PHYSICS

BOOKS - UNIVERSAL BOOK DEPOT 1960 PHYSICS (HINGLISH)

WORK , ENERGY , POWER AND COLLISION

Ordinary Thinking Objective Questions Work Dene By Constant Force

1. A body of mass m is moving in a circle of radius r with a constant speed v, The force on the body is $\frac{mv^2}{r}$ and is directed towards the centre what is the work done by the from in moving the body over half the circumference of the circle?

A. $\frac{mv^2}{\pi r^2}$

B. Zero

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

D. $\frac{\pi r^2}{mv^2}$

Answer: B

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2. If the unit of length and force be increaSd four times, then the unit of energy is

A. 16 times

B. 8 times

C. 2 times

D. 4 times

Answer: A

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3. A man pushes a wall and fails to displace it.He does

A. Negative work

B. Positive but not maximum work

C. No work at all

D. Maximum work

Answer: C

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4. A moving train is stopped by applying brakes. It stops after travelling $80m$. If the speed of the train is doubled and retardation remain the same, it will cover a distance-

A. The same

B. Doubled

C. Halved

D. Four times

Answer: D

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5. A rigid body moves a distance of 10m along a straight line under the action of a force 5N. If the work done by this force on the body is 25 joules, the angle which the force makes with the force makes with the direction of motion of the body is:

A. 0°

B. 30°

C. 60°

D. 90°

Answer: C

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6. you lift a heavy book from the floor of the room and keep it in the book - shelf having a height $2m$ in this process you take $5 \sec onds$

The work done you will depend upon

A. Mass of the book and time taken

B. Weight of the book and height of the book-shelf

C. Height of the book-shelf and time taken

D. Mass of the book, height of the book-shelf and time taken

Answer: B

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7. A body of mass mkg lifted by a man to a height of one metre in $30\sec$. Another mass lifted the same mass to the same height in $60\sec$. The work done by then are them are in the ratio.

A. $1:2$

B. $1:1$

C. $2:1$

D. $4:1$

Answer: B

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8. A force $\overrightarrow{F} = \left(5\hat{i} + 3\hat{j}\right)$ Newton is applied over a particle which displaces it from its origin to the point $\overrightarrow{r} = \left(2\hat{i} - 1\hat{j}\right)$ metres. The work done on the particle is

A. -7 joules

B. $+13$ joules

C. $+7$ joules

D. $+11$ joules

Answer: C

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9. 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. 5.28 J

B. 450 mJ

C. 490 mJ

D. 530 mJ

Answer: A

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10. 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. -490 Joules

B. $+490$ Joules

C. -980 Joules

D. $+980$ Joules

Answer: D

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11. Which of the following is a scalar quantity

A. Displacement

B. Electric field

C. Acceleration

D. Work

Answer: D

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12. The work done in pulling up a block of wood weighing 2 kN for a length of 10 m on a smooth plane inclined at an angle of 15° with the horizontal is

A. 4.36 kJ

B. 5.17 kJ

C. 8.91 kJ

D. 9.82 kJ

Answer: B

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13. A force $\overrightarrow{F} = 5\hat{i} + 6\hat{j} - 4\hat{k}$ acting on a body, produces a displacement $\overrightarrow{s} = 6\overrightarrow{i} + 5\overrightarrow{k}$. Work done by the force is

A. 18 units

B. 15 units

C. 12 units

D. 10 units

Answer: D

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14. A force of 5 N acts on a 15 kg body initially at rest. The work done by the force during the first second of motion of the body is

A. 5 J

B. $\frac{5}{6}J$

C. 6J

D. 75 J

Answer: B

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

A. 1.5 N

B. 2.5 N

C. 3.5 N

D. 4.5 N

Answer: B

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16. The work done against gravity in taking 10 kg mass at 1m height in 1 sec will be

A. 49 J

B. 98 J

C. 196J

D. None of these

Answer: B

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17. The energy which an e^{-} e acquires when accelerated through a potential difference of 1 volt is called

A. 1 Jolue

B. 1 Electorn volt

C. 1 Erg

D. 1 Watt.

Answer: B

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

A. 12 J

B. 9 J

C. 6 J

D. 3 J

Answer: D

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19. 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. 100 J

B. 300 J

C. 50 J

D. 125 J

Answer: D

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20. A cylinder of 10 kg is sliding in a plane with an initial velocity of 10 m / s . If the coefficient of friction between the surface and cylinder is 0.5 then before stopping, it will cover. $(g = 10m/s^2)$

A. 12.5 m

B. 5 m

C. 7.5 m

D. 10 m

Answer: D

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21. A force $\left(3\hat{i}+4\hat{j}\right)$ newton acts on a boby and displaces it by $\left(3\hat{i}+4\hat{j}\right)$ metre. The work done by the force is

A. 10 J

B. 12 J

C. 16 J

D. 25 J

Answer: D

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22. A 50kg man with 20 kg load on his head climbs up 20 steps of 0.25 m height each. The work done in climbing is

A. 5 J

B. 350 J

C. 100 J

D. 3430 J

Answer: D

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23. 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. -2

B. 1/2

C. 6

D. 2

Answer: A

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

A. 100 J

B. 50 J

C. 200 J

D. 75 J

Answer: A

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25. A force $\left(\overrightarrow{F}\right) = 3\hat{i} + c\hat{j} + 2\hat{k}$ acting on a particle causes a displacement: $\left(\overrightarrow{S}\right) = -4\hat{i} + 2\hat{j} + 3\hat{k}$ in its own direction.

If the work done is 12 J, then the value of .c. is

A. 0

B. 1

C. 9

D. 12

Answer: C

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26. In an explosion a body breaks up into two pieces of unequal masses. In this

A. Both parts will have numerically equal momentum

B. Lighter part will have more momentum

C. Heavier part will have more momentum

D. Both parts will have equal kinetic energy

Answer: A

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27. Which of the following is a unit of energy

A. Unit

B. Watt

C. Horse Power

D. None

Answer: D

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28. If force and displacement of particle in direction of force doubled. Work would be

A. Double

B. 4 times

C. Half

D. $\frac{1}{4}$ times

Answer: B

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29. A body of mass 5 kg is placed at the origin, and can move only on the x-axis. A force of 10 N is acting on it in a direction making an angle of o 60° with the x-axis and isplaces it along the x-axis by 4 metres . The work done by the force is

A. 2.5 J

B. 7.5 J

C. 40 J

D. 20 J

Answer: D

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30. A force $\overrightarrow{F} = \left(5\hat{i} + 4\hat{j}\right)N$ acts on a body and produces a displacement $\overrightarrow{S} = \left(6\hat{i} - 5\hat{j} + 3\hat{k}\right)$ m. The work done will be

A. 10 J

B. 20 J

C. 30 J

D. 40 J

Answer: A

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31. 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

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32. A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle. The motion of the particle takes place in a plane. It follows that

A. Its velocity is constant

B. Its acceleration is constant

C. Its acceleration is constant

D. It moves in a straight line

Answer: C

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33. A ball of mass m moves with speed v and stricks a wall having infinite mass and it returns with same speed then the work done by the ball on the wall is

A. Zero

B. mv J

C. m//v.J

D. v//m J

Answer: A

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

A. -7

B. $+7$

C. $+10$

D. $+13$

Answer: B

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35. The KE acquired by a mass m in travelling a certain distance s, starting from rest, under the action of a constant force is directly proportional to :

A. m^0

B. m

C. m^2

D. $\sqrt{m}$

Answer: A

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36. If a force $\overrightarrow{F} = 4\hat{i} + 5\hat{j}$ causes a displacement $\overrightarrow{s} = 3\hat{i} + 6\hat{k}$ work done is

A. 4×6 unit

B. 6×3 unit

C. 5×6 unit

D. 4×3 unit

Answer: D

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37. What is the amount of work done in bringing a mass from the surface of Earth on one side to a point diametrically opposite on the other side?

A. Zero

B. Positive

C. Negative

D. Nothing can be said

Answer: A

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

A. The friction is reduced

B. The mass becomes smaller

C. Only a part of the weight has to be overcome

D.

Answer: C

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39. 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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40. Due to a force of $\left(6\hat{i}+2\hat{j}\right)N$ the displacement of a body is $\left(3\hat{i}-\hat{j}\right)$, then the work done is

A. 16 J

B. 12 J

C. 8 J

D. Zero

Answer: A

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41. A ball is released from the top of a tower. The ratio of work done by force of gravity in 1st second, 2nd second and 3rd second of the motion of ball is

A. $1:2:3$

B. $1:4:9$

C. $1:3:5$

D. $1:5:3$

Answer: C

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Ordinary Thinking Objective Questions Work Done By Variable Force

1. A particale moves under the effect of a force $F = Cs$ from $x = 0$ to $x = x_1$. The work down in the process is

A. Cx_1^2

B. $\frac{1}{2}Cx_1^2$

C. Cx_1

D. Zero

Answer: B

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2. A cord is used to lower vertically a block of mass M, a distance d at a constant downward acceleration of $\frac{g}{4}$, then the work done by the cord on the block is

A. $M\frac{g(d)}{4}$

B. $3M\frac{g(d)}{4}$

C. $-3M\frac{g(d)}{4}$

D. Mgd

Answer: C

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3. Two springs have their force constant as k_1 and $k_2 (k_1 > k_2)$. When they are streched by the same force.

A. No work is done in case of both the springs

B. No work is done in case of both the springs

C. No work is done in case of both the springs

D. More work is done in case of first spring

Answer: C

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4. A spring of force constant $10 N / m$ has an initial stretch $0.20 m$. In changing the stretch to 0.25 m , the increase in potential energy is about

A. 0.1 joule

B. 0.2 joule

C. 0.3 joule

D. 0.5 joule

Answer: A

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5. The potential energy of a certain spring when stretched through a distance 'S' is 10 joule. The amount of work (in joule) that must be done on this spring to stretch it through an additional distance 'S' will be

A. 30

B. 40

C. 10

D. 20

Answer: A

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6. Two springs of spring constants $1500 N/m$ and $3000 N/m$ respectively are streched by the same force. The potential energy gained by the two springs will be in the ratio

A. $4:1$

B. $1:4$

C. $2:1$

D. $1:2$

Answer: C

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7. A spring 40 mm long is stretched by the application of a force. If 10 N force required to stretch the spring through 1mm, then the work done in stretching the spring through 40 mm is

A. 84 J

B. 68 J

C. 23 J

D. 8 J

Answer: D

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8. 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. 70

B. 270

C. 35

D. 135

Answer: D

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9. A body of mass $3kg$ is under a force , which causes a displacement in it is given by $S = \frac{t^3}{3}$ (in metres). Find the work done by the force in first 2 seconds.

A. 2 J

B. 3.8 J

C. 5.2 J

D. 24 J

Answer: D

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10. The force constant of a wire is k and that of another wire is . 2k When both the wires are stretched through same distance, then the work done

A. $W_2 = 2W_1^2$

B. $W_2 = 2W_1$

C. $W_2 = W_1$

D. $W_2 = 0.5W_1$

Answer: B

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11. A body of mass 0.1 g moving with a velocity of 10 m/s hits a spring (fixed at the other end) of force constant 1000 N/m and comes to rest after compressing the spring. The compression of the spring is

A. 0.01 m

B. 0.1m

C. 0.2 m

D. 0.5 m

Answer: B

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12. When a $1.0kg$ mass hangs attached to a spring of length $50cm,$ the spring stretches by $2cm.$ The mass is pulled down until the length of the spring becomes $60cm.$ What is the amount of elastic energy stored in the spring in this condition. if $g = 10m/s^2.$

A. 1.5 Joule

B. 2.0 Joule

C. 2.5 Joule

D. 3.0 Joule

Answer: C

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

A. 16 J

B. 8 J

C. 32 J

D. 24 J

Answer: B

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14. When a spring is stretched by 2 cm, it stores 100 J of energy. If it is further stretched by 2 cm, the stored energy will be increased by

A. 100 J

B. 200 J

C. 300 J

D. 400 J

Answer: C

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15. A spring when stretched by 2 mm its potential energy becomes 4 J. If it is stretched by 10 mm, its potential energy is equal to

A. 4 J

B. 54 J

C. 415 J

D. None

Answer: D

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16. A spring of spring constant $5 \times 10^3 N/m$ is stretched initially by 5 cm from the unstretched position. The work required to further stretch the spring 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

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17. A mass of $0.5kg$ moving with a speed of $1.5m/s$ on a horizontal smooth surface, collides with a nearly weightless spring of force constant $k = 50N/m$ The maximum compression of the spring would be.

A. 0.15 m

B. 0.12 m

C. 1.5 m

D. 0.5 m

Answer: A

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18. 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. x^2

B. e^x

C. x

D. $\log_e x$

Answer: A

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19. A spring with spring constant K when stretched through $1cm$, the potential energy is

U. If it stretched by $4cm$, the potential energy will be

A. 4 U

B. 8 U

C. 16 U

D. 2 U

Answer: C

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20. A spring with spring constant k is extended from x=0 to $x = x_1$. The work done will be

A. kx_1^2

B. $\frac{1}{2}kx_1^2$

C. $2kx_1^2$

D. $2kx_1$

Answer: B

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

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

B. U

C. 5U

D. 25 U

Answer: D

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22. Natural length of a spring is 60 cm, and its spring constant is 4000 N/m, A mass of 20 kg is hung from it. The extension produced in the spring is (take $g = 9.8m/s^2$)

A. 4.9 cm

B. 0.49 cm

C. 9.4 cm

D. 0.94 cm

Answer: A

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23. If a spring extends by x on loading, then the energy stored by the spring is (if T is tension in the spring and k is spring constant)

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

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

C. $\frac{2k}{T^2}$

D. $\frac{2T^2}{k}$

Answer: A

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24. 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

C. Proportional to x^2

D. Inversely proportional to x

Answer: B

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25. The potential energy between two atoms in a molecule is given by, $U(x) = \frac{a}{x^{12}} - \frac{b}{x^6}$, where a and b are positive constant and x is the distance between the atoms. The atoms is an stable equilibrium, when-

A. $x = \sqrt[6]{\frac{11a}{5b}}$

B. $x = \sqrt[6]{\frac{a}{2b}}$

C. x=0

D. $x = \sqrt[6]{\frac{2a}{b}}$

Answer: D

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26. Which one of the following is a non-conservative force ?

A. Gravitational force

B. Electrostatic force between two charges

C. Magnetic force between two magnetic dipoles

D. Frictional force

Answer: D

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Ordinary Thinking Objective Questions Conservation Of Energy And Momentum

1. Two bodies of different masses m_1 and m_2 have equal momenta. Their kinetic energies E_1 and E_2 are in the ratio

A. $m_1 : m_2$

B. $m_2 : m_1$

C. $\sqrt{m_1} : \sqrt{m_2}$

D. $m_1^2 : m_2^2$

Answer: C

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2. Work done in raising a box depends on

A. How fast it is raised

B. The strength of the man

C. The height by which it is raised

D. None of the above

Answer: C

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3. A light and a heavy body have equal momenta. Which one has greater K.E

A. The light body

B. The heavy body

C. The K.E. are equal

D. Data is incomplete

Answer: A

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4. A body at rest may have

A. Energy

B. Momentum

C. Speed

D. Velocity

Answer: A

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5. The kinetic energy passessed by a body of mass m moving with a velocity v is equal to $\frac{1}{2}mv^2$, provided

A. The body moves with velocities comparable to that of light

B. The body moves with velocities negligible compared to the speed of light

C. The body moves with velocities greater than that of light

D. None of the above statement is correcst

Answer: B

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6. If the momentum of a body is increased n times, its kinetic energy increases

A. n times

B. 2n times

C. $\sqrt{n}$ times

D. n^2 times

Answer: D

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7. When work is done on a body by an external force, its

A. Only kinetic energy increases

B. Only potential energy increases

C. Both kinetic and potential energies may increase

D. Sum of kinetic and potential energies remains constant

Answer: C

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8. The bob of a simple pendulum (mass m and length l) dropped from a horizontal position strikes a block of the same mass elastically placed on a horizontal frictionless table. The K.E. of the block will be

A. 2 mgl

B. mg//2

C. mgl

D. 0

Answer: C

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9. From a stationary tank of mass 125000 pound a small shell of mass 25 pound is fired with a muzzle velocity of 1000 ft / sec . The tank recoils with a velocity of

A. 0.1 ft/ sec

B. 0.2 ft/sec

C. 0.4 ft/sec

D. 0.8 ft/sec

Answer: B

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10. 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. 48 J

B. 32 J

C. 24 J

D. 288 J

Answer: D

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11. A bullet loses $1/20th$ of its velocity is passing through a plank. What is the least number of planks required to stop the bullet ?

A. 5

B. 10

C. 11

D. 20

Answer: C

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12. 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. 12.5 m

C. 25 m

D. 10 m

Answer: B

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13. Two masses of 1 gm and 4 gm are moving with equal kinetic energies. The ratio of the magnitudes of their linear momenta is

A. $4:1$

B. $\sqrt{2}:1$

C. $1:2$

D. $1:16$

Answer: C

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14. If the K.E. of a body is increased by 300%, its momentum will increase by

A. 100 %

B. 15 %

C. $\sqrt{300}$ %

D. 17.5 %

Answer: A

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

A. The light body

B. The heavy body

C. Both have equal momentum

D. It is not possible to say anything without additional information

Answer: B

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16. If linear momentum if increased by $50\,\%$ then kinetic energy will be increased by

A. 0.5

B. 1

C. 1.25

D. 0.25

Answer: C

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17. A free body of mass $8kg$ is travelling at 2 mater per second in a straight line. At a certain instant , the body splits into two equal parts due to internal wxplosion which releases `16 joules of energy . Neither part leves the original line of motion. Finally

A. Both parts continue to move in the same direction as that of the original body

B. One part comes to rest and the other moves in the same direction as that of the original body

C. One part comes to rest and the other moves in the direction opposite to that of the original body

D. One part moves in the same direction and the other in the direction opposite to that of the original body

Answer: B

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18. If the K.E. of a particle is doubled, then its momentum will

A. Remain unchanged

B. Be doubled

C. Be quadrupled

D. Increase $\sqrt{2}$ times

Answer: D

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19. If the stone is thrown up vertically and return to ground, its potential energy is maximum

A. During the upward journey

B. At the maximum height

C. During the return journey

D. At the bottom

Answer: B

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20. A body of mass 2 kg is projected vertically upward with a velocity of $2m\sec^{-1}$. The K.E. of the body just before striking the ground is

A. 2 J

B. 1 J

C. 4 J

D. 8 J

Answer: C

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21. The energy stored in wound watch spring is

A. K.E.

B. P.E.

C. Heat energy

D. Chemical energy

Answer: B

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22. Two bodies of different masses m_1 and m_2 have equal momenta. Their kinetic energies E_1 and E_2 are in the ratio

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

B. $m_1 : m_2$

C. $m_2 : m_1$

D. $m_1^2 : m_2^2$

Answer: C

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23. 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. 8 m

B. 16 m

C. 24 m

D. 32 m

Answer: D

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24. Tripling the speed of the motor car multiplies the distance needed for stopping it by

A. 3

B. 6

C. 9

D. Some other number

Answer: C

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25. If the kinetic energy of a body increases by 0.1% the percent increase of its momentum will be

A. 0.0005

B. 0.001

C. 0.0109

D. 0.1

Answer: A

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26. If velocity of a body is twice of previous velocity, then kinetic energy will become

A. 2 times

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

C. 4 times

D. 1 times

Answer: C

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27. Two bodies A and B having masses in the ratio of 3 : 1 possess the same kinetic energy. The ratio of their linear momenta is then

A. $3:1$

B. $9:1$

C. $1:1$

D. $\sqrt{3}:1$

Answer: D

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28. In which case does the potential energy decrease ?

A. On compressing a spring

B. On stretching a spring

C. On moving a body against gravitational force

D. On the rising of an air bubble in water

Answer: D

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29. A shere of mass m , moving with velocity V, enters a hanging bag of sand and stop. If the mass of the bag is M and it is reised by height h, then the velocity of the sphere will be

A. $\frac{M+m}{m}\sqrt{2gh}$

B. $\frac{M}{m}\sqrt{2gh}$

C. $\frac{m}{M+m}\sqrt{2gh}$

D. $\frac{m}{M}\sqrt{2gh}$

Answer: A

Watch Video Solution

30. Two bodies of masses m and 2m have same momentum. Their respective kinetic energies E_1 and E_2 are in the ratio

A. $1:2$

B. $2:1$

C. $1:\sqrt{2}$

D. $1:4$

Answer: B

Watch Video Solution

31. If a lighter body (mass M_1 and velocity V_1) and a heavier body (mass M_2 and velocity V_2) have the same kinetic energy, then-

A. $M_2V_2 < M_1V_1$

B. $M_2V_2 = M_1V_1$

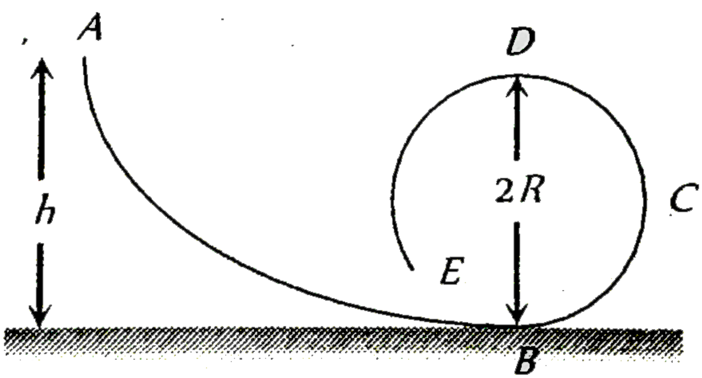
C. $M_2V_1 = M_1V_2$

D. $M_2V_2 > M_1V_1$

Answer: D

Watch Video Solution

32. A frictionless track ABCDE ends in a circular loop of radius R . A body slides down the track from point A which is at a height h = 5 cm . Maximum value of R for the body to successfully complete the loop is



A. 5cm

B. $\frac{15}{4}$ cm

C. $\frac{10}{3}$ cm

D. 2 cm

Answer: D

Watch Video Solution

33. The force constant of a weightless spring is $16Nm^{-1}$. A body of mass $1.0kg$ suspended from it is pulled down through $5cm$ and then released. The maximum energy of the system (spring + body) will be

A. $2 \times 10^{-2} J$

B. $4 \times 10^{-2} J$

C. $8 \times 10^{-2} J$

D. $16 \times 10^{-2} J$

Answer: A

Watch Video Solution

34. Two bodies with kinetix energies in the ratio of $4:1$ are moving with equal linear momentum. The ratio of their masses is

A. $1:2$

B. $1:1$

C. $4:1$

D. $1:4$

Answer: D

Watch Video Solution

35. The kinetic energy of a body becomes four times its initial value.The new linear momentum will be:

A. Becomes twice its initial value

B. Become three times its initial value

C. Become three times its initial value

D. Remains constant

Answer: A

Watch Video Solution

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

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

A. Less than that of the bullet

B. More than that of the bullet

C. Same as that of the bullet

D. Equal or less than that of the bullet

Answer: A

Watch Video Solution

37. If the water falls from a dam into a turbine wheel 19.6 m below, then the velocity of water at the turbine is $\left(g = 9.8m / s^2\right)$

A. 9.8 m//s

B. 19.6 m/s

C. 39.2 m/s

D. 98.0 m/s

Answer: B

Watch Video Solution

38. Two bodies of masses 2 m and m have their K.E. in the ratio 8 : 1, then their ratio of momenta is

A. $1:1$

B. $2:1$

C. $4:1$

D. $8:1$

Answer: C

Watch Video Solution

39. A bomb of 12 kg divides in two parts whose ratio of masses is 1 : 3. If kinetic energy of smaller part is 216 J , then momentum of bigger part in kg m / sec will be

A. 36

B. 72

C. 108

D. Data is incomplete

Answer: A

Watch Video Solution

40. A 4 kg mass and a 1 kg mass are moving with equal kinetic energies. The ratio of the magnitudes of their linear momenta is

A. $1:2$

B. $1:1$

C. $2:1$

D. $4:1$

Answer: C

Watch Video Solution

41. Two identical cylindrical vessels with their bases at the same level each, contain a liquid of density ρ. The area of either base is A but in one vessel the liquid heigth is h_1 and in the other liquid height is $h_2 (h_2 < h_1)$. If the two vessel are connected, the work done by gravity in equalizing the level is

A. $(h_1 - h_2) g\rho$

B. $(h_1 - h_2)gA\rho$

C. $\frac{1}{2}(h_1 - h_2)^2 gA\rho$

D. $\frac{1}{4}(h_1 - h_2)^2 gA\rho$

Answer: D

Watch Video Solution

42. If the increase in the kinetic energy of a body is 21%, then the increase in the momentum will be

A. 0.22

B. 0.44

C. 0.1

D. 3

Answer: C

Watch Video Solution

43. If a body of mass 200 g falls a height 200 m and its total P.E. is converted into K.E. at the point of contact of the body with earth surface. Then what is the decrease in P.E. of the body at the contact.

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

A. 200 J

B. 400 J

C. 600 J

D. 900 J

Answer: B

Watch Video Solution

44. If momentum is increased by 20% then K.E. increases by

A. 0.44

B. 0.55

C. 0.66

D. 0.77

Answer: A

Watch Video Solution

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

A. 1 J

B. 2 J

C. 3 J

D. 4 J

Answer: A

Watch Video Solution

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

A. 968 J

B. 98 J

C. 1980 J

D. None of these

Answer: B

Watch Video Solution

47. An object of 1kg mass has a momentum of 10 kg m / sec then the kinetic energy of the object will be

A. 100 J

B. 50 J

C. 1000 J

D. 200 J

Answer: B

Watch Video Solution

48. A ball is released from certain height. It loses 50% of its kinetic energy on striking the ground. It will attain a height again equal to

A. One fourth the initial height

B. Half the initial height

C. Three fourth initial height

D. None of these

Answer: B

Watch Video Solution

49. A 0.5 kg ball is thrown up with an initial speed 14 m/s and reaches a maximum height of 8.0 m . How much energy is dissipated by air drag acting on the ball during the ascent

A. 19.6 Joule

B. 4.9 Joule

C. 10 Joule

D. 9.8 Joule

Answer: D

Watch Video Solution

50. An ice cream has a marked value of 700 kcal. How may kilowatt-hour of energy will it deliver to the body as it is degested.

A. 0.81 kWh

B. 0.90 kWh

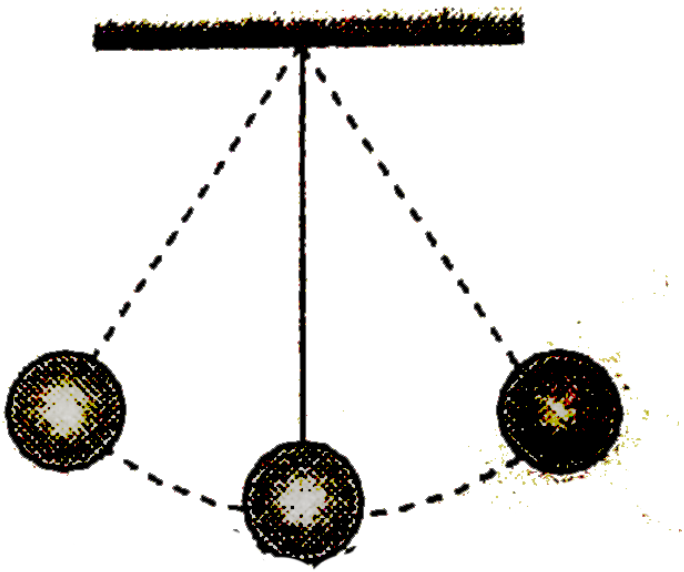
C. 1.11 kWh

D. 0.71 kWh

Answer: A

Watch Video Solution

51. What is the velocity of the bob of a simple pendulum at its mean position, if it is able to rise to vertical height of 10 cm (take $g = 9.8 m / s^2$)



A. 0.6 m/s

B. 1.4 m/s

C. 1.8 m/s

D. 2.2 m/s

Answer: B

Watch Video Solution

52. A particle of mass 'm' and charge 'q' is accelerated through a potential difference of V volt, its energy will be

A. qV

B. mqV

C. $\left(\frac{q}{m}\right)V$

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

Answer: A

Watch Video Solution

53. A man who is running has half the kinetic energy of a boy of half his mass. The man speeds up by 1 ms^{-1} and then has the same kinetic energy as the boy. The original speed of the boy was:

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

B. $(\sqrt{2}-1)m/s$

C. $\dfrac{1}{(\sqrt{2}-1)}m/s$

D. $\dfrac{1}{\sqrt{2}}m/s$

Answer: C

Watch Video Solution

54. The mass of two substance are $4gm$ and $9gm$ respectively. If their kinetic energy are the same, then the ratio of their momrntum will be

A. $4:9$

B. $9:4$

C. $3:2$

D. $2:3$

Answer: D

Watch Video Solution

55. If the momentum of a body is increased by 100%, then the percentage increase in the kinetic energy is

A. 1.5

B. 2

C. 2.25

D. 3

Answer: D

Watch Video Solution

56. If a body looses half of its velocity on penetrating 3 cm in a wooden block, then how much will it penetrate more before coming to rest?

A. 1cm

B. 2 cm

C. 3 cm

D. 4 cm

Answer: A

Watch Video Solution

57. A bomb of mass $9kg$ explodes into 2 pieces of mass $3kg$ and $6kg$. The velocity of mass $3kgis1.6m/s$. The $K.E.ofmass6kg$ is

A. 3.84 J

B. 9.6 J

C. 1.92 J

D. 2.92 J

Answer: C

Watch Video Solution

58. Two masses of 4kg and 16kg are moving with equal K.E. The ratio of magnitude of the linear momentum is

A. $1:2$

B. $1:4$

C. $1:\sqrt{2}$

D. $\sqrt{2}:1$

Answer: A

Watch Video Solution

59. A machine which is 75 percent efficient, uses 12 joules of energy in lifting up a 1 kg mass through a certain distance. The mass is then allowed to fall through that distance. The velocity at the end of its fall is (in ms^{-1})

A. $\sqrt{24}$

B. $\sqrt{32}$

C. $\sqrt{18}$

D. $\sqrt{9}$

Answer: C

Watch Video Solution

60. Two bodies moving towards each other collide and move away in opposite directions. There is some rise in temperature of bodies because a part of the kinetic energy is converted into

A. Heat energy

B. Electrical energy

C. Nuclear energy

D. Mechanical energy

Answer: A

Watch Video Solution

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

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

C. $\dfrac{F^2t^2}{3m}$

D. $\dfrac{Ft}{2m}$

Answer: B

Watch Video Solution

62. The potential energy of a weight less spring compressed by a distance a is proportional to

A. a

B. a^2

C. a^{-2}

D. a^0

Answer: B

Watch Video Solution

63. Two identical blocks A and B, each of mass m resting on smooth floor are connected by a light spring of natural length L and spring constant k, with the spring at its natural length. A third identical block C (mass m) moving with a speed v along the line joining A and B collides with A. The maximum compression in the spring is

A. $v\sqrt{\frac{m}{2k}}$

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

C. $\sqrt{\frac{mv}{k}}$

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

Answer: A

Watch Video Solution

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

A. $4:1$

B. $1:1$

C. $1:2$

D. $1:4$

Answer: C

Watch Video Solution

65. 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. m_1 / m_2

B. 1

C. $m_1 v_2 / m_2 v_1$

D. m_2 / m_1

Answer: D

Watch Video Solution

66. The kinetic energy of a body of mass 3 kg and momentum 2 Ns is

A. 1 J

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

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

D. 4 J

Answer: B

Watch Video Solution

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

A. 1.07 kJ

B. 2.14 kJ

C. 2.4 kJ

D. 4.8kJ

Answer: D

Watch Video Solution

68. A bullet moving with a speed of $100 ms^{-1}$ can just penetrate into two planks of equal thickness. Then the number of such planks, if speed is doubled will be .

A. 4

B. 8

C. 6

D. 10

Answer: B

Watch Video Solution

69. 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. $E_1 < E_2$

B. $\frac{E_1}{E_2} = \frac{m_1}{m_2}$

C. $E_1 > E_2$

D. $E_1 = E_2$

Answer: A

Watch Video Solution

70. 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. $1:4$

C. $1:2$

D. $1:\sqrt{2}$

Answer: C

Watch Video Solution

71. Four particles given have same momentum which has maximum kinetic energy

A. Proton

B. Electron

C. Deutron

D. α- particles

Answer: B

Watch Video Solution

72. A body moving with velocity v has momentum and kinetic energy numerically equal. What is the value of v?

A. 2m/s

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

C. 1 ,m/s

D. 0.2 m/s

Answer: A

Watch Video Solution

73. If a man increase his speed by 2m/s, his K.E. is doubled, the original speed of the man is

A. $\left(1+2\sqrt{2}\right)m/s$

B. 4m/s

C. $(2+2\sqrt{2})$ m/s

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

Answer: C

Watch Video Solution

74. An object of mass 3m splits into three equal fragments. Two fragments have velocities $v\hat{j}$ and $v\hat{i}$. The velocity of the third fragment is

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

B. $v\left(\hat{i}-\hat{j}\right)$

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

D. $\dfrac{v\left(\hat{i}+\hat{j}\right)}{\sqrt{2}}$

Answer: C

Watch Video Solution

75. A bomb is kept stationary at a point. It suddenly explodes into two fragments of masses 1 g and 3 g. the total K.E. of the gragments is $6.4 \times 10^4 J$. What is the K.E. of the smaller fragment

A. $2.5 \times 10^4 J$

B. $3.5 \times 10^4 J$

C. $4.8 \times 10^4 J$

D. $5.2 \times 10^4 J$

Answer: C

Watch Video Solution

76. Which among the followinig, is a form of energy

A. Light

B. Pressure

C. Momentum

D. Power

Answer: A

Watch Video Solution

77. A body is moving with a velocity v , breaks up into two equal parts. One of the part retraces back with velocity v . Then the velocity of the other part is

A. v in forward direction

B. 3v in forward direction

C. v in backward direction

D. 3v in backward direction

Answer: B

Watch Video Solution

78. If a shell fired from a cannon, explodes in mid air, then

A. Its total kinetic energy increases

B. Its total momentum increases

C. Its total momentum decreases

D. None of these

Answer: A

Watch Video Solution

79. A particle of mass m moving with velocity V_0 stick a simple pendulum of mass m and stick to it. The maximum height attained by the pendulum will be

A. $h = \frac{V_0^2}{8g}$

B. $\sqrt{V_0 g}$

C. $2\sqrt{\frac{V_0}{g}}$

D. $\frac{V_0^2}{4g}$

Answer: A

Watch Video Solution

80. Masses of two substances are 1 g and 9 g respectively. If their kinetic energies are same, then the ratio of their momentum will be

A. $1:9$

B. $9:1$

C. $3:1$

D. $1:3$

Answer: D

Watch Video Solution

81. 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 $10\,\text{sec}$. The increase in its kinetic energy.

A. 2.8 Joule

B. 3.2 Joule

C. 3.8 Joule

D. 4.4 Joule

Answer: D

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

A. 0.0001

B. 0.0002

C. 0.0004

D. 0.0008

Answer: B

Watch Video Solution

83. 1 a.m.u is equivalent to

A. 1.6×10^{-12} Joule

B. 1.6×10^{-19} Joule

C. 1.5×10^{-10} Joule

D. 1.5×10^{-19} Joule

Answer: C

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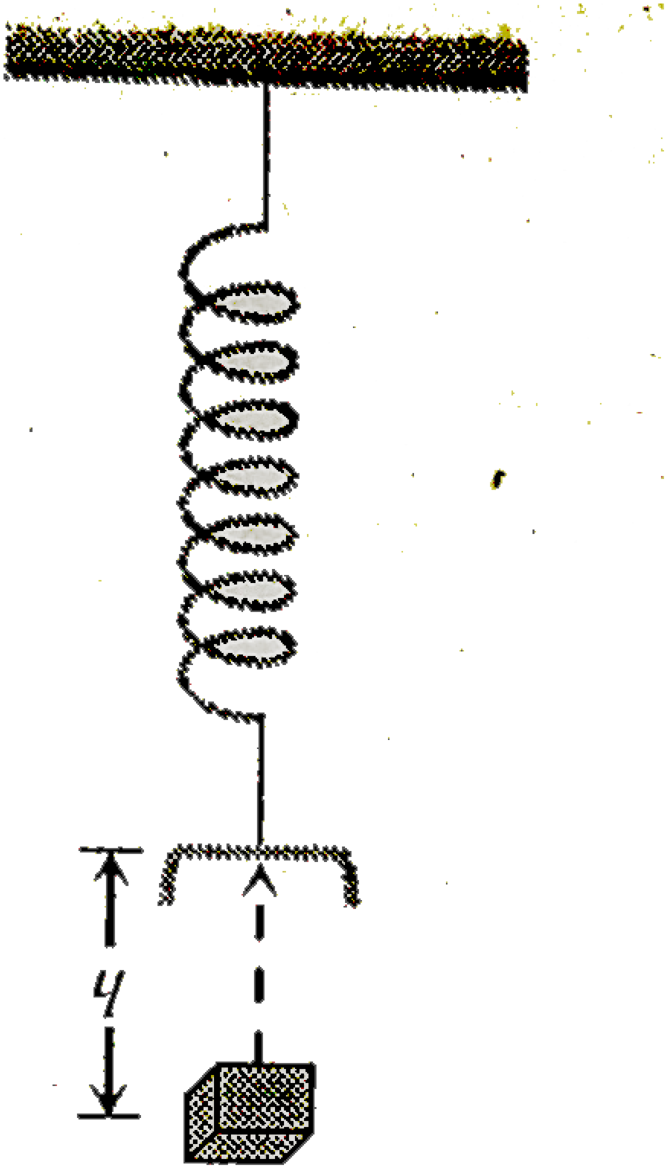


84.

A block of mass m initially at rest is dropped from a height h on to a spring of force constant k . the maximum compression in the spring is x

then

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

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

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

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

Answer: B

Watch Video Solution

85. A spherical ball of mass $20kg$ is stationary at the top of a hill of height $100m$, it rolls down a smooth surface to the ground , then climbs up another bill of height of $30m$ and final rolls down to a horizontal base at a height of $20m$ about the ground . The velocity attained by the ball is

A. 10 m/s

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

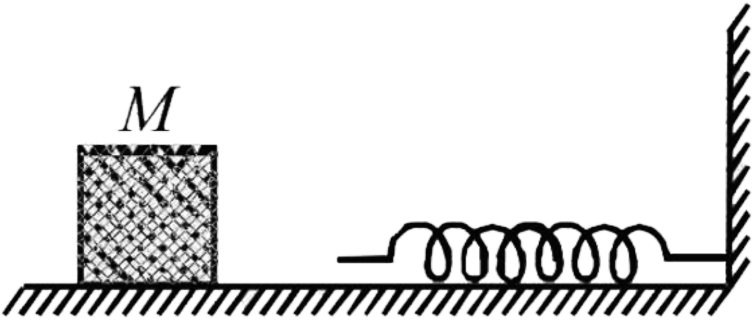
C. 40 m/s

D. 20 m/s

Answer: C

Watch Video Solution

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



A. Zero

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

C. $\sqrt{MKL}$

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

Answer: C

Watch Video Solution

87. 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. 256 J

B. 486 J

C. 524 J

D. 324 J

Answer: B

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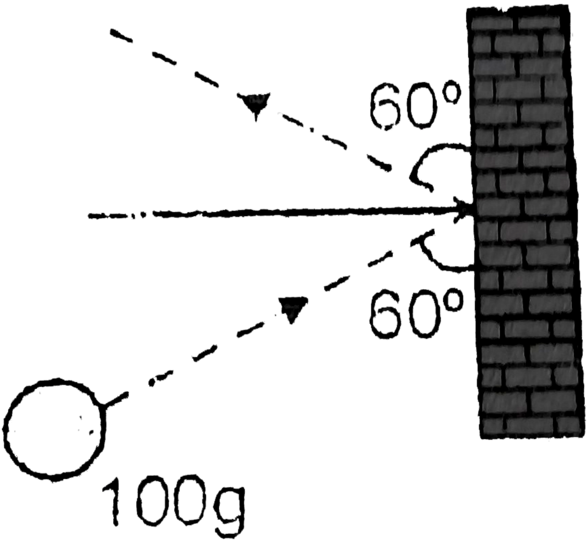
Ordinary Thinking Objective Questions Power

1. A mass of 100 g strikes the wall with speed $5m/s$ at an angle as shown in figure and it rebounds with the same speed it the contact time is 2×10^{-3} sec. What is the force applied on the mass by the wall :



A. $250\sqrt{3}$ N to right

B. 250 N to right

C. $250\sqrt{3}$ N to left

D. 250 N to left

Answer: C

Watch Video Solution

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

A. $F \times v$

B. F/v

C. F / v^2

D. $F \times v^2$

Answer: A

Watch Video Solution

3. A body of mass m accelerates uniformly from rest to v_1 in time v_2. As a function of time t, the instantaneous power delivered to the body is

A. $\frac{mv_1t}{t_1}$

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

C. $\frac{mv_1t^2}{t_1}$

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

Answer: D

Watch Video Solution

4. A man is riding on a cycle with velocity $7.2\frac{km}{hr}$ up a hill having a slope 1 in 20. The total mass of the man and cycle is 100kg. The power of the man is

A. 200 W

B. 175 W

C. 125 W

D. 98 W

Answer: D

Watch Video Solution

5. A 12 HP motor has to be operated 8 hours / day . How much will it cost at the rate of 50 paisa / kWh in 10 days

A. Rs.350 /-

B. Rs.358/-

C. Rs.375/-

D. Rs.397/-

Answer: B

Watch Video Solution

6. A motor boat is travelling with a speed of $3.0 m / sec$. If the force on it due to water flow is $500 N$, the power of the boat is

A. 150 kW

B. 15 kW

C. 1.5 kW

D. 150 W

Answer: C

Watch Video Solution

7. An electric motor exerts a force of 40 N on a cable and pulls it by a distance of 30 m in one minute. The power supplied by the motor (in Watts) is

A. 20

B. 200

C. 2

D. 10

Answer: A

Watch Video Solution

8. An electric motor creates a tension of 4500 newton in a hoisting cable and reels it at the rate of $2m/s$. What is the power of the motor ?

A. 15 kW

B. 9 kW

C. 225 W

D. 9000 HP

Answer: B

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9. A weight lifter lifts 300kg from the ground to a height of 2 meter in 3 second . The average power generated by him is

A. 5880 watt

B. 4410 watt

C. 2205 watt

D. 1960 watt

Answer: D

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10. If a force $\overrightarrow{F} = 5\hat{i} + 5\hat{j} + 6\hat{k}$ causes a displacement $\overrightarrow{s} = 3\hat{i} + 6\hat{j} + 2\hat{k}$ work done is

Watch Video Solution

11. An engine develops 10 kW of power. How much time will it take to lift a mass of 200 kg to a height of 40 m ($g = 10\frac{m}{\sec^2}$)`?

A. 4 sec

B. 5 sec

C. 8 sec

D. 10 sec

Answer: C

Watch Video Solution

12. 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

13. The average power required to lift a 100 kg mass through a height of 50 metres in approximately 50 seconds would be

A. 50 J/s

B. 5000 J/s

C. 100 J/s

D. 980 J/s

Answer: D

Watch Video Solution

14. 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. 100 kW

B. 10 kW

C. 1kW

D. 1000 kW

Answer: A

Watch Video Solution

15. The power of pump, which can pump 200 kg of water to height of 200 m in 10 s $\left(g=10(m)/\left(s^{2}\right)\right)$

A. 40 kw

B. 80kW

C. 400 kW

D. 960 kW

Answer: A

Watch Video Solution

16. A 10 H.P. motor pumps out water from a well of depth 20 m and fills a water tank of volume 22380 litres at a height of 10 m from the ground. The running time of the motor to fill the empty water tank is $(g = 10ms^{-2})$

A. 5 minutes

B. 10 minutes

C. 15 minutes

D. 20 minutes

Answer: C

Watch Video Solution

17. A car of mass 1250 kg is moving at $30(m)/(s)$. Its engine delivers 30 kW while resistive force due to surface is 750 N. What maximum acceleration can be given to the car

A. $\frac{1}{3}m/s^2$

B. $\frac{1}{4} m / s^2$

C. $\frac{1}{5} m / s^2$

D. $\frac{1}{6} m / s^2$

Answer: C

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18. A force applied by an engine of a train of mass 2.05×10^6kg changes its velocity from 5 m/s to 25 m/s in 5 minutes. The power of the engine is

A. 1.025 MW

B. 2.05 MW

C. 5 MW

D. 6 MW

Answer: B

Watch Video Solution

19. A truck of mass 30,000 kg moves up an inclined plane of slope 1 in 100 at a speed of 30 kmph . The power of the truck is $(g = 10ms^{-1})$

A. 25 kW

B. 10 kW

C. 5 kW

D. 2.5 kW

Answer: A

Watch Video Solution

20. A 60 kg man runs up a staircase in 12 seconds while 50 kg man runs up the same staircase in 11, seconds, the ratio of the rate of doing their work is

A. $6:5$

B. $12:11$

C. $11:10$

D. $10:11$

Answer: C

Watch Video Solution

21. A pump motor is used to deliver water at a certain rate from a given pipe. To obtain 'n' times water from the same pipe in the same time by what amount (a) the force and (b) power of the motor should be increased ?

A. 16 times

B. 4 times

C. 8 times

D. 2 times

Answer: C

Watch Video Solution

22. What average horsepower is developed by an 80 kg man while climbing in 10 s a flight of stairs that rises 6 m vertically

A. 0.63 HP

B. 1.26 HP

C. 1.8 HP

D. 2.1 HP

Answer: A

Watch Video Solution

23. A car of mass 1000 kg accelerates uniformly from rest to a velocity of 15 m/s in 5 sec. The average power of the engine during this period in watts is :

A. 2000 W

B. 22500 W

C. 5000 W

D. 2250 W

Answer: B

Watch Video Solution

24. A quarter horse power motor runs at a speed of 600 r . p . 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

25. An engine pumps up $100kg$ water through a height of $10m$ in $5s$. If efficiency of the engine is 60%. What is the power of the engine? $Take g = 10ms^2$.

A. 3.3 kW

B. 0.33 kW

C. 0.033 kW

D. 33 kW

Answer: A

Watch Video Solution

26. A force $2\hat{i} + 3\hat{j} + 4\hat{k}$ N acts on a body for 4 sec, produces a displacement of $\left(3\hat{i} + 4\hat{j} + 5\hat{k}\right)$m. the power used is

A. 9.5 W

B. 7.5 W

C. 6.5 W

D. 4.5 W

Answer: A

Watch Video Solution

27. The power of pump, which can pump 200 kg of water to a height of 50 m in 10 sec, will be

A. 10×10^3 watt

B. 20×10^3 watt

C. 4×10^3 watt

D. 60×10^3 watt

Answer: A

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28. From an automatic gun a man fires 360 bullet per minute with a speed of 360 km/hour. If each weighs 20 g, the power of the gun is

A. 600 W

B. 300 W

C. 150 W

D. 75 W

Answer: A

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29. An engine pumps liquid of density d continuosly through a pipe of cross-section are A. If the speed with which liquid passes through the pipe is v, then the rate at which kinetic energy is being imparted to the liquid by the pump is

A. $\frac{1}{2}A\rho v^3$

B. $\frac{1}{A\rho v^2}$

C. $\frac{1}{2}A\rho v$

D. $A\rho v$

Answer: A

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30. If the heart pushes 1 cc of blood in one second under pressure 20000 N/m 2 the power of heart is

A. 0.02 W

B. 400 W

C. 5×10 W

D. 0.2 W

Answer: A

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31. A man does a given amount of work in 10 sec. Another man does the same amount of work in 20 sec. The ratio of the output power of first man to the second man is

A. 1

B. 1//2

C. 2//1

D. None of these

Answer: C

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Ordinary Thinking Objective Questions Elastic And Inelastic Collision

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

A. 1

B. 0

C. ∞

D. -1

Answer: A

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2. The principle of conservation of linear momentum can be strictly applied during a collision between two particles provided the time of impact is

A. Extremely small

B. Moderately small

C. Extremely large

D. Depends on a particular case

Answer: A

Watch Video Solution

3. A shell initially at rest explodes into two pieces of equal mass, then the two pieces will

A. Be at rest

B. Move with different velocities in different directions

C. Move with the same velocity in opposite directions

D. Move with the same velocity in same direction

Answer: C

Watch Video Solution

4. Sphere A of mass 'm' moving with a constant velocity u hits another stationary sphere B of the same mass. If e is the co-efficient of restitution, then ratio of velocities of the two spheres $v_A : v_B$ after collision will be :

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

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

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

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

Answer: A

Watch Video Solution

5. The solid rubber balls A and B having masses 200 and 400 gm respectively are moving in opposite directions with velocity of A equal to 0.3 m / s . After collision the two balls come to rest, then the velocity of B is

A. 0.15 m/sec

B. 1.5 m/sec

C. $-0.15 \frac{m}{\sec}$

D. None of the above

Answer: C

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6. Two perfectly elastic particles A and B of equal masses travelling along a line joining them with velocities $15m/s$ and $10m/s$ respectively collide. Their velocities after the elastic collision will be (in m/s) respectively

A. 0, 25

B. 5, 25

C. 10, 15

D. 20, 5

Answer: C

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7. A cannot ball is fired with a velocity 200m / sec at an angle of 60^{o} with the horizontal. At the highest point of its flight it explodes into 3 equal fragments, one going vertically upwards with a velocity 100 m / sec , the second one falling vertically downwards with a velocity 100 m / sec . The third fragment will be moving with a velocity

A. 100 m/s in the horizontal direction

B. 300 m/s in the horizontal direction

C. 300 m/s in a direction making an angle of 60° with the horizontal

D. 200 m/s in a direction making an angle of 60° with the horizontal

Answer: B

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8. A lead ball strikes a wall and falls down, a tennis ball having the same mass and velocity strikes the wall and bounces back. Check the correct statement

A. The momentum of the lead ball is greater than that of the tennis ball

B. The lead ball suffers a greater change in momentum compared with the tennis ball

C. The tennis ball suffers a greater change in momentum as compared with the lead ball

D. Both suffer an equal change in momentum

Answer: C

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9. When two bodies collide elastically, then

A. Kinetic energy of the system alone is conserved

B. Only momentum is conserved

C. Both energy and momentum are conserved

D. Neither energy nor momentum is conserved

Answer: C

Watch Video Solution

10. Two ball at the same temperature collide which is conserved?

A. Temperature

B. Velocity

C. Kinetic energy

D. Momentum

Answer: D

Watch Video Solution

11. A body of mass 5 kg explodes at rest into three fragments with masses in the ratio 1 : 1 : 3. The fragments with equal masses fly in mutually perpendicular directions with speeds of 21 m/s.

The velocity of the heaviest fragment will be -

A. $11.5m / s$

B. $14.0m / s$

C. $7.0m / s$

D. $9.89m / s$

Answer: D

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12. A heavy steel ball of mass greater than 1 kg moving with a speed of 2 m $\sec^{-1}$ collides head on with a stationary ping-pong ball of mass less than 0.1 gm. The collision is elastic. After the collision the ping-pong ball moes approximately with speed

A. $2m\sec^{-1}$

B. $4m\sec^{-1}$

C. $2 \times 10^4 m\sec^{-1}$

D. $2 \times 10^3 m\sec^{-1}$

Answer: B

Watch Video Solution

13. A body of mass M collides against a wall with a velocity v and retraces its path with the same speed. The change in momentum is (take initial direction of velocity as positive)

A. Zero

B. 4Mv

C. Mv

D. -2 Mv

Answer: D

Watch Video Solution

14. A gun fires a bullet of mass $50g$ with a velociy of $30m/s$. Due to this, the gun is pushed back with a velocity of $1m/s$, then the mass of the gun is :

A. 15 kg

B. 30 kg

C. 1.5 kg

D. 20 kg

Answer: C

Watch Video Solution

15. In an elastic collision between two particles

A. Momentum of each particle

B. Speed of each particle

C. Kinetic energy of each particle

D. Total kinetic energy of both the particles

Answer: D

Watch Video Solution

16. which a U^{238} nucleus original at rest , decay by emitting an alpha particle having a speed u , the recoil speed of the residual nucleus is

A. $-4v/234$

B. $v/4$

C. $-4v/238$

D. $4v/238$

Answer: A

Watch Video Solution

17. A smooth sphere of mass M moving with velocity u directly collides elastically with another sphere of mass m at rest. After collision their final velocities are V and v respectively. The value of v is

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

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

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

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

Answer: C

Watch Video Solution

18. A body of mass m having an initial velocity v , makes head on collision with a stationary body of mass M . After the collision, the body of mass m comes to rest and only the body having mass

M moves. This will happen only when

A. $m > > M$

B. $m < < M$

C. $m = M$

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

Answer: C

Watch Video Solution

19. 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. $\overrightarrow{V}$

B. $-\overrightarrow{V}$

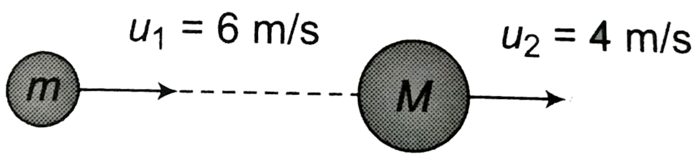
C. $-2\overrightarrow{V}$

D. Zero

Answer: D

Watch Video Solution

20. A particle of mass m moving with horizontal speed $6m/s$ as shown in the figure. If $m < < M$ then for one - dimensional elastic collision , the speed of lighter particle after collision will be



A. 2m/sec in original direction

B. 2 m/sec opposite to the original direction

C. 4 m/sec opposite to the original direction

D. 4 m/sec in original direction

Answer: A

Watch Video Solution

21. 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. v

B. 2v

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

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

Answer: D

Watch Video Solution

22. 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. $+4m/s$ for both

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

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

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

Answer: D

Watch Video Solution

23. A rubber ball is dropped from a height of $5m$on a plane, where the acceleration due to gravity is not shown. On bouncing it rises to $1.8m.$ The ball loses its velocity on bouncing by a factor of

A. $16/25$

B. $2/5$

C. $3/5$

D. $9/25$

Answer: B

Watch Video Solution

24. A metal ball falls from a height of 32 metre on a steel plate. If the coefficient of restitution is 0.5, to what height will the ball rise after second bounce

A. 2m

B. 4m

C. 8 m

D. 16m

Answer: A

Watch Video Solution

25. At high altitude , a body explodes at rest into two equal fragments with one fragment receiving horizontal velocity of $10m/s$. Time taken by the two radius vectors connecting of explosion to fragments to make 90° is

A. 10s

B. 4s

C. 2s

D. 1s

Answer: C

Watch Video Solution

26. A ball of mass 10 kg is moving with a velocity of 10 m / s . It strikes another ball of mass 5 kg which is moving in the same direction with a velocity of 4 m / s . If the collision is elastic, their velocities after the collision will be, respectively

A. 6 m/s, 12 m/s

B. 12 m/s, 6 m/s

C. 12 m/s, 10 m/s

D. 12 m/s, 25 m/s

Answer: A

Watch Video Solution

27. 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. 8N

B. $2 \times 10^4 N$

C. 4N

D. $10^4 N$

Answer: B

Watch Video Solution

28. 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. 0.6 m

B. 0.4 m

C. 1m

D. 0.36m

Answer: D

Watch Video Solution

29. A ball is dropped from a height h . If the coefficient of restitution be e , then to what height will it rise after jumping twice from the ground

A. $eh/2$

B. 2eh

C. eh

D. e^4h

Answer: D

Watch Video Solution

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

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

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

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

Answer: B

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31. 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. $10ms^{-1}$

B. $5ms^{-1}$

C. $2.5ms^{-1}$

D. $1.0ms^{-1}$

Answer: B

Watch Video Solution

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

A. 0.48 kg-m/s

B. 0.24 kg -m/s

C. 0.81 kg -m/s

D. Zero

Answer: A

Watch Video Solution

33. A ball of mass m falls vertically to the ground from a height h_1 and rebound to a height h_2. The change in momentum of the ball on striking the ground is.

A. $mg(h_1 - h_2)$

B. $m\left(\sqrt{2gh_1} + \sqrt{gh_2}\right)$

C. $m\sqrt{2g(h_1+h_2)}$

D. $m\sqrt{2g}(h_1+h_2)$

Answer: B

Watch Video Solution

34. A body of mass $50kg$ is projected vertically upward with velocity of $100m/s$. After $5s$ this body breaks into $20kg$ and $30kg$. If the $20kg$ piece travels upwards with $150m/s$, then the velocity of other block will be

A. 15 m/sec downwards

B. 15 m/sec upwards

C. 51 m/sec downwards

D. 51 m/sec upwards

Answer: A

Watch Video Solution

35. A steel ball of radius $2cm$ is at rest on a frictionless surface. Another ball of radius $4cm$ moving at a velocity of $81cm / see$ collides elast cally with first ball. After collision the smaller ball moves with speed of

A. 81 cm/sec

B. 63 cm/sec

C. 144 cm/sec

D. None of these

Answer: C

Watch Video Solution

36. A space craft of mass M is travelling in space with velocity v. It then breaks up into two parts such that the smaller part m comes to the rest, then the velocity of the remaining part is-

A. $\dfrac{MV}{M-m}$

B. $\dfrac{MV}{M+m}$

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

D. $\dfrac{(M+n)V}{m}$

Answer: A

Watch Video Solution

37. A ball hits a vertical wall horizontal at 10 m/s bounces back at 10 m/s

A. There is no acceleration because $10\frac{m}{s} - 10\frac{m}{s} = 0$

B. There may be an acceleration because its initial direction is horizontal

C. There is an acceleration because there is a momentum change

D. Even though there is no change in momentum there is a change in direction. Hence it has an acceleration

Answer: C

Watch Video Solution

38. A bullet of mass 50 gram is fired from a 5 kg gun with a velocity of 1 km/s . the speed of recoil of the gun is

A. 5 m/s

B. 1 m/s

C. 0.5 m/s

D. 10 m/s

Answer: D

Watch Video Solution

39. A body falling from a height of 10m rebounds from hard floor. If it loses 20% energy in the impact, then coefficient of restitution is

A. 0.89

B. 0.56

C. 0.23

D. 0.18

Answer: A

Watch Video Solution

40. A body of mass m_1 moving with a velocity $3m / s$ collides with another body at rest of m_2. After collision the velocities of the two bodies are $2m/s$ and $5m/s$, respectively , along the direction of motion of m_1. The ratio m_1/m_2 is

A. $\frac{5}{12}$

B. 5

C. $\frac{1}{5}$

D. $\frac{12}{5}$

Answer: B

Watch Video Solution

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

A. 100 N

B. 10 N

C. 0.1 N

D. 1.0 N

Answer: B

Watch Video Solution

42. Two bodies having same mass 40 kg are moving in opposite direction. One with a velocity of 10 m/s and the other will 7m/s. if they collide nd move as one body, the velocity of the combination is

A. 10 m/s

B. 7 m/s

C. 3 m/s

D. 1.5 m/s

Answer: D

Watch Video Solution

43. A body at rest breaks up into 3 parts. If 2 parts having equal masses fly off perpendicularly each after with a velocity of $12m/s$ when the velocity of the third part which has $3 \times$ mass of each part is

A. u$4\sqrt{2}m/s$ at an angle of 45° from each body

B. $24\sqrt{2}m / s$ at angle of 135° from each body

C. $6\sqrt{2}m / s$ at 135° from each body

D. $4\sqrt{2}m / s$ at 135° from each body

Answer: D

Watch Video Solution

44. A partical 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

45. The 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 elastic

A. Both A and B rise to the same height

B. Both A and B come to rest at B

C. Both A and B move with the same velocity of A

D. A comes to rest and B moves with the velocity of A

Answer: D

View Text Solution

46. A big ball of mass M , moving with velocity u strikes a small ball of mass m , which is at rest. Finally small ball obtains velocity u and big ball v . Then what is the value of v

A. $\frac{M-m}{M+m}u$

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

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

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

Answer: A

Watch Video Solution

47. A body of mass 5 kg moving with a velocity 10 m/s collides with another body of the mass 20 kg at rest, and comes to rest. The velocity of the second body due to collision is

A. 2.5 m/s

B. 5 m/s

C. 7.5 m/s

D. 10 m/s

Answer: A

Watch Video Solution

48. A ball of mass m moving with velocity V, makes a head on elastic collision with a ball of the same moving with velocity $2V$ towards it.

Taking direction of V as positive velocities of the two balls after collision are.

A. $-V$ and $2V$

B. 2V and -V

C. V and -2 V

D. $-2V$ and V

Answer: D

Watch Video Solution

49. A body of mass M_1 collides elastically with another mass M_2 at rest. There is maximum transfer of energy when :

A. $M_1 > M_2$

B. $M_1 < M_2$

C. $M_1 = M_2$

D. Same for all values of M_1 and M_2

Answer: C

Watch Video Solution

50. A body of mass $2kg$ makes an elastic head - on collision another body at rest and continues to move in the original direction with one fourth of its original speed . The mass of the second body which collides with the first body is

A. 2 kg

B. 1.2 kg

C. 3 kg

D. 1.5 kg

Answer: B

Watch Video Solution

51. In the elastic collision of objects

A. Only momentum remains constant

B. Only K.E. remains constant

C. Both remains constant

D. None of these

Answer: C

Watch Video Solution

52. Two particles having position verctors $\overrightarrow{r}_1 = \left(3\hat{i} + 5\hat{j}\right)$ metres and $\overrightarrow{r}_2 = \left(-5\hat{i} - 3\hat{j}\right)$ metres are moving with velocities

$\overrightarrow{v}_1 = \left(4\hat{i} + 3\hat{j}\right) m/s$ and $\overrightarrow{v}_2 = \left(\alpha\hat{i} + 7\hat{j}\right) m/s$

. If they collide after 2 seconds, the value of α is

A. 2

B. 4

C. 6

D. 8

Answer: D

Watch Video Solution

53. A neutron makes a head-on elastic collision with a stationary deuteron. The fraction energy loss of the neutron in the collision is

A. $16/81$

B. $8/9$

C. $8/27$

D. $2/3$

Answer: B

Watch Video Solution

54. A body of mass m is at rest. Another body of same mass moving with velocity V makes head on elastic collision with the first body. After collision the first body starts to move with velocity

A. V

B. 2V

C. Remain at rest

D. No predictable

Answer: A

Watch Video Solution

55. A body of mass M moves with velocity v and collides elasticity with another body of mass $m(M > > m)$ at rest , then the velocity of the body of mass m is

A. v

B. 2v

C. $v/2$

D. Zero

Answer: B

Watch Video Solution

56. Four smooth steel balls of equal mass at rest are free to move along a straight line without friction. The first ball is given a velocity of 0.4 m/s . It collides head on with the second elastically, the second one similarly with the third and so on. The velocity of the last ball is

A. 0.4m/s

B. 0.2 m/s

C. 0.1 m/s

D. 0.05 m/s

Answer: A

Watch Video Solution

57. A space craft of mass .M. and moving with velocity .v. suddenly breaks in two pieces of same mass m. After the explosion one of the mass .m. becomes stationary. What is the velocity of the other part of craft

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

B. v

C. $\frac{Mv}{m}$

D. $\frac{M-m}{m}v$

Answer: A

View Text Solution

58. 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. 1

B. $\frac{v_A - v_B}{v_A + v_B}$

C. $(m_A + m_B) / m_A$

D. v_A / v_B

Answer: A

Watch Video Solution

59. A ball is allowed to fall from a height of 10m . If there is 40% loss of energy due to impact, then after one impact ball will go up to

A. 10 m

B. 8 m

C. 4 m

D. 6 m

Answer: D

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60. Which of the following statements is true ?

A. In elastic collisions, the momentum is conserved but not in inelastic collisions

B. Both kinetic energy and momentum are conserved in elastic as well as inelastic collisions

C. Total kinetic energy is not conserved but momentum is conserved in inelastic collisions

D. Total kinetic energy is conserved in elastic collisions but momentum is not conserved in elastic collisions

Answer: C

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61. A tennis ball dropped from a height of 2 m rebounds only 1.5 metre after hitting the ground. What fraction of energy is lost in the impact?

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

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

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

D. $\frac{1}{8}$

Answer: A

Watch Video Solution

62. A body of mass m moving with velocity v makes a head-on collision with another body of mass 2 m which is initially at rest. The loss of kinetic energy of the colliding body (mass m) is

A. $\frac{1}{2}$ of its initial kinetic energy

B. $\frac{1}{9}$ of its initial kinetic energy

C. $\frac{8}{9}$ of its initial kinetic energy

D. $\frac{1}{4}$ of its initial kinetic energy

Answer: C

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63. The quantities remaining constant in colision are

A. Momentum, kinetic energy and temperature

B. Momentum and kinetic energy but not temperature

C. Momentum and temperature but not kinetic energy

D. Momentum but neither kinetic energy nor temperature

Answer: D

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64. 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. 80 m

B. 40 m

C. 60 m

D. 20 m

Answer: A

Watch Video Solution

65. A ball is projected vertically down with an initial velocity from a height of $20m$ onto a horizontal floor. During the impact it loses 50% of its energy and rebounds to the same height. The initial velocity of its projection is

A. $20ms^{-1}$

B. $15ms^{-1}$

C. $10ms^{-1}$

D. $5ms^{-1}$

Answer: A

Watch Video Solution

66. A tennis ball is released from height h above ground level. If the ball makes inelastic collision with the ground, to what height will it rise after third collision

A. he^{6}

B. $e^{2}h$

C. $e^{3}h$

D. None of these

Answer: A

Watch Video Solution

67. A mass .m. moves with a velocity .v. and collides inelastically with another identical mass. After collision the 1st mass moves with velocity $\frac{v}{\sqrt{3}}$ in a direction perpendicular to the initial direction of motion. Find the speed of the 2^{nd} mass after collision

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

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

C. v

D. $\sqrt{3}v$

Answer: A

View Text Solution

68. A sphere collides with another sphere of identical mass. After collision, the two spheres move. The collision is inelastic. Then the angle between the directions of the two spheres is

A. 90°

B. 0°

C. 45°

D. Different from 90°

Answer: D

View Text Solution

Ordinary Thinking Objective Questions Perfectly Inelastic Collision

1. A particle of mass m moving eastward with a velocity V collides with another particle of same mass moving northwards with the same speed V. The two particles coalesce and the new particle moves in NE direction. Calculate magnitude and direction of velocity of new particle.

A. $v/2$

B. 2v

C. $v/\sqrt{2}$

D. v

Answer: C

Watch Video Solution

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

A. 1

B. 0

C. ∞

D. -1

Answer: B

Watch Video Solution

3. When two bodies stick together after collision, the collision is said to be

A. Partially elastic

B. Total elastic

C. Total inelastic

D. None of the above

Answer: C

Watch Video Solution

4. 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. $\frac{c}{a+b}\cdot b$

B. $\frac{a}{a+c}\cdot b$

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

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

Answer: B

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5. A mass of 10 gm moving with a velocity of 100 cm / s strikes a pendulum bob of mass 10 gm . The two masses stick together. The maximum height reached by the system now is $(g = 10 m / s^2)$

A. Zero

B. 5 cm

C. 2.5 cm

D. 1.25 cm

Answer: D

Watch Video Solution

6. A completely inelastic collision is one in which the two colliding particles

A. Are separated after collision

B. Remain together after collision

C. Split into small fragments flying in all directions

D. None of the above

Answer: B

Watch Video Solution

7. 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. Momentum and kinetic energy both conserved

B. Only kinetic energy is conserved

C. Only momentum is conserved

D. Neither momentum nor kinetic energy is conserved

Answer: C

Watch Video Solution

8. 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. $1/4$

B. $1/3$

C. $2/3$

D. $3/4$

Answer: C

Watch Video Solution

9. A body of mass m moving with a constant velocity v hits another body of the same mass moving with the same velocity v but in the opposite direction and sticks to it. The velocity of the compound body after collision is

A. v

B. 2v

C. Zero

D. $v/2$

Answer: C

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10. In the above question, if another body is at rest, then velocity of the compound body after collision is

A. $v/2$

B. 2v

C. v

D. Zero

Answer: A

Watch Video Solution

11. A bag (mass M) hangs by a long thred and a bullet (mass m) comes horizontally with velocity v and gets caught in the bag. Then for the combined (bag+bullet) system -

A. Momentum is $\frac{mvM}{M+m}$

B. Kinetic energy is $\frac{mv^2}{2}$

C. Momentum is $\frac{mv(M+m)}{M}$

D. Kinetic energy is $\frac{m^2v^2}{2(M+m)}$

Answer: D

Watch Video Solution

12. A 50 g bullet moving with velocity 10 m / s strikes a block of mass 950 g at rest and gets embedded in it. The loss in kinetic energy will be

A. $100\,\%$

B. $95\,\%$

C. $5\,\%$

D. $50\,\%$

Answer: B

Watch Video Solution

13. Two putty balls of equal mass moving with equal velocity in mutually perpendicular direction, stick together after collision. If the balls were initially moving with a velocity of $45\sqrt{2}jms^{-1}$ each, the velocity of their combined mass after collision is

A. $45\sqrt{2}ms^{-1}$

B. $45ms^{-1}$

C. $90ms^{-1}$

D. $22.5\sqrt{2}ms^{-1}$

Answer: B

Watch Video Solution

14. A particle of mass 2m moving with velocity v strikes a stationary particle of mass 3m and sticks to it. The speed of the system will be

A. $v/2$

B. 2v

C. $v/3$

D. 3v

Answer: C

Watch Video Solution

15. 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

16. If a skater of weight 3 kg has initial speed 32 m / s and second one of weight 4 kg has 5 m / s

. After collision, they have speed (couple) 5 m / s

. Then the loss in K.E. is

A. 48 J

B. 96 J

C. Zero

D. None of these

Answer: D

Watch Video Solution

17. A ball is dropped from height 10 m . Ball is embedded in sand 1 m and stops, then

A. Only momentum remains conserved

B. Only kinetic energy remains conserved

C. Both momentum and K.E. are conserved

D. Neither K.E. nor momentum is conserved

Answer: A

Watch Video Solution

18. A metal ball of mass 2 kg moving with a velocity of $36 km / h$ 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. 40 J

B. 60 J

C. 100 J

D. 140 J

Answer: B

Watch Video Solution

19. A body of mass 2 kg is moving with velocity 10 m / s towards east. Another body of same mass and same velocity moving towards north collides with former and coalsces and moves towards northeast. Its velocity is

A. 10 m/s

B. 5 m/s

C. 2.5 m/s

D. $5\sqrt{2}$ m/s

Answer: D

Watch Video Solution

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

A. Striking of two glass balls

B. A bullet striking a bag of sand

C. An electron captured by a proton

D. A man jumping onto a moving cart

Answer: A

Watch Video Solution

21. A mass of 20 kg moving with a speed of 10 m / s collides with another stationary mass of . 5kg As a result of the collision, the two masses stick together. The kinetic energy of the composite mass will be

A. 600 Joule

B. 800 Joule

C. 1000 Joule

D. 1200 Joule

Answer: B

Watch Video Solution

22. 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. $2.56 \times 10^3 m / s$

B. $2.98 \times 10^5 m / s$

C. $3.33 \times 10^7 m / s$

D. $5.01 \times 10^9 m / s$

Answer: C

Watch Video Solution

23. The quantity that is not conserved in an inelastic collision is

A. Momentum

B. Kinetic energy

C. Total energy

D. All of these

Answer: B

Watch Video Solution

24. An object of mass $40kg$ and having velocity $4m/s$ collides with another object of mass

$60kg$ having velocity $2m/s$. The loss of energy when the collision is perfectly inelastic is

A. 440 J

B. 392 J

C. 48 J

D. 144 J

Answer: C

Watch Video Solution

25. A body of mass m_1 is moving with a velocity V. it collides with another stationary body of mass m_2. They get embedded. At the point of collision, the velocity of the system.

A. Increases

B. Decreases but does not become zero

C. Remains same

D. Become zero

Answer: B

Watch Video Solution

26. A bullet of mass m moving with velocity v strikes a block of mass M at rest and gets embedded into it. The kinetic energy of the 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

27. In an inelastic collision

A. Kinetic energy

B. Momentum

C. Both (a) and (b)

D. Neither (a) nor (b)

Answer: B

Watch Video Solution

28. Two bodies of masses 0.1 kg and 0.4 kg move towards each other with the velocities 1 m/s and 0.1 m/s respectively, After collision they stick together. In 10 sec the combined mass travels

A. 120 m

B. 0.12 m

C. 12 m

D. 1.2 m

Answer: D

Watch Video Solution

29. A body of mass $4kg$ moving with velocity $12m/s$ collides with another body of mass $6kg$ at rest. If two bodies stick together after collision , then the loss of kinetic energy of system is

A. Zero

B. 288 J

C. 172.8 J

D. 144 J

Answer: C

Watch Video Solution

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

A. A bullet fired into a block if bullet gets embedded into block

B. Capture of electrons by an atom

C. A man jumping on to a moving boat

D. A ball bearing striking another ball bearing

Answer: D

Watch Video Solution

Critical Thinking Objective Questions

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

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

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

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

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

Answer: C

Watch Video Solution

2. 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. MgL

B. MgL/3

C. $MgL/9$

D. $MgL/18$

Answer: D

Watch Video Solution

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

A. $W_1 > W_2 > W_3$

B. $W_1 = W_2 = W_3$

C. $W_1 < W_2 < W_3$

D. $W_2 > W_1 > W_3$

Answer: B

View Text Solution

4. A particle of mass m is moving in a horizontal circle of radius r, under a centripetal force equal to $\left(-K/r^2\right)$, where k is a constant. The total energy of the particle is -

A. $\frac{K}{2r}$

B. $-\frac{K}{2r}$

C. $-\frac{K}{r}$

D. $\frac{K}{r}$

Answer: B

Watch Video Solution

5. The displacement x of a particle of mass m kg moving in one dimension, under the action of a force, is related to the time t by the equation $t = 4x + 3$ where x is in meters and t is in seconds. The work done by the force in the first six seconds in joules is

A. 9 J

B. 6 J

C. 0 J

D. 3 J

Answer: C

Watch Video Solution

6. A force $F = -K(y\hat{i} + x\hat{j})$ (where K is a positive constant) acts on a particle moving in the x-y plane. Starting from the origin, the particle is taken along the positive x-axis to the point $(a, 0)$, and then parallel to the y-axis to the point (a, a). The total work done by the force F on the particle is

A. $-2Ka^2$

B. $2Ka^2$

C. $-Ka^2$

D. Ka^2

Answer: C

Watch Video Solution

7. If g is the acceleration due to gravity on the earth's surface, the gain in the potential energy of an object of mass m raised from the surface of the earth to a height equal to the radius R of the earth, is

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

B. 2 mgR

C. mgR

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

Answer: A

Watch Video Solution

8. A lorry and a car moving with the same KE are brought to rest by applying the same retarding force. Then

A. Lorry will come to rest in a shorter distance

B. Car will come to rest in a shorter distance

C. Both come to rest in a same distance

D. None of the above

Answer: C

Watch Video Solution

9. A particle free to move along the $x-$ axis has potential energy given by $U(x)=k\left[1-e^{-x^2}\right]$ for $-\infty \leq x \leq +\infty$, where k is a positive constant of appropriate dimensions. Then select the incorrect option

A. At point away from the origin, the particle is in unstable equilibrium

B. For any finite non-zero value of x, there is a force directed away from the origin

C. If its total mechanical energy is k/2, it has its minimum kinetic energy at the origin

D. For small displacements from x = 0, the motion is simple harmonic

Answer: D

Watch Video Solution

10. The KE acquired by a mass m in travelling a certain distance s, starting from rest, under the action of a constant force is directly proportional to :

A. $\sqrt{m}$

B. Independent of m

C. $1/\sqrt{m}$

D. m

Answer: B

Watch Video Solution

11. An open knife of mass m is dropped from a height h on a wooden floor. If the blade penetrates up to the depth d into the wood. The average resistance offered by the wood to the knife edge is .

A. mg

B. mg $\left(1-\frac{h}{d}\right)$

C. mg $\left(1+\frac{h}{d}\right)$

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

Answer: C

Watch Video Solution

12. Consider the following two statements:

A. Linear momentum of a system of partcles is zero.

B. Kinetic energ of a system of particles is zero.

A. 1 implies 2 and 2 implies 1

B. 1 does not imply 2 and 2 does not imply 1

C. 1 implies 2 but 2 does not imply 1

D. 1 does not imply 2 but 2 implies 1

Answer: D

Watch Video Solution

13. A body is moved along a straight line by a machine delivering constant power . The distance moved by the body is time t is proptional to

A. $t^{1/2}$

B. $t^{3/4}$

C. $t^{3/2}$

D. t^2

Answer: C

Watch Video Solution

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

A. $3v \cos \theta$

B. $2v \cos \theta$

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

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

Answer: A

Watch Video Solution

15. A vessel at rest exlodes breaking it into three piecess. Two pieces having equal mass fly off prependicular to one anther with the same speed of $30 m / s$. The third pieces has three times the mass of each other piece. What is the direction (w.r.t. the piece having equal masses) and magnitude of its velocity immediately after the explosion?

A. $10\sqrt{2}$ m/second and 135° from either

B. $10\sqrt{2}$ m/second and 45° from either

C. $\dfrac{10}{\sqrt{2}}$ m/second and 135° from either

D. $\dfrac{10}{\sqrt{2}}$ m/second and 45° from either

Answer: A

Watch Video Solution

16. Two particles of masses m_1 and m_2 in projectile motion have velocities $\overrightarrow{v}_1$ and $\overrightarrow{v}_2$, respectively, at time $t = 0$. They collide at time t_0. Their velocities become $\overrightarrow{v'}_1$ and $\overrightarrow{v'}_2$ at time $2t_0$ while still moving in air. The value of

$$\left|\left(m_1\overrightarrow{v'}_1 + m_2\overrightarrow{v'}_2\right) - \left(m_1\overrightarrow{v}_1 + m_2\overrightarrow{v}_2\right)\right|$$

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

17. Consider elastic collision of a particle of mass m moving with a velocity u with another particle of the same mass at rest. After the collision the projectile and the struck particle move in direction making angles θ_1 and θ_2 respectively with the initial direction of motion. The sum of the angles. $\theta_1 + \theta_2$, is

A. 45°

B. 90°

C. 135°

D. 180°

Answer: B

Watch Video Solution

18. A body of mass m moving with velocity v makes a head-on collision with another body of mass 2m which is initially at rest. The loss of kinetic energy of the colliding body (mass m) is

A. $1:1$

B. $2:1$

C. $4:1$

D. $9:1$

Answer: D

Watch Video Solution

19. A particle P moving with speed v undergoes a head -on elastic collision with another particle

Q of identical mass but at rest. After the collision the collision

A. Both P and Q move forward with speed $\frac{v}{2}$

B. Both P and Q move forward with speed $\frac{v}{\sqrt{2}}$

C. P comes to rest and Q moves forward with speed v

D. P and Q move in opposite directions with speed $\frac{v}{\sqrt{2}}$

Answer: C

Watch Video Solution

20. A set of n identical cubical blocks lies at rest parallel to each other along a line on a smooth horizontal surface. The separation between the near surfaces of any two adjacent blocks is L . The block at one end is given a speed v towards the next one at time 0 t . All collisions are completely inelastic, then

A. The last block starts moving at

$$t = \frac{(n-1)L}{v}$$

B. The last block starts moving at

$$t = \frac{n(n-1)L}{2v}$$

C. The centre of mass of the system will have a final speed v

D. The centre of mass of the system will have a final speed $\frac{v}{n}$

Answer: B::D

Watch Video Solution

Graphical Questions

1. A batsman hits a sixes and the ball touches the ground outside the cricket ground. Which of the following graph describes the variation of the cricket ball's vertical velocity v with time between the time t_1 as it hits the bat and time t_2 when it touches the ground?

A.

B.

C.

D.

Answer: C

Watch Video Solution

2. The relationship between force and position is shown in the figure given (in one dimensional case). The work done by the force in displacing a body from x = 1 cm to x = 5 cm is

A. 20 ergs

B. 60 ergs

C. 70 ergs

D. 700 ergs

Answer: A

View Text Solution

3. The pointer reading v/s load graph for a spring balance is as given in the figure. The spring constant is

A. 0.1 kg/cm

B. 5 kg/cm

C. 0.3 kg/cm

D. 1 kg/cm

Answer: A

View Text Solution

4. A force-time graph for a linear motion is shown in figure where the segments are circular. The linear momentum gained between zero and 8 second is

A. -2π newton $\times$ second

B. Zero newton $\times$ second

C. $+4\pi$ newton $\times$ second

D. -6π newton $\times$ second

Answer: B

View Text Solution

5. Adjacent figure shows the force-displacement graph of a moving body, the work done in displacing body from $x = 0$ to $x = 35$ is equal to

A. 50 J

B. 25 J

C. 287.5 J

D. 200 J

Answer: C

View Text Solution

6. A 10kg mass moves along x-axis. Its acceleration as a function of its position is shown in the figure. What is the total work done on the mass by the force as the mass moves from x = 0 to x = 8 cm

A. 8×10^{-2} joules

B. 16×10^{-2} joules

C. 4×10^{-4} joules

D. 1.6×10^{-3} joules

Answer: A

View Text Solution

7. A toy car of mass 5 kg moves up a ramp under the influence of force F plotted against displacement x. The maximum height attained is given by

A. $y_{\max} = 20m$

B. $y_{\max} = 15m$

C. $y_{\max} = 11m$

D. $y_{\max} = 5m$

Answer: C

View Text Solution

8. The graph between the resistive force F acting on a body and the distance covered by the body is shown in the figure. The mass of the body is 25 kg and initial velocity is 2 m/s. When the distance covered by the body is 4m, its kinetic energy would be

A. 50 J

B. 40 J

C. 20 J

D. 10 J

Answer: D

View Text Solution

9. A particle of mass 0.1 kg is subjected to a force which varies with distance as shown in fig. If it starts its journey from rest at , its velocity at is

A. $0m / s$

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

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

D. $40m / s$

Answer: D

View Text Solution

10. The relation between the displacement X of an object produced by the application of the variable force F is represented by a graph shown in the figure. If the object undergoes a displacement from X = 0.5 m to X = 2.5 m the work done will be approximately equal to

A. 16J

B. 32 J

C. 1.6 J

D. 8 J

Answer: A

View Text Solution

11. A particle is dropped a height h. A constant horizontal velocity is given to the particle. Taking g to be constant every where, kinetic energy E of the particle w. r. t. time t is correctly shown in

A.

B.

C.

D.

Answer: A

Watch Video Solution

12. The adjoining diagram shows the velocity versus time plot for a particle. The work done by the force on the particle is positive from

A. A to B

B. B to C

C. C to D

D. D to E

Answer: A

View Text Solution

13. A particle which is constant to move along the $x - a\xi s$, is subjected to a force in the same direction which varies with the distance x of the particle from the origin as $F(x) = -Kx + ax^3$. Hero K and a are positive constant . For $x \geq 0$, the fanctional from of the patential every `U(x) of the particle is

A.

B.

C.

D.

Answer: D

Watch Video Solution

14. A force acting on an object varies with distance as shown here. The force is in newton and x in metre. The work done by the force in moving the object from x = 0 to x = 6m is

A. 4.5 J

B. 13.5 J

C. 9.0 J

D. 18.0 J

Answer: B

View Text Solution

15. The potential energy of a system is represented in the first figure. the force acting on the system will be represented by

A.

B.

C.

D.

Answer: C

View Text Solution

16. A particle initially at rest on a frictionless horizontal surface, is acted upon by a horizontal force which is constant is size and direction. A graph is plotted between the work done (W) on the particle, against the speed of the particle, (v). If there are no other horizontal forces acting on the particle the graph would look like

A.

B.

C.

D.

Answer: D

Watch Video Solution

17. Which of the following graph is correct between kinetic energy E, potential energy (U) and height (h) from the ground of the partical

A.

B.

C.

D.

Answer: A

Watch Video Solution

18. The graph betwee $\sqrt{E}$ and $\frac{1}{p}$ is (E=kinetic energy and p= momentum)

A.

B.

C.

D.

Answer: C

Watch Video Solution

19. The force acting on a body moving along x-axis varies with the position of the particle as shown in the fig.

The body is in stable equilibrium at

A. $x = x_1$

B. $x = x_2$

C. both x_1 and x_2

D. neither x_1 nor x_2

Answer: B

View Text Solution

20. The potential energy of a particle varies with distance x as shown in the graph.

The force acting on the particle is zero at

A. C

B. B

C. B and C

D. A and D

Answer: C

View Text Solution

21. Figure shows the F-x graph. Where F is the force applied and x is the distance covered

by the body along a straight line path. Given that F is in newton and x in metre, what is the work done ?

A. 10 J

B. 20 J

C. 30 J

D. 40 J

Answer: A

View Text Solution

22. The force required to stretch a spring varies with the distance as shown in the figure. If the experiment is performed with the above spring of half length, the line OA will

A. Shift towards F-axis

B. Shift towards X-axis

C. Remain as it is

D. Become double in length

Answer: A

View Text Solution

23. The graph between E and v is

A.

B.

C.

D.

Answer: A

Watch Video Solution

24. A particle of mass m moving with a velocity u makes an elastic one dimensional collision with a stationary particle of mass m establishing a contact with it for extremely small time T. Their force of contact increases from zero to F_0 linearly in time $\frac{T}{4}$, remains constant for a further time $\frac{T}{2}$ and decreases linearly from F_0

to zero in further time $\frac{T}{2}$ as shown. The magnitude possessed by F_0 is

A. $\frac{mu}{T}$

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

C. $\frac{4mu}{3T}$

D. $\frac{3mu}{4T}$

Answer: C

View Text Solution

25. A body moves from rest with a constant acceleration. Which one of the following graphs represents the variation of its kinetic energy K with the distance travelled x?

A.

B.

C.

D.

Answer: C

Watch Video Solution

26. These diagrams represent the potential energy U of a diatomic molecule as a function of the inter-atomic distance r. The diagram corresponds to stable molecule found in nature is.

A.

B.

C.

D.

Answer: A

Watch Video Solution

27. The relationship between the force F and position x of a body is as shown in figure. The work done in displacing the body from x = 1 m to x = 5 m will be

A. 30 J

B. 15 J

C. 25 J

D. 20 J

Answer: B

View Text Solution

28. A particle is placed at the origin and a force F=Kx is acting on it (where k is a positive constant). If $U_{(0)}=0$, the graph of $U(x)$ verses x will be (where U is the potential energy function.)

A. 

B. 

C.

D.

Answer: A

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Assertion Reason For Aiims Aspirants

1. Statement-1: A person walking on a horizontal road with a load on his head does no work on the load against gravity.

Statement-2: No work is said to be done, it directions of force and displacement of load are perpendicular to each other.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

2. Assertion : The work done during a round trip is always zero. Reason : No force is required to move a body in its round trip.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

Watch Video Solution

3. Assertion : Work done by friction on a body sliding down an inclined plane is positive.

Reason : Work done is greater than zero, if angle between force and displacement is acute or both are in same direction.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

4. Assertion : When a gas is allowed to expand, work done by gas is positive. Reason : Force due to gaseous pressure and displacement (of piston) are in the same direction

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

5. Assertion: A light body and a heavy body have same momentum. Then they also have same kinetic energy.

Reason: Kinetic energy does not depand on mass of the body.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

Watch Video Solution

6. Assertion: The instantcous power of an agent is measured as the dot product of instaneous velocity and the force acting on it at that instant.

Reason: The unit of instaneous power is watt.

A. If both assertion and reason are true and the reason is the correct explanation of

the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

7. Assertion: The change in kinetic energy of a particle is equal to the work done on it by the net force.

Reason: Change in kinetic energy of particle is equal to the work done in case of a system of one particle.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

8. Assertion: A spring has potential energy , both when it is compressed or stretched.

Reason: In compressing or stretching, work is done on the spring against the restoring force.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

9. Statement-1:Comets move around the sun in elliptical orbits, the gravitational force on the comet due to sun is not normal to the comet's velocity, but the work done by the gravitational force over every complete orbit of the comet is zero.

Statement-2: Gravitational force is a conservative force and the work done by a conservative force over a closed path is always zero.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

10. The rate of change of total momentum of a many particle system is proportional to the........................

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

11. Assertion : Water at the foot of the water fall is always at different temperature from that at the top. Reason : The potential energy of water at the top is converted into heat energy during falling.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

12. Assertion : The power of a pump which raises 100 kg of water in 10 sec to a height of 100 m is 10 KW . Reason : The practical unit of power is horse power.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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13. Assertion: According to law of conservation of machainical energy change in potential energy is equal and opposite to the change in kinetic energy

Reason: Mechanical energy is not a conserved quantity.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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14. Assertion : When the force retards the motion of a body, the work done is zero. Reason : Work done depends on angle between force and displacement.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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15. Assertion: In an elastic collision of two bodies , the momentum and energy of each body is conserved.

Reason: If two bodies stick to each other , after colliding , the collision is said to be perfectly elastic.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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16. Assertion : A body cannot have energy without possessing momentum but it can have momentum without having energy.

Reason : Momentum and energy have same dimensions.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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17. Assertion : Power developed in circular motion is always zero. Reason : Work done in case of circular motion is zero.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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18. Assertion : A kinetic energy of a body is quadrupled, when its velocity is doubled.

Reason : Kinetic energy is proportional to square of velocity

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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19. Assertion: A quick collision between two bodies is more violent that show collision , even when initial and final velocity are identical.

Reason: The rate of change of momentum determine that force is small or large.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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20. Assertion : Work done by or against gravitational force in moving a body from one point to another is independent of the actual path followed between the two points.

Reason : This is because gravitational forces are conservative forces.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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21. Assertion : When current is drawn from a cell, chemical energy is converted into heat energy.

Reason : This is because wire through which current flows gets heated.

A. If both assertion and reason are true and the reason is the correct explanation of

the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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22. Statement-1: Graph between potential energy of spring versus the extension or comparision of the spring is a straight line.

Statement-2: Potential energy of a stretched or compressed spring is proportional to square of extension or comparision.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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23. Assertion : Heavy water is used as moderator in nuclear reactor.

Reason : Water cool down the fast neutron.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

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24. Assertion: Mass and energy are not conserved separately, but are conserved as a single entity called mass-energy.

Reason: Mass and energy conservation can be obtained by Einstein equation for energy.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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25. Two protons are brought towards each other. Will the potential energy of the system decrease or increase? If a proton and an electron be brought nearer, then?

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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26. Assertion : In case of bullet fired from gun, the ratio of kinetic energy of gun and bullet is equal to ratio of mass of bullet and gun. Reason : In firing, momentum is conserved

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

27. Assertion: Power of machine gun is determined by body both the number of bullet fired per secondand kinetic energy of bullets.

Reason: Power of any machine is defined as work done(by it) per unit time.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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28. Assertion : A work done in moving a body over a closed loop is zero for every force in nature. Reason : Work done does not depend on nature of force.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

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29. Assertion : Mountain roads rarely go straight up the slope. Reason : Slope of mountains are large therefore more chances of vehicle to slip from roads.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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30. Assertion : Soft steel can be made red hot by continued hammering on it, but hard steel cannot.

Reason : Energy transfer in case of soft iron is large as in hard steel.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

View Text Solution

Self Evaluation Test

1. How much work does a putting force of 40 N do on the 20 kg box in pulling it 8 m across the floor at a constant speed. The pulling force is directed at 60° above the horizontal

A. $160J$

B. $277J$

C. $784J$

D. None of these

Answer: A

Watch Video Solution

2. A horizontal force of 5 N is required to maintain a velocity of 2 m / s for a block of 10 kg mass sliding over a rough surface. The work done by this force in one minute is

A. $600J$

B. $60J$

C. $6J$

D. $6000J$

Answer: A

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3. Work done in time t on a body of mass m which is accelerated from rest to a speed v in time t_1 as a function of time t is given b

A. $\frac{1}{2}m\frac{v}{t_1}t^2$

B. $m\frac{v}{t_1}t^2$

C. $\frac{1}{2}\left(\frac{mv}{t_1}\right)^2 t^2$

D. $\frac{1}{2}m\frac{v^2}{t_1^2}t^2$

Answer: D

Watch Video Solution

4. What is the shape of the graph between the speed and kinetic energy of a body

A. Straight line

B. Hyperbola

C. Parabola

D. Exponential

Answer: C

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5. When a body moves with some friction on a surface

A. It loses kinetic energy but momentum is constant

B. It loses kinetic energy but gains potential energy

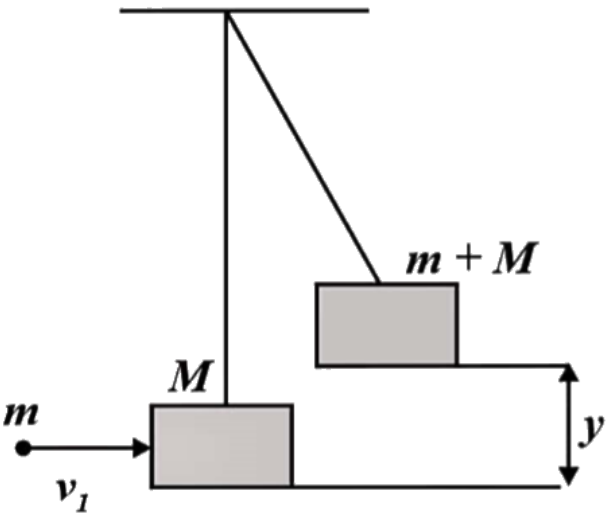
C. Kinetic energy and momentum both decrease

D. Mechanical energy is conserved

Answer: C

Watch Video Solution

6. A bullet of mass m moving with velocity v_1 strikes a suspended wooden block of mass M as shown in the figure and sticks to it. If the block rises to a height y. the initial of the bullet is



A. $\sqrt{2gh}$

B. $\frac{M+m}{m}\sqrt{gh}$

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

D. $\frac{M+m}{M}\sqrt{2gh}$

Answer: A

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7. There will be decrease in potential energy of the system, if work is done upon the system by

A. Any conservative or non-conservative force

B. A non-conservative force

C. A conservative force

D. None of the above

Answer: C

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8. The slope of kinetic energy displacement curve of a particle in motion is

A. Equal to the acceleration of the particle

B. Inversely proportional to the acceleration

C. Directly proportional to the acceleration

D. None of the above

Answer: C

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9. The energy required to accelerate a car from 10 m/s to 20 m / s is how many times the energy required to accelerate the car from rest to 10 m /s

A. Equal

B. 4 times

C. 2 times

D. 3 times

Answer: D

10. A body of mass 2 kg slides down a curved track which is quadrant of a circle of radius 1 metre. All the surfaces are frictionless. If the body starts from rest, its speed at the bottom of the track is

A. $443m / \sec$

B. $2m / \sec$

C. $0.5m / \sec$

D. $19.6m / \sec$

Answer: A

View Text Solution

11. The kinetic energy of a body decreases by 36% the decrease in its momentum is

A. 36%

B. 20%

C. 8%

D. 6%

Answer: B

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12. A bomb of mass 3 m kg explodes into two pieces of mass m kg and m kg . If the velocity of m kg mass is 16 m / s , the total kinetic energy released in the explosion is

A. 192 ml

B. 96 ml

C. 384 ml

D. 768 ml

Answer: A

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13. Which one of the following statement does not hold good when two balls of masses m_1 and m_2 undergo elastic collision

A. When $m_1 < < m_2$ and m_2 at rest, there will be maximum transfer of momentum

B. When $m_1 > > m_2$ at rest . After collision the ball of mass m_2 moves with four times the velocity of m_1

C. When $m_1 = m_2$ and m_2 at rest , there will be maximum transfer of K.E.

D. When collision is oblique and m_2 at rest with $m_1 = m_2$ after collision the balls move in opposite directions

Answer: B::D

View Text Solution

14. A neutron travelling with a velocity v and kinetic energy E collides perfectly elastically head on with the nucleus of an atom of mass number A at rest. The fraction of the total kinetic energy retained by the neutron is

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

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

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

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

Answer: A

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15. 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. 0.75

B. 1.33

C. 3.0

D. 4.0

Answer: C

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16. Six identical balls are lined in a straight groove made on a horizontal frictionless surface as shown. Two similar balls each moving with a velocity v collide elastically with the row of 6 balls from left. What will happen

A. One ball from the right rolls out with a speed 2v and the remaining balls will remain at rest
B. Two balls from the right roll out with speed v each and the remaining balls will remain stationary
C. All the six balls in the row will roll out with speed v/6 each and the two colliding balls

will come to rest

D. The colliding balls will come to rest and no ball rolls out from right

Answer: B

View Text Solution

17. A wooden block of mass M rests on a horizontal surface. A bullet of mass m moving in the horizontal direction strikes and gets embedded in it. The combined system covers a distance x on the surface. If the coefficient of friction between wood and the surface is μ, the speed of the bullet at the time of striking the block is (where m is mass of the bullet)

A. $\sqrt{\frac{2Mg}{\mu m}}$

B. $\sqrt{\frac{2\mu Mg}{Mx}}$

C. $\sqrt{2\mu gx}\left(\frac{M+m}{m}\right)$

D. $\sqrt{\frac{2\mu mx}{M+m}}$

Answer: C

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18. A ball moving with speed v hits another identical ball at rest. The two balls stick together after collision. If specific heat of the material of the balls is S , the temperature rise resulting from the collision is

A. $\frac{v^2}{8s}$

B. $\frac{v^2}{4S}$

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

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

Answer: A

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19. A bag of sand of mass M is suspended by a string. A bullet of mass m is fired at it with velocity v and gets embedded into it. The loss of kinetic energy in this process is

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

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

C. $\frac{1}{2}mv^2 \times \frac{M}{m}$

D. $\frac{1}{2}mv^2\left(\frac{M}{M+m}\right)$

Answer: D

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