QB365 Question Bank Software Study Materials

Work, Energy and Power Work, Energy and Power

11th Standard

Physics

Total Marks : 50

Multiple Choice Question

50 x 1 = 50

1) A uniform force of $(2\hat{i}+\hat{j})$ N acts on a particle of mass 1 kg. The particle displaces from position $(3\hat{j}+\hat{k})$ m to $(5\hat{i}+3\hat{j})$ m. The work done by the force on the particle is

(a) 9 J (b) 6 J **(c) 10 J** (d) 12 J

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**

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

(a) 20 J (b) 30 J (c) 40 J (d) 10 J

4) 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) $4mv^2$

5) 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

6) What is the minimum velocity with which 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) $\sqrt{gR}$

7) The work done by the conservative force for a closed path is

(a) always negative **(b) zero** (c) always positive (d) not defined

8) 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 %

9) 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 = βx** (c) F = -βx (d) F = -$\frac{\beta}{2}x^2$

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

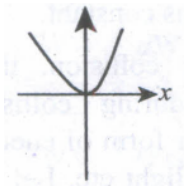
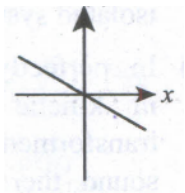
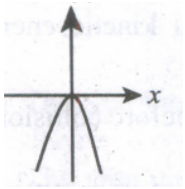
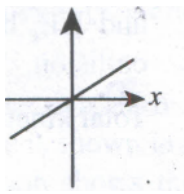
(a) v (b) v^2 **(c) v^3** (d) v^4

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

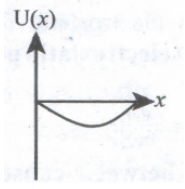
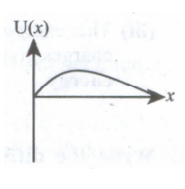
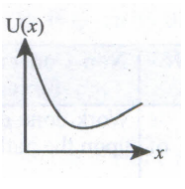
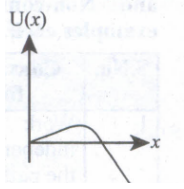
(a) -4 ms^{-1} and 10 ms^{-1} (b) 10 ms^{-1} and 0 ms^{-1} **(c) -9 ms^{-1} and 5 ms^{-1}** (d) 5 ms^{-1} and 1 ms^{-1}

12) 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)

U(x) U(x) U(x) U(x)

(a)  (b)  **(c)**  (d) 

13) 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 particles

(a)  (b)  (c)  **(d)** 

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

(a) $\frac{2}{3}$k **(b)** $\frac{3}{2}$**k** (c) 3k (d) 6k

15) An engine pumps water continuously through a hose. Water leaves the hose with a velocity v and m is the mass per unit length of the water of the jet. What is the rate at which kinetic energy is imparted to water?

(a) $\frac{1}{2}mv^2$ (b) mv^3 (c) $\frac{1}{2}mv^3$ (d) $\frac{1}{2}mv^2$

16) The coefficient of restitution e for a perfectly elastic collision is _____.

(a) 1 (b) 0 (c) α (d) -1

17) 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

18) 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

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

(a) 5J (b) 500J (c) 0.5J **(d) zero**

20) 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

21) 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 $=m_1 > m_2$ the _____.

(a) $E_1 2$ (b) $\frac{E_1}{E_2} = \frac{m_1}{m_2}$ (c) $E_1 > E_2$ (d) $E_1 = E_2$

22) 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

23) A stone is released from a tower, its total energy during its fall _____.

(a) increases (b) decreases **(c) remains constant** (d) first increases then remains constant

24) Which of the following statements is Wrong?

(a) K.E of a body is dependent on the direction of motion

(b) In an elastic collision of two bodies, the momentum and energy of each body is conserved

(c) If two protons are brought towards each other, the P.E of the system increases

(d) A body can have energy without momentum

25) If a body is raised from the surface of the earth upto height R, what is the change in potential energy?

(a) mgR (b) $\frac{3}{2}mgR$ **(c)** $\frac{mgR}{2}$ (d) $\frac{mgR}{4}$

26) Two balls at the same temperature collide. What is conserved?

(a) Momentum (b) KE (c) Temperature (d) Velocity

27) A ball strikes against the floor and returns with double the velocity. What type of collision is it?

(a) perfectly elastic (b) perfectly inelastic (c) partially elastic (d) none of the above

28) A stone tied to a piece of string whirled in a vertical circle with uniform speed, in what position of the stone is the tension in the string greatest?

(a) in the highest position of the stone (b) in the lowest position of the stone

(c) in the position when string is horizontal (d) is same for all positions of the stone

29) Two bodies A and having masses in the ratio 5:1 are dropped from the same height. Then the ratio of their momenta just before they hit the ground is _____.

(a) 1: 5 **(b) 5:1** (c) $1:\sqrt{5}$ (d) 1: 10

30) A body of mass 1kg at rest explodes and breaks into three fragments of masses in the ratio 1:1:3. The two pieces of equal mass fly off perpendicular to each other with a speed of 30ms^{-1} each. The velocity of the heavier fragment is _____.

(a) 12.5 ms^{-1} (b) 10.2 ms^{-1} **(c) 14.1 ms^{-1}** (d) 7.5 ms^{-1}

31) A position dependent force F = (7 - 2x - 6x^2) N acts on a small body of mass 2 kg and displaces it from x = 0 to x = 2 m. The work done is _____.

(a) -2 J **(b) -6 J** (c) 236 J (d) 124 J

32) An escalator is moving downwards with a uniform speed 5 ms^{-1}. A man of mass 60 kg is running upwards on it at a uniform speed 10 ms^{-1}. If the height of the escalator is 10 m, the work done by the man is going up the escalator is _____. (Take g = 10 ms^{-2}).

(a) 12J **(b) 12kJ** (c) 1.2kJ (d) 120kJ

33) One coolie takes 1 minute to raise a suitcase through a height of 2 m but the second coolie takes 30 s to raise the same suitcase to the same height. The powers of two coolies are in the ratio _____.

(a) 1: 3 (b) 2: 1 (c) 3: 1 **(d) 1: 2**

34) A shell of mass 200 gm is ejected from a gun of mass 4 kg by an explosion that generates 1.05 kJ of energy. The initial velocity of the shell is _____.

(a) 40ms^{-1} (b) 120ms^{-1} **(c) 100ms^{-1}** (d) 80ms^{-1}

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

(a) - 4 m/s and +4 m/s (b) +4 m/s for both (c) - 3 m/s and +5 m/s **(d) - 5 m/s and + 3 m/s**

36) A body moves a distance of 10 m along a straight line under the action of a 5 N force. If the work done is 25 J, then angle between the force and direction of motion of the body is _____.

(a) 60° (b) 75° (c) 30° (d) 45°

37) When a body moves with a constant, speed along a circle _____.

(a) no work is done on it (b) no acceleration is produced in it (c) its velocity remains constant (d) no force acts on it

38) The rate of work done is called as _____.

(a) energy **(b) power** (c) force (d) mechanical energy

39) The work done by the goal keeper catches the ball coming towards him by applying a force is _____.

(a) positive **(b) negative** (c) zero (d) infinity

40) The body must have a speed at highest point in vertical circular motion to stay in the circular path _____.

(a) $\geq \sqrt{gr}$ (b) $\geq \sqrt{2gr}$ (c) $\geq \sqrt{5gr}$ (d) $\geq$5gr

41) kWh is the practical unit of _____.

(a) energy (b) power (c) electrical energy (d) none

42) For perfectly inelastic collision, coefficient of restitution is _____.

(a) 0 (b) 1 (c) 0 < e < 1 (d) ∞

43) In a gravitational field, the work done in moving a body from one point into another depends on _____.

(a) initial and final positions (b) distance between them **(c) actual distance covered** (d) velocity of motion

44) The potential energy of a certain spring when stretched by a distance x is 40J. The amount of work required to stretch it through an additional distance is

(a) 240J (b) 60J **(c) 120J** (d) 160J

45) A 50g bullet moving with a speed of $10ms^{-1}$ strokes a stationary body of mass 950g and enters it. The percentage loss of kinetic energy of the bullet is

(a) 0.25m/s **(b) 0.5m/s** (c) 1m/s (d) 0m/s

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

(a) 12.3 kW (b) 7.0 kW **(c) 8.1 kW** (d) 10.2 kW

47) The decrease in the potential energy of a ball of mass 20 kg that falls from a height 50 cm

(a) 968 J **(b) 98 J** (c) 1980 J (d) None

48) A boat is moving both constant velocity of 5m/s against a frictional force of 1000 N. The amount of power delivered is

(a) 5000W (b) 500W (c) 2500W (d) 250W

49) A body of mass 0.1kg is rotated at the end of a string in a vertical circle of radius 1.0 m at a constant speed of $5ms^{-1}$. The tension in newton in the string at the highest point of its path is (g = $10ms^{-2}$).

(a) 0.5 (b) 1.0 **(c) 1.5** (d) 3.5

50) Two springs have force constants K_1 and K_2. These are extended through the same distance x. If their elastic energies are E_1 and E_2 then $\frac{E_1}{E_2}$ is _____.

(a) $K_1 : K_2$ (b) $K_1^2 : K_2^2$ (c) $K_2 : K_1$ (d) $\sqrt{K_1} : \sqrt{K_2}$