv_1^2 t}{t_2}$

Answer: b

Watch Video Solution

86. 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. 3.0 cm

B. 2.0 cm

C. 1.5 cm

D. 1.0 cm

Answer: d

Watch Video Solution

87. The block of mass M moving on the frictionless horizontal surface collides with the spring of spring constant K and compresses it by length L. The maximum momentum of the block after the collision is :

A. $\sqrt{MKL}$

B. $\frac{KL^2}{2M}$

C. zero

D. $\frac{ML^2}{K}$

Answer: a

View Text Solution

88. A bomb of mass 16 kg at rest explodes into two pieces of masses 4 kg and 12 kg. The velocity of the 12 kg mass is $4ms^{-1}$. The kinetic energy of the other mass is :

A. 144 J

B. 288 J

C. 192 J

D. 96 J

Answer: b

Watch Video Solution

89. A particle of mass 100 g is thrown vertically upwards with a speed of 5 m/s. The work done by the force of gravity during the time the particle goes up is:

A. $-0.5J$

B. $-1.125J$

C. $1.25J$

D. 0.5 J

Answer: c

Watch Video Solution

90. A ball of mass 0-2 kg is thrown vertically upwards by applying a force by hand. If the hand moves 0.2 m while applying the force

and the ball goes upto 2 m height further, find the magnitude of the force. Consider $g = 10m/s^2$:

A. 4 N

B. 16 N

C. 20 N

D. 22 N

Answer: c

Watch Video Solution

91. A particle of mass 'm' executes simple harmonic motion with amplitude 'a' and frequency v. The average kinetic energy during its motion from the position of equilibrium to the end is :

A. $2\pi^2 ma^2 v^2$

B. $\pi^2 ma^2 v^2$

C. $\frac{1}{4} ma^2 v^2$

D. $4\pi^2 ma^2 v^2$

Answer: b

Watch Video Solution

92. An athlete in the olympic games cover a distance of 100 m. in 10 s. His kinetic energy can be estimated to be in the the range.

A. 200 J-500 J

B. $2 \times 10^5 J - 3 \times 10^5 J$

C. 20,000 J-50,000 J

D. 2,000 J-5,000 J

Answer: d

Watch Video Solution

93. A block of mass 0.50 kg is moving with speed of $2.00ms^{-1}$ on a smooth surface. It strikes another mass of 1.00 kg and then they move together as a single body. The energy loss during the collisions is

A. 0.16 J

B. 1.00 J

C. 0.67 J

D. 0.34 J

Answer: c

Watch Video Solution

Multiple Choice Questions Level Ii

1. A particle of mass m strickes a horizontal smooth surafce at an angle θ with velocity u as shown. It rebound with speed v at angle ϕ with the verticle. If e is the coefficient of

restitution, the magnitude of v is:

A. eu

B. (1-e)u

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

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

Answer: c

View Text Solution

2. A particle falls from a height 'h' upon a fixed horizontal plane and rebounds. If 'e' is the coefficient of restitution the total distance travelled before rebounding has stopped is :

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

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

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

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

Answer: a

Watch Video Solution

Watch video solution

3. A body of mass 5 kg explodes into 3 fragments having masses in the ratio of 2:2 : 1. The fragments with equal masses fly in merely far direction with speed 15 ms^{-1}. What will be the velocity of lighter one ?

A. 15 m/s

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

C. 30 m/s

D. $30\sqrt{2}$ m/s

Answer: d

Watch Video Solution

4. A body of mass m at rest is subjected to a constant force F for time. The kinetic energy at timet is given by :

A. $F^2t^2/2m$

B. $F^2t^2/3m$

C. $2F^2t^2/m$

D. F^2t^2/m

Answer: a

Watch Video Solution

5. A 5 kg stationary bomb is exploded in three parts having mass 1: 1: 3 respectively. Parts having same mass move in perpendicular direction with velocity 39 m/s, then the velocity of bigger part will be:

A. $13\sqrt{2}$ m/s

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

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

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

Answer: a

Watch Video Solution

6. A shell is fired from a canon with a velocity θ at angle with the horizontal direction. At the highest point in its path it explodes into two pieces of equal masses. One of the pieces retraces its path to the canon. The speed of

the other piece immediately after the explosion is:

A. 3v cos θ

B. 2v cos θ

C. $\frac{3}{2}$ v θ

D. v cos θ

Answer: a

Watch Video Solution

7. A pump motor is used to deliver water at a certain rate from a given pipe. To obtain twice as much water from the same pipe in the same time, power of the motor has to be increased to :

A. 16 time

B. 4 times

C. 8 times

D. 2 times

Answer: c

Watch Video Solution

8. A bullet of mass (M) hits a block of mass (M)

the transfer energy is maximum then:

A. M'=M

B. M' = 2M

C. M' ltltM

D. M'gtgt M

Answer: a

Watch Video Solution

9. If the momentum of a body increases by 0-01%, its kinetic energy will increase by:

A. 0-0%

B. 0.0002

C. 0.0004

D. 0.0008

Answer: b

Watch Video Solution

10. A sphere of mass M moving with velocity w collides elastically with another of mass m at rest. After collision their final velocities are V and v. The value of vis:

A. $\frac{2Mu}{m}$

B. $\frac{2\mu}{M}$

C. $\frac{2u}{1+\frac{m}{M}}$

D. $\frac{2u}{1+\frac{M}{m}}$

Answer: c

Watch Video Solution

11. A body is falling freely under the action of force of gravity alone. No air resistance is there as duc laxly is falling in Vacuum. Out of the following quantities which of them remains contant during its fall?

A. Kinetic energy only

B. Potential energy only

C. Total mechanical energy

D. Total linear momentum.

Answer: c

 Watch Video Solution

12. During inelastic collision between two objects, which of the following quantity always remains conserved?

A. Kinetic energy

B. Potential energy

C. Total linear momentum

D. Total mechanical energy

Answer: c

Watch Video Solution

13. A body is travelling in a straight line path with a velocity given by v = ax where 'a' is a constant such that a = 5 units. What will be the work done by the force acting during its displacement from x = 0 to x = 2m ?

A. 15 J

B. 50 J

C. 10 j

D. 100 J

Answer: b

Watch Video Solution

14. A body is moving in a straight line under the influence of a surce of constant power which supplies its energy continuously. Which

of the above graphs shown between displacement 's' and time 'shows the true relation for its motion ?

A. 

B. 

C. 

D. 

Answer: b

View Text Solution

15. A particle of mass 5 kg is moving along a circular path of radius 1 m. It is making 300 rp., uniformly. Its kinetic energy would be:

A. $100\ \pi^2$ J

B. $50\ \pi^2$ J

C. $250\ \pi^2$ J

D. zero

Answer: c

Watch Video Solution

16. In an athletic-meet an athlete has to throw a shot put with mass 10 kg with an initial velocity 1 ms at an angle 45° with the horizontal from a platform 1.5 m above the ground. What will be the kinetic energy of this shot put when it just strikes the ground. Assume the air resistance to be negligible and take the value of 'g' to be 10 ms?

A. 5.0 J

B. 55.0 J

C. 105 J

D. 155 J

Answer: d

Watch Video Solution

17. What will be power of a crane in watts which lifts a stone of mass 100 kg to a height of 10 min 20 seconds ?

A. 500 W

B. 50 W

C. 250 W

D. 1000 W

Answer: a

Watch Video Solution

18. An iron sphere starts falling just from the top surface of water in a lake having enough depth for the sphere to attain its terminal velocity in the water of the lake after a fall under gravity. Which of the graphs given

below will correctly represent the change in kinetic energy with the depth of the lake as the sphere goes straight into water?

A. 

B. 

C. 

D. 

Answer: b

View Text Solution

19. A cricket ball having a mass of 0.15 kg is moving with uniform speed of 126 km/h strikes the bat of the player at its middle who holds it firmly at its position. After hitting the bat the ball moves straight back along the same path. If the collision is assumed to be perfectly clastic and bat and ball remain in contact only for a small fraction of time 0.001s the force that batsman has to apply to hold the ball for that short interval would be:

A. 105 N

B. 10.5 N

C. 1.05 X $10^4 N$

D. 1050N

Answer: c

Watch Video Solution

20. The power used by the human heart while beating 72 times per minute is given by one of the following if the average work done during one singal beat is 0.5 J.

A. 0.06 W

B. 0.6 W

C. 6.0 W

D. 0.30 W

Answer: b

Watch Video Solution

21. A metallic bob A of a pendulum tied to nail in the wall with an inelastic massless thread I m long is brought to horizontal position in a

vertical plane as shown in the fig. It is released from this position and moves in a Nimm circular arc to a vertical position when another ball Bof similar mass is placed on the horizontal table in such a way that it suffers perfectly elastic collision BIA with it, with what speed the TABLE second ball B would move?

A. 2.21 ms^{-1}

B. 3.31 ms^{-1}

C. 4.47 ms^{-1}

D. None of these

Answer: c

View Text Solution

22. A train wagon is attached to the engine through a shock absorber 1.5 m long the system having a total mass of 5 x 104 kg is going at a speed of 36 km/h. Suddenly the brakes are applied to bring them to rest. In the process of coming to rest, the spring of

the shock absorber gets compressed by 1 metre. If only 90% energy of the wagon is lost due to friction. What is spring constant of spring?

A. 5×10^4 N/m

B. 10^5 N/m

C. 10^4 N/m

D. 5×10^5 N/m

Answer: d

Watch Video Solution

23. A runner weighing 60 kg raises the CG of his body by 0.25 m during each step of 1 min length. If he runs for 6 km and there is loss of 10% of the energy due to friction of air etc. What is the total energy required by him from his intake of food ?

A. 9×10^5 J

B. 8×10^5 J

C. 9.9×10^5 J

D. 8.8×10^5 J

Answer: c

Watch Video Solution

24. A car weighing 12000 kg along with the weight of its driver and is moving at a uniform speed on a road which offers same force of friction consumes one litre of petrol for every 15 km run. If combustion of petrol ganerates 3 x 10') per litre and efficiency of the engine is 50%, calculate the force of friction acting on the car during 15 km drive.

A. 10^3 N

B. 0.5×10^3 N

C. 10^4 N/m

D. 0.5×10^4 N

Answer: a

View Text Solution

25. Two steel cubes each of mass 50 g exactly identical with each other having side of 1 cm each are travelling with a speed of 10 cm s in

opposite directions collide head-on with each other face to face. What would be the compression of each? 

A. $0.79 \times 10^{-7} m$

B. $0.395 \times 10^{-6} m$

C. 1.58×10^{-7} m

D. None of these

Answer: c

View Text Solution

26. A Rough inclined plane with inclination 30° with the horizontal has a block of 1 kg being pushed up the plane by a force of 10 N acting parallel to the plane. If the coefficient of friction between the block and the plane is 0.1 and block is pushed through a distance of 10 m along then incline. What are the increases in the (1) potential energy and (ii) kinetic energy of the block ?

A. 50 J: 41.3J

B. 40 J: 31.6 J

C. 100 J, 81.8 J

D. 25 J, 20.7 J.

Answer: a

27. A raindrop of radius r falls from a certain height h above the ground. The work done by the gravitational force is proportional to :

A. r^4

B. r^3

C. r^2

D. r

Answer: b

Watch Video Solution

28. A body is subjected to a constant force $\overrightarrow{F}$ in newton given by : $\overrightarrow{F} = 2\hat{i} + 9\hat{j} + 12\hat{k}$, where $\hat{i}$, $\hat{j}$and $\hat{k}$ are unit vectors along x,y and z-axis respectively. What is the work done by

this force in moving the body through a distance of 2 m along 2-axis ?

A. 24 J

B. 18 J

C. 12 J

D. 6 J

Answer: b

Watch Video Solution

29. Kinetic energy of a mass m travelling through some distance d, starting from rest, under action of a constant force F is directly proportional to

A. Independent of m

B. Directly proportional to $\sqrt{m}$

C. Inversely proportional to $\sqrt{m}$

D. Directly proportional to m

Answer: a

Watch Video Solution

Watch video solution

30. If the linear momentum of a body is increased by 50% then the kinetic energy of that body increases by

A. 0.25

B. 0.5

C. 1

D. 1.25

Answer: d

Watch Video Solution

31. A motor drives a body along a straight line with a constant force. The power P developed by the motor must vary with time tas:

A. A

B. B

C. C

D. D

Answer: a

View Text Solution

32. Three constant forces $\vec{F}_1 = 2\hat{i} - 3\hat{j} + 2\hat{k}, \vec{F}_2 = \hat{i} + \hat{j} - \hat{k}$ and j - 2k in newton displace a particle from (1,-1,2) to (-1,-1, 3) to (2,2,0) (displacement being in metres). The total work done by the forces is, if displacement is along straight path:

A. 2 J

B. 3 J

C. 4 J

D. 5 J

Answer: d

Watch Video Solution

33. A bullet fired into a fixed target loses 20% of its K.E.in penetrating 1 cm. Find the total distance penetrated by bullet before it comes to rest :

A. 2 cm

B. 3 cm

C. 4 cm

D. 5 cm

Answer: d

Watch Video Solution

34. A bullet of mass a moving with velocity b strikes a large stationary block of wood of

mass c, and remains embed in it, the final velocity of the system is :

A. $\frac{a}{a+b}c$

B. $\frac{a \times b}{a+b}$

C. $\frac{a \times b}{a-c}$

D. $\frac{a}{a-c}c$

Answer: b

Watch Video Solution

35. A quarter horse power motor runs at a speed of 600 Ep.m. Assuming 40% efficiency the work done by the motor in one rotation will be:

A. 7.46 J

B. 7400 J

C. 7.46 ergs

D. 74.6 J

Answer: a

Watch Video Solution

Watch Video Solution

36. Find the magnitude of the force acting along the direc tion $-6\hat{i}+2\hat{j}+3\hat{k}$ which displaces a particle from position (2, -1, 0) to a new position (1, 2, -1) and in doing so does a work of 5 units :

A. 7/3 units

B. $\frac{3}{7}$ units

C. $\frac{5}{6}$ units

D. $\frac{6}{5}$ units

Answer: a

View Text Solution

37. A shell is fired from a canon with a velocity θ at angle with the horizontal direction. At the highest point in its path it explodes into two pieces of equal masses. One of the pieces retraces its path to the canon. The speed of the other piece immediately after the explosion is:

A. 3 v sosθ

B. 2v cos θ

C. $\frac{3}{2}$ v cos θ

D. v cos θ

Answer: a

Watch Video Solution

38. Water enters in a turbine at a speed of 500 m/s and leaves at 400 m/s. If 2×10^3 kg/s of

water flows and efficiency is 75%, then output power is

A. $6.75 \times 10^7 W$

B. 1000 KW

C. 100 KW

D. 400 W

Answer: a

Watch Video Solution

39. A body falling with a speed of 2 ms-strikes the floor and rebounds with a speed of 1 ms. The loss of energy is:

A. 0.125

B. 0.25

C. 0.4

D. 0.75

Answer: d

Watch Video Solution

40. A particle moves in a straight line with retardation propotional to its displacement. Loss of K.E. for any displacement x is proportional to :

A. x

B. x^2

C. log x

D. e^x

Answer: b

Watch Video Solution

41. The velocity of a 2 kg body is changed from $\left(4\hat{i}+3\hat{j}\right)\ ms^{-1}$ to $6\widehat{m}s^{-1}$. The work done on the body is

A. 9 J

B. 11 J

C. 1 J

D. 0 J

Answer: b

Watch Video Solution

42. A ball is allowed to fall from a height of 10 m. There is 40% loss of energy every time it hits the ground. After second impact with the ground, the ball will rise upto

A. 10 m

B. 6 m

C. 3.6 m

D. 2.4 m

Answer: c

Watch Video Solution

43. A force of 1 N acts on a body of mass 0.5 kg initially at rest. The ratio of the works done by the force in the first, second and third second is :

A. 1:2:3

B. $1:2:5$

C. $1:3:5$

D. $1:5:9$

Answer: c

Watch Video Solution

44. A water pump driven by petrol raises water at a rate of 0.5 m' min from a depth of 30 m. If the pump is 70% efficient, what power is developed by the engine?

A. 1750 W

B. 2450 W

C. 3500W

D. 7000W

Answer: c

Watch Video Solution

45. A 1 kg block moving with a velocity of 4 mscollides with a stationary 2 kg block. The lighter block comes to rest after the collision. The loss of kinete energy of the system is

A. 1 J

B. 2 J

C. 3 J

D. 4 J

Answer: d

Watch Video Solution

46. A body of mass 5 kg collides elastically with a stationary body of mass 2.5 kg. After the collision, the 2.5 kg body begins to move with

a kinetic energy of 8). Assuming the collision to be one-dimensional, the kinetic energy of the 5 kg body before collision is:

A. 3 J

B. 6 J

C. 9 J

D. 11J

Answer: c

Watch Video Solution

47. A ball moving with a velocity ef 10 impinges on a vertical wall at an angle of 45° with the normal to the wall. After the collision, the ball moves on the other side of the normal at an angle of 45° with the normal. The coefficient of restitution is 0.5. The velocity of the ball after the collision will be

A. 2 ms^{-1}

B. 3ms^{-1}

C. 5 ms^{-1}

D. 50 ms^{-1}

Answer: c

Watch Video Solution

48. A slab S of mass m is released from a height, from the top of a spring of force constant k. The maximum compression of the spring is given by the equation:

A. $mgh_0 = \frac{1}{2}kx^2$

B. $mg(h_0 - x) = \frac{1}{2}kx^2$

C. $mgh_0 = \frac{1}{2}k(h_0 + x)^2$

D. $mg(h_0 + x) = \frac{1}{2}kx^2$

Answer: d

View Text Solution

49. A body falls on the ground from a height of 10 metre and rebounds to a height of 2.5 m. The ratio of the velocity of the body before collision to the velocity of the body after collision is:

A. $2:1$

B. $1:2$

C. $4:1$

D. $3:1$

Answer: a

Watch Video Solution

50. In the above question the percentage loss of kinetic energy of the body during its collision with the ground is :

A. 0.25

B. 0.5

C. 0.75

D. 0.99

Answer: c

View Text Solution

51. A particle of mass 'm' at rest is acted upon by a force 'P for a time 'r'. Its Kinetic energy after an interval 'r' is:

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

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

C. $\frac{p^2t^2}{3m}$

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

Answer: b

Watch Video Solution

52. Two particles of masses m_1 and m_2 in projectile motion have velocities $\vec{v}_1$ and $\vec{v}_2$ respectively at time $t = 0$. They collide at

time t_0. Their velocities become $\vec{v}_1'$ and $\vec{v}_2'$ at time $2t_0$ while still moving in air. The value of $\left|\left(m_1\vec{v}_1' + m_2\vec{v}_2'\right) - \left(m_1\vec{v}_1 + m_2\vec{v}_2\right)\right|$ is

A. Zero

B. $(m_1 + m_2)gt_0$

C. $2(m_1 + m_2)gt_0$

D. $\frac{1}{2}(m_1 + m_2)gt_0$

Answer: c

Watch Video Solution

53. A heavy ball is dropped from a height H on a horizontal floor. After the nth' impact, it reaches a maximum height of Hin. What is the coefficient of restitution ?

A. 1

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

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

D. $\left(\frac{1}{n}\right)^{2n}$

Answer: c

View Text Solution

54. A particle, which is constrained to move along the x-axis, is subjected to a force in the same direction which varies with the distance of the particle from the origin as F(x) $= -kx + ax^3$. Hence k and a are positive constants. For 20. the functional form of the potential energy U(x) of the particle is:

A. 

B. 

C. 

D. 

Answer: d

View Text Solution

55. An ideal spring with spring-constants bung from the celling and a block of mass M is attached to its lower end. The mass is released

with the spring initially unstretched. Then the maximum extension in the spring is:

A. $\frac{4Mg}{k}$

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

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

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

Answer: b

Watch Video Solution

56. If $W_1 W_2$ and W_3 represent the work done in moving a particle from A to B along three different parts 1, 2 and 3 respectively (as shown) in the gravitational field on a point mass m, find the correct relation between $W_1 W_2$ and W_3

A. W_1 gt W_2 gtW_3

B. W_1 =W_2 =W_3

C. W_1 lt W_2 lt W_3

D. W_2 gt W_1 gt W_3

Answer: b

View Text Solution

57. A particle moves in a straight line with retardation propotional to its displacement. Loss of K.E. for any displacement x is proportional to :

A. x^2

B. e^x

C. x

D. $\log_e$ x

Answer: a

Watch Video Solution

58. A block P of mass m is placed on a frictionless horizontal surface. Another block Q of same mass is kept on and connected to the wall with the help of a spring of spring

constant k as shown in the figure. w. is the coefficient of friction between P and Q. The blocks move together performing SHM of amplitude A. The maximum value of the frictional force between P and Q is:

A. kA

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

C. zero

D. $\mu_s mg$

Answer: b

View Text Solution

59. A block is acted upon by a force F = kx (where k is a positive constant). Its potential energy at is zero Which curve correctly represents, the variation of potential energy of the block with respect tox?

A. 

B. 

C. 

D. 

Answer: b

View Text Solution

60. A mass 'm' moves with a velocity '' and collides inelastically with another identical mass. After collision the Ist mass moves with velocity in a direction perpen-dicular to the initial direction of motion Find the speed of the 2nd mass after collision :

A. v

B. $\sqrt{3v}$

C. $2\left(\sqrt{3}\right)v$

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

Answer: c

View Text Solution

61. A body of mass m, accelerates uniformly from rest to v_1 in time t_1. The instantaneous

power delivered to the body as a function of time is :

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

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

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

D. $\frac{1}{2}\frac{mv^2}{T^2}$

Answer: a

Watch Video Solution

62. A spherical shell of mass 20 kg is stationary at the top of a hill of height 100 m. It rolls down a smooth surface to the ground, then climbs up another hill of height 30 m and finally rolls down to a horizontal base at a height of 20 m above, the ground. The velocity attained by the ball is :

A. 40 m/s

B. 20 m/s

C. 10 m/s

D. $10\sqrt{30}\frac{m}{s}$

Answer: a

Watch Video Solution

63. The ball rolls down without slipping (which is at rest A) along AB having friction. It rolls to a maximum height he where BC has no friction, K_A, K_B and K_C are kinetic energies A, B and C:

A. $K_A = K_C, h_A = h_C$

B. K_B gt K_C ,$h\_C = h_C$

C. K_B gt K_C, h_A lt h_C

D. $K_B K_C, h_A$ gt h_C

Answer: d

View Text Solution

64. A 2 kg block slides on a horizontal floor with a speed of 4 m/s. It strikes an uncompressed spring, and compresses it till

the block is motionless. The kinetic friction force is 15 N and spring constant is 10,000 N/m. The spring compresses by :

A. 2.5 cm

B. 11.0 cm

C. 8.5 cm

D. 5.5 cm

Answer: d

Watch Video Solution

65. A block of mass 2 kg is free to move along the x-axis. It is at rest and from 1 = 0 onwards it is Ft) subjected to a time- 4N dependent force F(T) in the x-direction. The force F(t) varies with t as shown in the fig. The kinetic energy of the block after 4.5 seconds is:

A. 4.50 J

B. 7.50 J

C. 5.06 J

D. 14.06 J

Answer: c

View Text Solution

66. A point mass of 1 kg collides elastically with a stationary point mass of 5 kg. After their collision, the 1 kg mass reverses its direction and moves with a speed of 2 ms. Which of the following statement After collision (s) is (are) correct for the system of these two masses ?

A. Total momentum of them system is 3 kg ms - Before collision

B. Momentum of 5 kg mass after collision is

C. Kinetic energy of the centre of mass is

D. Total kinetic energy of the system is 4 J.

Answer: a,c

View Text Solution

67. Statement-1: Two particles moving in the same direction do not lose all their energy in a completely inelastic collision.

Statement-2: Principle of conservation of momentum holds true for all kinds of collisions.

A. Statement-1 is true, Statement-2 is false.

B. Statement-1 is true, Statement-2 is true, Statement 2 is the correct explanation of Statement-1.

C. Statement-1 is true, Statement-2 is true: Statement 2 is not the correct explanation of Statement-1.

D. Statement-1 is false, Statement-2 is true.

Answer: b

Watch Video Solution

Multiple Choice Questions Level Iii

1. At time t = Os a particle starts moving along the x-direction. If its kinetic energy increases uniformly with time Y', the net force acting on it must be proportional to :

A. constant

B. t'

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

D. $\sqrt{t}$

Answer: c

Watch Video Solution

Watch video solution

2. If two springs S, and S, of force constants k, and ky, respectively, are stretched by the same force, it is found that more work is done on spring S, than on spring S.

Statement 1: If stretched by the same amount, work done on S, will be more than that on S.

Statement 2: k_1 ltk_2

A. Statement 1 is true, Statement 2 is true, Statement 2 is not the correct

explanation of Statement 1.

B. Statement 1 is false, Statement 2 is true.

C. Statement 1 is true, statement 2 is false.

D. Statement 1 is true, statement 2 is true, statement 2 is the correct explanation of statement 1.

Answer: a

Watch Video Solution

3. This question has Statement-I and Statement-II. Of thefour choices given after the Statements, choose the one that best describes the two Statements. Statement-I: A point particle of mass in moving with speed v collides with stationary point particle of mass M. If the maximum energy loss possible is given as

$f\left(\frac{1}{2}\ mv^2\right)$ then $f = \left(\frac{m}{M+m}\right)$

Statement-II : Maximum enegy loss occurs when the particles get stuck together as a result of the collision.

A. Statement-I is true, Statement-II is true, Statement-II is not a correct explanation of Statement

B. Statement-T is true, Statement-II is false

C. Statement-I is false, Statement-II is true

D. Statement-I is true, Statement-II is true, Statement-II is a correct explanation of Statement-1.

Answer: c

 Watch Video Solution

4. When a rubber-band is stretched by a distance x, it exerts a restoring force of magnitude F = ax + bx2 where a and b are constants. The work done in stretching the unstretched rubber band by L is :

A. $\frac{1}{2}\left(\frac{aL^2}{2}+\frac{bL^3}{3}\right)$

B. aL^2+bL^3

C. $\frac{1}{2}(aL^2+bL^2)$

D. $\frac{aL^2}{2}+\frac{bL^3}{3}$

Answer: d

Watch Video Solution

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

A. 0.5

B. 0.56

C. 0.62

D. 0.44

Answer: b

Watch Video Solution

Recent Competitive Questions

1. If the linear momentum of a body is increased by 50% then the kinetic energy of

that body increases by

A. 2.25

B. 0.25

C. 1

D. 1.25

Answer: d

 Watch Video Solution

2. A body of mass 5 kg is thrown vertically up with a kinetic energy of 490 J.The height at which the kinetic energy of the body becomes half of the origibnal value is

A. 5 m

B. 2.5 m

C. 10 m

D. 12.5 m

Answer: a

Watch Video Solution

Watch Video Solution

3. Two bodies of masses m_1 and m_2 are acted upon by a constant force F for a time t . They start from rest and acquire kinetic energies E_1 and E_2 respectively . Then $\frac{E_1}{E_2}$ is

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

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

C. 1

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

Answer: b

 Watch Video Solution

4. A truck accelerates from speed v to 2 v. Work done in during this is

A. three times as the work done in accelerating it from rest to v.

B. same as the work done in accelerating it from rest to v

C. four times as the work done in accelerating it from rest to v.

D. less than the work done in accelerating it from rest tov.

Answer: a

Watch Video Solution

5. A 10 kg metal block is attached to a spring of spring constant 1000 N m^{-1}. A block is displaced from equilibrium position by 10 cm

and released. The maximum acceleration of the block is

A. 10 ms^{-2}

B. 100ms^{-2}

C. 200ms^{-2}

D. 0.1 ms^{-2}

Answer: a

Watch Video Solution

6. The kinetic energy of a body of mass 4 kg and momentum 6 N s will be

A. 3.5 J

B. 5.5 J

C. 2.5 J

D. 4.5 J

Answer: d

Watch Video Solution

7. A bomb of mass 18 kg at rest explodes into two pieces of masses 6 kg and 12 kg. The velocity of 12 kg mass is 4 m/s. The kinetic energy of the other mass is :

A. 288 J

B. 192 J

C. 96 J

D. 144 J

Answer: b

Watch Video Solution

8. A 2 kg mass lying on a table is displaced in the horizontal direction through 50 cm. The work done by the normal reaction will be:

A. 10 J

B. 0

C. 100 erg

D. 100 J

Answer: b

 Watch Video Solution

Revision Test

1. A ball is dropped from height of Im. If coefficient of restituion between surface and ball is 0.6. The ball rebounds to a height of:

A. 0.4 m

B. 1 m

C. 0.6 m

D. 0.36 m

Answer: d

Watch Video Solution

2. A metal ball hits a wall and does not rebound, where as b a rubber ball of the same mass on hitting the wall with the same velocity rebounds back. It can be concluded that:

A. The initial momentum of metal ball is greater than initial momentum of

rubber

B. Rubber ball suffers greater change in momentum

C. Metal ball suffers greater change in momentum

D. None of these.

Answer: b

Watch Video Solution

3. The velocity of a body of mass 2.5 kg is changed from $\vec{V}_i = \left(3\hat{i} - 4\hat{j}\right) m/s$ to $\vec{V}_f = \left(2\hat{i} - 9\hat{j}\right)$ms. What is the work done on the body:

A. 75 J

B. 125 J

C. 95 J

D. 55 J

Answer: a

Watch Video Solution

Watch Video Solution

4. The value of 1 Mev is equal to :

A. $1 \times 10^{-19} J$

B. $1 \times 10^{-13} J$

C. $10^{6} J$

D. None of these.

Answer: b

Watch Video Solution

5. A particle is projected vertically upwards with a velocity given by $V = \sqrt{gR}$, where R denotes the radius of earth and 'g' the acceleration due to gravity on the surface of earth, then the maximum height ascended by the particle is :

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

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

C. R

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

Answer: c

Watch Video Solution

6. A spring of constant 5×10^3 N/m is stretched initially by 5 cm from the unstretched position. Then the work required to stretch it further by another 5 cm is :

A. 12.50 N m

B. 18.75 N m

C. 25.00 N m

D. 6.25 N m

Answer: b

Watch Video Solution

7. Consider the following two statements.

a. Linear momentum of a system of particles is zero.

b. Kinetic energy of a system of particles is zero. Then

A. 1 does not imply 2 and 2 does not imply 1

B. 1 Imply 2 but 2 does not imply 1

C. 1 does not imply 2 but 2 imply 1

D. 1 Implies 2 and 2 implies 1.

Answer: c

Watch Video Solution

8. A body of volume V and dinsity p is raised through height h in a liqiud of density $\sigma < p$. The change in potential energy of the body is :

A. V pgh

B. $V(p-\sigma)gh$

C. $V(p+\sigma)$

D. $V\sigma gh$

Answer: b

Watch Video Solution

9. A child is swinging a swing. He is one metre above the ground at the lower point and 2 metre above the gound at the highest point.

The speed of the child at the lowest point of the swing is : $\left(g = 10ms^{-2}\right)$

A. $4.5ms^{-1}$

B. $6.4ms^{-1}$

C. $7.8ms^{-1}$

D. $10ms^{-1}$

Answer: a

Watch Video Solution

10. A canon shell explodes in mid air, its total

A. Momentum increases

B. Momentum decreases

C. Kinetic energy increases

D. Kinetic energy remains unchanged.

Answer: c

 Watch Video Solution

11. A body at rest may have :

A. Velocity

B. Speed

C. Momentum

D. Energy

Answer: d

 Watch Video Solution

12. A car is moving along a straight horizontal road with a speed V. If the coefficient of friction between road and tyres is H, the shortest distance in which the car stops when engine is shut off, is :

A. $\frac{V_0}{2\mu g}$

B. $\frac{V_0}{\mu g}$

C. $\frac{V_0^2}{\mu}$

D. $\left(\frac{V_0}{\mu g}\right)$

Answer: a

Watch Video Solution

13. If a body of mass m moving with velocity v collides with another body of mass m at rest. If e is the coefficient of restitution then find the ratio of final velocities of two bodies :

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

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

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

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

Answer: c

Watch Video Solution

14. A ball is projected vertically upward with an initial velocity. Which of the following graphs best represents the K.E. of the ball as a function of time from the instant of projection till it reaches the point of projection :

A. 

B. 

C. 

D. 

Answer: c

View Text Solution

15. A motor with an efficiency of 90% drives a pump, whose efficiency is 60%. Then the efficiency of the entire installation is :

A. 0.75

B. 0.54

C. 0.45

D. 0.3

Answer: b

Watch Video Solution

16. A lorry and a car moving with the same kinetic energy are bought to rest by the application of brakes which provide equal

retarding forces. Which of the two will come to rest in a shorter distance ?

A. The car

B. The lorry

C. Both will travel the same distance before coming to rest

D. None of these.

Answer: c

 Watch Video Solution

17. The power of motor pump is 2 KW. The water raised by the pump per minute to a height of 10 m. is nearly :

A. 100 litres

B. 2000 litres

C. 1000 litres

D. 1200 litres

Answer: d

Watch Video Solution

18. The energy required to accelerate a car from rest to $10ms^{-1}$ is W. the energy required to accelerate the car froms $10ms^{-2}$ to $20ms^{-1}$.is:

A. 3 W

B. 4 W

C. 2 W

D. W

Answer: a

Watch Video Solution

19. A man weighing 60 kg lifts a body of 15 kg to a top of building 10 m high in 30 minutes. His efficiency is :

A. 0.4

B. 0.3

C. 0.2

D. 0.1

Answer: c

Watch Video Solution

20. A sphere of mass M moving with velocity w collides elastically with another of mass m at rest. After collision their final velocities are V and v. The value of vis:

A. $\frac{2Mu}{m}$

B. $\frac{2\mu}{M}$

C. $\frac{2u}{1+\frac{m}{M}}$

D. $\frac{2u}{1+\frac{M}{m}}$

Answer: c

Watch Video Solution

21. The particle moves along x-axis from $x = x_1$ to $x = x_2$ under the influence of force F= 2x, then work done in the process :

A. Zero

B. $x_2^2 - x_1^2$

C. $2x_2(x_2 - x_1)$

D. $2x_1(x_1 - x_2)$

Answer: b

Watch Video Solution

22. An engine pumps a liquid of density 'd' continuously through a pipe of area A. If the speed with which the liquid passes through the pipe is V, then the rate at which K.E. is imparted to the liquid is :

A. $\frac{1}{2}AdV^3$

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

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

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

Answer: a

Watch Video Solution

23. A shell at rest at the origin explodes into three pieces of masses 1 kg, 2 kg, and m kg, The 1 kg and 2 kg pieces fly off with speeds $12ms^{-1}$ and $16ms^{-1}$, along X-axis and Y-axis

respectively. If m kg flies off with a speed of $40ms^{-1}$, the total mass of the shell must be :

A. 3.64 kg

B. 36.4 kg

C. 4.5 kg

D. 5.24 kg

Answer: a

Watch Video Solution

24. K.E. of body is increased by 300 percent, then percentage increase in linear momentum will be:

A. 100 present

B. 150 present

C. 265 present

D. 200 present

Answer: a

 Watch Video Solution

25. A long spring is stretched by 2 cm having potential energy as V. If the spring is stretched by 10 cm, the potential energy would be

A. 25 U

B. U/5

C. 5 U

D. 10 U

Answer: a

Watch Video Solution

26. A stationary particle explodes into two particles of masses m_1 and m_2 which move in opposite directions with velocities v_1 and v_2 .The ratio of their $K.EE_1 / E_2$ is:

A. $\frac{m_1 v_2}{m_2 u_1}$

B. m_2 / m_1

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

D. 1

Answer: b

Watch Video Solution

27. Two masses 1 gm and 4 gm are moving with equal kinetic energies. The ratio of their momentum is :

A. $1:6$

B. $2:1$

C. $1:2$

D. $4:1$

Answer: c

Watch Video Solution

28. A bullet of mass 'm' moving with velocity *v' strikes a block of mass 'M' at rest and gets embeded into it. The K.E. of composite block will be:

A. $\frac{1}{2}mv^2 \times \frac{m}{(M+m)}$

B. $\frac{1}{2}mv^2 \times \frac{M}{(M+m)}$

C. $\frac{1}{2}Mv^2 \times \frac{M+m}{(M)}$

D. $\frac{1}{2}Mv^2 \times \frac{m}{(M+m)}$

Answer: a

Watch Video Solution

29. A ball collides head-on with another at rest having 3 times the mass of first with a velocity of $1ms^{-1}$. If the coefficient of restitution is 0.8, then velocities of the two after the collision will be:

A. $-0.35ms^{-1}$ and $0.45ms^{1}$

B. $-0.45ms^{-1}$ and $0.35ms^{1}$

C. $-0.35ms^{-1}$ and $-0.45ms^{1}$

D. $-0.45ms^{-1}$ and $-0.35ms^{1}$

Answer: a

Watch Video Solution

30. A body of mass 'm' moving with $3kmhr^{-1}$ collides with a body of mass 2 m at rest and sticks to it. The combination starts moving with velocity :

A. $4Kmhr^{-1}$

B. $3Kmhr^{-1}$

C. $2Kmhr^{-1}$

D. $1Kmhr^{-1}$

Answer: d

Watch Video Solution

31. A 2.5 kg mass moving at a speed of $15ms^{-1}$ collides with 5 kg object at rest. They

stick together, find the velocity of combined object:

A. $15ms^{-1}$

B. $5ms^{-1}$

C. $20ms^{-1}$

D. None of these.

Answer: b

Watch Video Solution

32. A ball is dropped on a horizontal plate from a height.The total distance travelled by the ball before coming to rest is (e coeff, of restitution)

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

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

C. $h\left(1-e^4\right)$

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

Answer: b

Watch Video Solution

Watch Video Solution

33. Water is flowing in a river at $2ms^{-1}$. The river is 50 m wide and has average depth of 5 m. The power available by current in the river is : (Density of water $1000Kgm^{-3}$)

A. 0.5 MW

B. 1.0 MW

C. 1.5 MW

D. 2.0 MW

Answer: b

Watch Video Solution

34. A ball dropped from a height of 2.43 m attains a height of 3 cm after second rebound. What is the value of coefficient of restitution ?

A. 0.5

B. 0.33

C. 0.25

D. 0.75

Answer: b

Watch Video Solution

35. In one dimensional motion a 1 kg body experiences a force which is function of time and is F= 2 r in the direction of motion. The work done by the force in first 4 sec. is :

A. 16 J

B. 32 J

C. 64 J

D. 128 J

Answer: d

Watch Video Solution

36. A particle of mass 'm' at rest is acted upon by a force 'P for a time 'r'. Its Kinetic energy after an interval 'r' is:

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

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

C. $\frac{P^2t^2}{3m}$

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

Answer: b

Watch Video Solution

37. A rifle $\frac{1}{16}$ bullet loses th of its velocity while passing through one plank of wood. The smallest number of similar plancks required to stop the bullet completely is :

A. 6

B. 9

C. 11

D. 13

Answer: b

 Watch Video Solution

38. A motor delivers power which draws 100 liters per minute of water from a pipe. If its

power is increased x times it draws 200 liters/min. The value of x is:

A. 4

B. 8

C. 16

D. 32

Answer: b

View Text Solution

39. A ball falls vertically with a momentum 'p' and then bounces for large number of times before coming to rest. The total momentum imparted by ball to floor is (e = coff. of restitution):

A. $p(1+e)$

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

C. $p\left[1+\frac{1}{e}\right]$

D. $p\left[\frac{1+e}{1-e}\right]$

Answer: d

Watch Video Solution

40. A ball falls from rest from a height 'h' and rebounds to a height h/4. The value of coefficient fo restitution is :

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

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

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

D. $3/4$

Answer: b

Watch Video Solution