PHYSICS

BOOKS - SURA PHYSICS (TAMIL ENGLISH)

WORK, ENERGY AND POWER

Exercise Questions I Multiple Choice Questions

1. A uniform force of $\left(2\hat{i}+\hat{j}\right)$ N acts on a particle of mass 1 kg. The particle displaces

from position $\left(3\hat{j}+\hat{k}\right)$ m to $\left(5\hat{i}+3\hat{j}\right)$ m.

The work done by the force on the particle is

A. 9 J

B. 6 J

C. 10 J

D. 12 J

Answer: C

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2. A ball of mass 1 kg and another of mass 2 kg are dropped from a tall building whose height is 80 m. After, a fall of 40 m each towards Earth, their respective kinetic energies will be in the ratio of

A. $\sqrt{2}:1$

B. $1:\sqrt{2}$

C. $2:1$

D. $1:2$

Answer: D

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

A. 20 J

B. 30 J

C. 40 J

D. 10 J

Answer: A

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4. An engine water continuously through a hose. Water leaves the hose with a velocity v and m is the mass per unit length of the kinetic energy is imparted to water ?

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

B. mv^3

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

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

Answer: A

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5. A body of mass 4 m is lying in xy - plane at rest. It suddenly explodes into three pieces. Two pieces each of mass m move perpendicular to each other with equal speed

v. The total kinetic energy generated due to explosion is

A. mv^2

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

C. $2mv^2$

D. $4mv^2$

Answer: B

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6. The potential energy of a system increases, if work is done

A. by the system against a conservative force

B. by the system against a non - conservative force

C. upon the system by a conservative force

D. upon the system by a non - conservative force

Answer: A

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7. What is the minimum velocity with a body of mass m must enter a vertical loop of radius R so that it can complete the loop ?

A. $\sqrt{2gR}$

B. $\sqrt{3gR}$

C. $\sqrt{5gR}$

D. $\sqrt{gR}$

Answer: C

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8. The work done by the conservative force for a closed path is

A. always negative

B. zero

C. always positive

D. not defined

Answer: B

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9. If the linear momentum of the object is increased by 0.1%, then the kinetic energy is increased by

A. $0.1\,\%$

B. $0.2\,\%$

C. $0.4\,\%$

D. $0.01\,\%$

Answer: B

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10. If the potential energy of the particle is $\alpha - \frac{\beta}{2}x^2$ then force experienced by the particle is

A. $F = \frac{\beta}{2}x^2$

B. $F = \beta x$

C. $F = -\beta x$

D. $F = -\frac{\beta}{2}x^2$

Answer: B

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11. A wind - powered generator converts wind energy into electric energy. Assume that the energy intercepted by its blades into electrical energy. For wind speed v, the electrical power output will be proportional to,

A. v

B. v^2

C. v^3

D. v^4

Answer: C

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12. Two equal masses m_1 and m_2 are moving along the same straight line with velocities $5ms^{-1}$ and $-9ms^{-1}$ respectively. If the collision is elastic, then calculate the velocities after the collision of m_1 and m_2, respectively

A. $-4ms^{-1}$ and $10ms^{-1}$

B. $10ms^{-1}$ and $0ms^{-1}$

C. $-9ms^{-1}$ and $5ms^{-1}$

D. $5ms^{-1}$ and $1ms^{-1}$

Answer: C

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13. 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) versus

x will be (where U is the potential energy function)

A. 

B. 

C. 

D. 

Answer: C

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14. A particle which is constrained to move along x - axis, is subjected to a force in the same direction which varies with the distance x of the particle from the origin as $F(x) = kx + ax^3$. Here, k and a are positive constants. For $x \geq 0$, the functional form of the potential energy U (x) of the particle is

A. 

B. 

C. 

D. 

Answer: D

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15. A spring of force constant k is cut info two pieces such that one piece is double the length of the other. Then, the long plece will have a force constant of

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

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

C. 3 k

D. 6 k

Answer: B

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Exercise Questions Ii Short Answer Questions

1. Explain how the definition of work in physics is different from general perception.

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2. Write the various types of potential energy. Explain the formulae.

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3. Write the differences between conservative and Non - conscrvative force. Give two examples each.

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4. Explain the characteristics of elastic and inelastic collision. (OR) What is the condition for perfect inelastic collision ?

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5. Define the following.

Coefficient of restitution

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6. Define the following.

Power

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7. Define the following.

Law of conservation of energy

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8. Define the following.

loss of kinetic energy in inelastic collision.

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Exercise Questions Iii Long Answer Questions

1. Explain with graphs the difference between work done by a constant force and by a variable force.

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2. State and explain work energy principle. Mention any three examples for it.

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3. Arrive at an expression for power and velocity. Given some examples for the same.

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4. Arrive at an expression for elastic collision in Dimension and discuss various case.

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5. Derive velocities after the collision in terms of velocities before collision in elastic collision in one dimension case.

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6. What is inelastic collision ? In which way it is different from elastic collision. Mention few examples in day to life for inelastic collision.

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Exercise Questions Iv Numerical Problems

1. Calculate the work done by a force of 30 N in lifting load of 2g to a height of 10 m $\left(g = 10ms^{-2}\right)$.

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2. A ball with a velocity of $5ms^{-1}$ impinges at angle of 60° with the vertical on a smooth horizontal plane. If the coefficient of restitution is 0.5, find the velocity and direction after the impact.

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3. A bob of mass m is attached to one end of the rod of negligible mass and length r, the

other end of which is pivoted freely at a fixed center O as shown in the figure. What initial speed must be given to the object to reach the top of the circle ? (Hint : Use law of conservation of energy). Is this speed less or greater than speed obtained in the section 4.2.9 ?

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4. Two different unknown masses A and B collide. A is initially at rest when B has a speed v. After collision B has a speed v/2 and moves at right angles to its original direction of motion. Find the direction in which A moves after collision.

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5. A bullet of mass 20 g strikes a pendulum of mass 5kg. The centre of mass of pendulum

rises a vertical distance of 10 cm. If the bullet gets embedded into the pendulum, calculate its initial speed.

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Exercise Questions V Conceptual Questions

1. A spring which is initially in un-streatched condition, is first stretched by a length x and again by a further length x. The work done in

the first case W_1 is one third of the work done in second case W_2. True of false ?

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2. Which is conserved in inelastic collision ? Total energy (or) Kinetic energy ?

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3. Is there any net work done by external forces on a car moving with a constant speed

along a straight road ?

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4. A car starts from rest and moves on a surface with uniform acceleration. Draw the graph of kinetic energy versus displacement. What information you can get from that graph ?

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5. A charge particle moves towards another charged particle. Under what conditions the total momentum and the total energy of the system conserved ?

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Additional Questions I Multiple Choice Questions

1. A body is whirled in a horizontal circle of radius vector $\overrightarrow{r}$. It has an angular velocity of

$\overrightarrow{\omega}$. The velocity at any point on circular path is

A. $V = r\omega$

B. $V = \frac{\omega}{r}$

C. $V = \frac{r}{\omega}$

D. $V = m$

Answer: A

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2. What is the work done by the gravity when an object of mass m is taken from ground to some height h with constant velocity ?

A. W = mgh

B. W = - mgh

C. W = 0

D. W = 2 mgh

Answer: B

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3. If the work done is independent of path, then the force is

A. Non - conservative force

B. conservative force

C. Newton's force

D. Centrifugal force

Answer: B

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4. One horse power is

A. 707 W

B. 786 W

C. 746 W

D. 647 W

Answer: C

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5. 1 k Wh is equal to

A. $3.6 \times 10^4 J$

B. $3.6 \times 10^5 J$

C. $3.6 \times 10^{+6} J$

D. $36 \times 10^6 J$

Answer: C

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6. The coefficient of restitution (e) for a material is as follows

A. e = 0

B. e = 1

C. $0 < e < 1$

D. $0 > e > -1$

Answer: C

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7. The work done on an object does not depend upon the

A. displacement

B. force applied

C. angle between force and displacement

D. initial velocity of the object

Answer: D

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8. In case of negative work, the angle between the force and displacement is

A. 0°

B. 90°

C. 45°

D. 180°

Answer: D

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9. The force on a particle as the function of displacement x is given by $F = 9 + 0.3x$. The

work done corresponding to displacement of particle from x = 0 to x = 2 unit is

A. 18.6 J

B. 21 J

C. 25 J

D. 9.6 J

Answer: A

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10. A body carrying a box on his head is walking on a level load from one place to another on a straight is doing no work. This statement is

A. correct

B. incorrect

C. partly correct

D. insufficient information

Answer: A

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11. A ball moves on a frictionless inclined table without slipping. The work done by the table surface on the ball is

A. positive

B. negative

C. zero

D. none

Answer: C

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12. A force $\vec{F} = 3\hat{i} + c\hat{j} + 2\hat{k}$ acting on a particle causes a displacement $\vec{S} = \left(2\hat{i} - 3\hat{j} + 4\hat{k}\right)$ in its own direction. If the work done is 8J, then the value of c is

A. 0

B. 6

C. 2

D. 1

Answer: C

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13. A body is falling from a height h. After it has fallen a height $\frac{h}{2}$ it will possess

A. only Potential Energy

B. only Kinetic Energy

C. half potential and half kinetic energy

D. more kinetic and less potential energy

Answer: C

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14. Water stored in a dam possesses

A. no energy

B. electrical energy

C. kinetic energy

D. potential energy

Answer: D

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15. Which one of the following is not the unit of energy ?

A. joule

B. Nm

C. kW

D. kWh

Answer: C

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16. A car is accelerated on a levelled road and attains a velocity 3 times of its initial velocity. In this process the potential energy of the car

A. does not change

B. becomes twice to that of initial

C. becomes 4 times to initial

D. becomes 16 times to that of initial

Answer: A

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17. When a body falls freely towards the earth, then its T.E.

A. increases

B. decreases

C. remains constant

D. first increases and then decreases

Answer: C

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18. An iron sphere of mass 8 kg has the same diameter as a copper sphere of mass4 kg. Both spheres are dropped simultaneously from a tower. When they are 10 m above the ground, they have the same

A. acceleration

B. momenta

C. Potential Energy

D. Kinetic Energy

Answer: A

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19. A boy is carrying a school bag of 5 kg mass on his back and moves 100 m on a levelled road. The work done against the gravitational force is $\left(g = 10ms^{-1}\right)$

A. 5 J

B. 500 J

C. 0.5 J

D. zero

Answer: D

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20. How are joule (J) and erg related

A. $1J = 10^7$ erg

B. $1erg = 10^{-7}J$

C. $1J = 10^{-7}$ erg

D. none

Answer: B

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21. A simple pendulum hanging freelyand at rest vertical because in the position

A. Kinetic Energy is zero

B. Kinetic Energy is minimum

C. Potential Energy is Zero

D. Potential Energy is minimum

Answer: D

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22. A bullet is fired and gets embedded in a block kept on table. If table is frictionless, then

A. Kinetic Energy gets conserved

B. Potential Energy gets conserved

C. Momentum conserved

D. both (a) and (c)

Answer: C

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23. A ball whose Kinetic Energy is E is projected at an angle of 45° to the horizontal. The kinetic energy of the ball at the highest point of its flight will be

A. E

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

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

D. zero

Answer: C

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24. A particle is projected at an angle of 60° to the horizontal with a kinetic energy E. The kinetic energy at the highest point is

A. E

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

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

D. zero

Answer: C

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25. A gun of mass M fires a bullet of mass m with maximum speed v. G.T. $m < M$. The kinetic energy of the gun will be

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

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

C. more than $\frac{1}{2}mv^2$

D. less than $\frac{1}{2}mv^2$

Answer: D

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26. A particle of mass m_1 is moving with a velocity v, and another of mass m_2 is moving with velocity v_2. Both of them have the some

momentum but their kinetic energies are E_1 and E_2 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

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27. Two bodies of masses m and 4 m are moving with equal kinetic energies. The ratio of their linear momenta is

A. $1:2$

B. $1:4$

C. $4:1$

D. $1:1$

Answer: A

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28. The potential energy of a system increases, if work is done

A. upon the system by a non - conservative force

B. upon the system by a conservative force

C. By a system against conservative force

D. By a system against non conservative force

Answer: C

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29. A shell, in fight explodes into four unequal parts. Which is conserved ?

A. potential energy

B. momentum

C. kinetic energy

D. both a and c

Answer: B

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30. A bullet hits and gets embedded in a solid block resting on a frictionless surface. In this process which is correct ?

A. only momentum is conserved

B. both momentum and energy are conserved

C. only kinetic energy is conserved

D. neight momentum nor energy are conserved

Answer: A

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31. Power can be expressed as

A. $\vec{F} . \vec{v}$

B. $\frac{1}{2}\vec{F} . v^2$

C. $\vec{F} . t$

D. $\vec{F}\vec{\mathrm{v}}$

Answer: A

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32. In an elastic collision

A. both momentum and kinetic energy are conserved

B. only kinetic energy is conserved

C. both momentum and kinetic energy are not conserved

D. only momentum is conserved

Answer: A

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33. In an elastic collision

A. kinetic energy

B. momentum

C. both (a) and (b)

D. neither (a) nor (b)

Answer: C

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34. A particle of mass 'm' moving with velocity 'v' collides with a mass m_2 at rest, then they get embedded. At the instant of collision, velocity of the system

A. increases

B. decreases

C. remains constant

D. becomes zero

Answer: C

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35. When a particle is moving in vertical circle

A. its radial and tangential acceleration both are constant

B. its radial and tangential acceleration both are varying

C. its radial is constant but tangential acceleration is varying

D. its radial and is varying but tangential acceleration is constant.

Answer: B

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36. A particle of mass m is being rotated on a vertial circle of radius r. If the speed of particle at the highest point be v, then

A. $mg = \frac{mv^2}{r}$

B. $mg > \frac{mv^2}{r}$

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

D. $mg \leq \frac{mv^2}{r}$

Answer: C

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

A. 1

B. 0

C. α

D. -1

Answer: A

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Additional Questions Iii Fill In The Blanks

1. The work done by the variable force is defined by _____

A. $\int_f^i F \times \overrightarrow{d}\, v$

B. $\int_i^f \overrightarrow{F} \times \overrightarrow{d}\, r$

C. $\int_i^f \overrightarrow{F} . \overrightarrow{d}\, r$

D. $\int_i^f \overrightarrow{d}\, r \times \overrightarrow{F}$

Answer: C

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2. The kinetic energy can also be defined in terms of momentum which is given by _____

A. $P/2m$

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

C. $P^2/2m$

D. $P^2 2m$

Answer: C

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3. The work done by the conservative force for a closed path is

A. zero

B. positive

C. negative

D. constant

Answer: A

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4. The frictional force is _____

A. conservative

B. non - conservative

C. resistive

D. submissive

Answer: B

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5. In the conservative force field, _____ of the object is conserved.

A. Total energy

B. Internal Energy

C. external energy

D. Kinetic Energy

Answer: A

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6. When the elonation or compression is x, the spring potential energy (U) is given by _____

A. Kx^2

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

C. $\frac{K}{x^2}$

D. $2Kx^2$

Answer: B

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7. In a vertical circular motion, the minimum speed required by the mass to complete the circle is _____

A. $\sqrt{4gr}$

B. $\sqrt{2gr}$

C. $\sqrt{5gr}$

D. $\sqrt{5r}$

Answer: C

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8. The _____ is not conserved in an inelastic collision

A. Kinetic Energy

B. potential Energy

C. Internal Energy

D. Pressure Energy

Answer: A

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9. In conservative force, Force is the _____ gradiet of Potential energy.

A. Potential

B. negative

C. Positive

D. Kinetic

Answer: B

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10. The work done by a force on the object is equal to the change in its Kinetic. This is called _____

A. Lami's Theorem

B. Right Hand Plam Rate

C. Work - Energy Theorem

D. Benoullis theorem

Answer: C

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Additional Questions Iv Choose The Odd One Out

1. Choose The Odd One Out -

A. spring force

B. viscous force

C. magnetic force

D. electrostatic force

Answer: b

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2. Choose The Odd One Out -

A. $\int_h \overrightarrow{F}_a . dr$

B. mgh

C. $\int_0^h |\overrightarrow{F}_a||dr \cos\theta$

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

Answer: d

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3. Choose The Odd One Out -

A. Work/time

B. Force $\times$ Velocity

C. 746 W

D. 1 k Wh

Answer: d

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Additional Questions V Choose The Correct Pair

1. Choose the Correct Pair -

A. 1 hp - 746 W

B. 1 k Wh - $36 \times 10^4 J$

C. 1 Unit - 1 Wh

D. 1 erg - 10^{-7} Cabric

Answer: a

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2. Choose the Correct Pair -

A. $K.E - \frac{P^2}{2m}$

B. $P.E. = mgh^2$

C. Elastic P.E. - $\left(-\frac{1}{2}\right)Kx$

D. Static Energy - $\left(\frac{1}{2}\right)mV$

Answer: a

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Additional Questions Vi Choose The Incorrect Pair

1. Choose the Incorrect Pair :

A. Conservative Force - Viscous Force

B. None - conservative force - Frictional force

C. Centripetal force - Inward force

D. Frictional force - Resistive force

Answer: a

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2. Choose the Incorrect Pair :

A. Minimum speed at - $\sqrt{gr}$

B. $1GW - 10^9W$

C. Work - $\int \overrightarrow{F} . dt$

D. 1 Unit - 1 k Wh

Answer: c

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Additional Questions Vii Assertion Reason

1. Assertion : When Air is blow on a plastic cover, lying on the floor. If flies to a particular height in different directions. Also It's energy at different positions keep changing.

Reason : Work done by the force on the body changes the kinetic energy of the body. This is called Work - Energy Theorem. i.e., $W = \Delta K.E.$

A. Assertion and Reason are correct and Reason is the correct explanation of Assertion

B. Assertion and Reason are true but Reason is the false explanation of the Assertion

C. Assertion is true - but Reason is false

D. Assertion is false but Reason is true

Answer: A

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2. Assertion : When a Rubber band is stretched to a particular length, there is a change in length as well as the elastic potential energy is increased i.e., $U = \frac{1}{2}Kx^2$

Reason : A bullet shot from the gun if embedded in a long of wood. Kinetic Energy is not conserved, but momentum is conserved, but momentum is conserved. The loss in kinetic is $\Delta\theta = K.\,E_i - K.\,E_f$

A. Assertion and Reason are correct and Reason is the correct explanation of Assertion

B. Assertion and Reason are true but Reason is the false explanation of the Assertion

C. Assertion is true - but Reason is false

D. Assertion is false but Reason is true

Answer: B

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Additional Questions Viii Choose The Correct Or Incorrect Statements

1. (I) KWh is the unit of electrical energy not of power.

(II) The frictional force is a conservative force which statement is correct ?

Which Statement is correct ?

A. I only

B. II only

C. Both are correct

D. None

Answer: A

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2. (I) The total linear momentum is conserved only for Elastic collisions not for inelastic.

(II) Power is also equal to force $\times$ velocity

Which statement is correct ?

A. I only

B. II only

C. Both are correct

D. None

Answer: B

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3. (I) The work done by a non - conservative force, around the closed path is zero.

(II) The co - efficient of restitution is e.

Which statement is incorrect ?

A. I only

B. II only

C. Both are correct

D. None

Answer: A

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4. (I) Force is the negative gradient of Potential Energy.

(II) Work done is not completely recoverable in Non - conservative forces.

Which statement is correct ?

A. I only

B. II only

C. Both are correct

D. none

Answer: D

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Additional Questions Very Short Answer Questions

1. Write the spring force acting on the object at the positions given below (surface is frictionless)

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2. Write the spring force acting on the object at the positions given below (surface is frictionless)

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3. What is power ? Give its dimensional formula ?

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4. What is the condition for perfect inelastic collision ?

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5. What is the work done by the centripetal force in circular motion ?

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6. What is meant by positive work ? Give example.

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7. Define the following.

Law of conservation of energy

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8. Define energy and write its unit and dimension.

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9. Can Kinetic energy of a system be changed without changing its momentum ?

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10. Can momentum of a system be changed without changing its kinetic energy ? Give example.

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11. Define Potential energy. Write the expression of it.

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12. Define gravitational potential energy.

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13. How can an object move with zero acceleration (constant velocity) when the external force is acting on the object ?

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14. Define power.

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15. Define average power.

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16. Define instantaneous power.

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17. Give the unit and dimension of power.

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18. Define watt.

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19. Which unit is used to measure electrical energy ? (or) Define kilo watt hour.

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20. Define work. Give its unit and dimension.

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21. List the various units for energy and give their equivalent SI values.

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22. Define work - energy theorem.

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23. Define electrostatic potential energy.

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Additional Questions Short Answer Questions

1. Write down the coefficient of restitution for the following cases :

A ball rebounding from a floor

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2. A box is pulled with a force of 25 N to produce a displacement of 15 m. If the angle between the force and displacement is 30°. Find the work done by the force ?

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3. Consider a system of two identical particles having mass m. If one of the particles of mass m is pushed towards the center of mass of the particles through a distance x, by what

amount the other particle should move so as to keep the center of mass of particles at the original position?

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4. How will you measure the work done ? When

the force acts along the direction of motion of the body

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5. How will you measure the work done ? When the force is inclined to the direction of motion of the body ?

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6. Writen the different cases of zero work done. Given examples of each case. (or) Can work done on an object becomes zero ? Explain with example.

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7. What is meant by negative work ? Give example.

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8. Obtain graphically and mathematically work done by a variable force.

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9. What is mechanical energy ? What are its two types ?

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10. What does the work - kinetic energy theorem imply ?

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11. Draw force - displacement graph for a spring and find an expression for the potential energy of an elastic spring.

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12. Depict Δ kinetic energy $= \Delta U$ in potential energy - displacement graph for a spring.

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13. What is conservative force ? State how it is determioned from potential energy ?

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14. When does a force is said to be in work ?

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15. State total linear momentum is conserved in all collisions.

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Additional Questions Long Answer Questions

1. Deduce the relation between linear momentum and kinetic energy.

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2. Derive an expression for the potential energy of a body near the surface of the Earth.

(OR) Calculate the potential energy of the object of mass m at a height h.

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3. Derive an expression for the potential energy of an elastic stretched spring.

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4. State and prove the law of conservation of linear momentum.

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5. Derive an expression for the velocity of the body moving in a vertical circle. And also find a tension at the top of the circle.

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6. What is a perfect inelastic collision ? Derive the expression of the common velocity after collision.

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Numerical Problems

1. A circket ball falls from a height of 40 m. What is the velocity with which the ball hits the ground ?

A. $40ms^{-1}$

B. $20ms^{-1}$

C. $16ms^{-1}$

D. $28ms^{-1}$

Answer: D

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2. Convert 1 kWh in joule.

A. $1.2 \times 10^2 j$

B. $2.4 \times 10^4 J$

C. $3.6 \times 10^6 J$

D. $4.4 \times 10^3 J$

Answer: C

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3. A motor which is capable of raising 2,000 litres of water in 3 mins from a well 120 m deep. So what is the power of a motor ?

A. $8.730kW$

B. $7.840kW$

C. $11.652kW$

D. $13.066kW$

Answer: D

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4. If momentum of a body increases by 100% then what will be percentage increase in its kinetic energy ?

A. $200\ \%$

B. $100\ \%$

C. $300\ \%$

D. $400\ \%$

Answer: C

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5. A body of mass of 3 kg initially at rest wakes under the action of an applied horizontally force of 10 N on a table with co-efficient of kinetic friction = 0.3, then what is the workdone by the applied force in 10 s :

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6. A particles moves along x - axis from x = 0 to x = 7m under the influence of a force given by $f(x) = 12 - 2x + 3x^2$ then the workdone is,

A. 205 J

B. 390 J

C. 378 J

D. 291 J

Answer: C

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7. A particles along y axis from y = 1 m to y = 3 m under the influence of a force given by $f(y) = 6 - 2y + 3y^2$ then the work done is,

A. 48 J

B. 50 J

C. $-48J$

D. $-50J$

Answer: C

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8. Find the workdone if a particle moves from position $\vec{r}_1 = \left(2\hat{j} + \hat{j} - 3\hat{k}\right)$ to a position $\vec{r}_2 = \left(4\hat{i} + 6\hat{j} - 7\hat{k}\right)$ under the effect of force $\vec{F} = \left(3\hat{i} + 2\hat{j} + 4\hat{k}\right)N$.

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9. A ball bounces to 75% of its original height. Calculate the mechanical energy lost in each bounce.

A. 0.40

B. 0.35

C. 0.25

D. 0.20

Answer: C

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10. Two masses of 2 g and 6 are moving with equal kinetic energy. The ratio of the magnitudes of their Linear momenta is,

A. $1:2$

B. $2:1$

C. $2:6$

D. $1:\sqrt{3}$

Answer: D

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11. A large and small vehicle moving with the some kinetic energy on a straight road. Their

engine are simultaneously OFF. Which one will stop at a longer distance ?

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12. A bullet of mass 30 g moving with a speed of $500ms^{-1}$ pentrates 10 cm into a fixed target. Calculate the average force exerted by target on the bullet.

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13. A particle of mass 2 kg moving with a velocity $v_1 = \left(2\hat{i} - 3\hat{j}\right) m/s$ experience a perfectly inelastic collision with another particle of mass 2 kg having velocity $\overrightarrow{v}_2 = \left(3\hat{j} + 6\hat{k}\right) m/s$. Find the velocity and speed of the particle formed.

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14. Find the work done in moving a particle along a vectors $\overrightarrow{S} = \left(\hat{i} - 2\hat{j} + 3\hat{k}\right) m$ if

applied force is $\vec{F} = \left(2\hat{i} - 3\hat{j} + 4\hat{k}\right)N.$

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15. Find the workdone in moving a particle along a vectors $\vec{S} = \left(\hat{i} + 2\hat{j} + 6\hat{k}\right)m$ if applied force is $\vec{F} = \left(2\hat{i} + 3\hat{j} + 5\hat{k}\right)N$ at an angle 60°.

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16. A body of mass 600 g travels in a straight line with velocity $v = ax^{\frac{3}{2}}$. Where $a = 3m^{\frac{1}{2}}s^{-1}$. What is the workdone by the net force during its displacement from x = 0 to x = 3 m ?

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17. A body of mass 500 g initially at rest is moved by a horizontal force of 1 N. Calculate the workdone by the force in 20s and show

that is equal to the change in kinetic energy of the body.

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18. Find the work done in pulling and pushing an object through 200 m horizontally when a force of 1000 N is acting along a chain making an angle of 60° with ground. Assume the floor to be smooth friction less surface.

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Creative Questions Hots

1. Why should the object be moved at constant velocity when we define potential energy ?

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2. Why does a pilot not fall down, when his aeroplane loops a vertical loops ?

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3. A motor cyclist is going in a vertical circle. What is the necessary condition so that he may not fall down ?

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4. What is the power of an engine which can lift 20 metric ton of coal per hour from a mine 30 metres deep ?

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5. A body constrained to move along the x - axis of a coordinate system is subjected to a constant force $\vec{F} = \left(2\hat{i} - \hat{j} + 4\hat{k}\right)N$, then what is the workdone by this force in moving the body over a distance of 4 m along the x - axis.

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6. A molecule in gas container hits the wall with speed 350 m/s at an angle 45° with the

normal and rebound with the same speed. Is momentum conserved in the collision ?

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7. Calculate work done to move a boy of mass 20 kg along an inclined plane $(\theta = 45^\circ)$ with constent velocity through a distance of 10 m.

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8. A bullet of mass 25 g moving with a velocity of $400ms^{-1}$ strikes a cardboard and goes out from the other end with a velocity of $300ms^{-1}$, find out the work done in passing through the cardboard.

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9. Find the work done and power of an car engine which can maintain a speed of $40ms^{-1}$

for a mass of a car 2×10^3 kg on a rough level road to 2 km. The coefficient of friction is 0.05.

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Value Based Questions

1. Ramu and Raju are dragging water in a bucket from the wells A and B respectively. Ramu dragged three buckets of water within 5 minutes but Raju could not do for the short interval of time. He could take only two

buckets of water in 7 minutes. What do you inter from this Incidence.

What is the Expression for Work or Energy ?

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What is the expression and unit for power ?

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3. Ruvanjani was told to switch on motor by her mother. Since the tank at the top of her building is empty, water is filled from the well. After the tank is full, she switched it off. She went near the tap opened it and washed her hands and legs with water from the tap for ten minutes. What concept is hidden in this

scene.

What are the different energies at different position from the tank to the Tap.

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4. Ruvanjani was told to switch on motor by her mother. Since the tank at the top of her building is empty, water is filled from the well. After the tank is full, she switched it off. She went near the tap opened it and washed her hands and legs with water from the tap for

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What is the Total Energy near the tap ?

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