NEET : CHAPTER WISE TEST-6

SUBJECT :- PHYSICS
CLASS :- 11th
CHAPTER :- WORK,POWER,ENERGY

DATE...
NAME..
SECTION...

(SECTION-A)

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 this force in moving the body over half the circumference of the circle

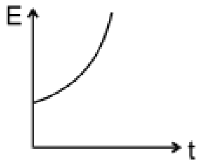
(A) $\frac{mv^2}{\pi r^2}$ (B) Zero

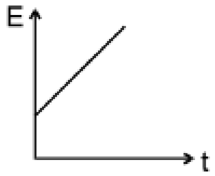
(C) $\frac{mv^2}{r^2}$ (D) $\frac{\pi r^2}{mv^2}$

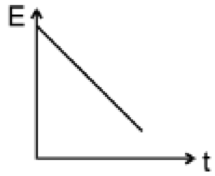
2. A force acts on a 30 *gm* particle in such a way that the position of the particle as a function of time is given by $x = 3t - 4t^2 + t^3$, where *x* is in *metres* and *t* is in seconds. The work done during the first 4 seconds is

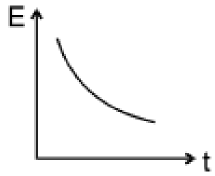
(A) 5.28 *J* (B) 450 *Mj*
(C) 490 *mJ* (D) 530 *mJ*

3. A particle is dropped from 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 with respect to time t is correctly shown in

(A) 

(B) 

(C) 

(D) 

4. A force $(\vec{F}) = 3\hat{i} + c\hat{j} + 2\hat{k}$ acting on a particle causes a displacement: $(\vec{s}) = -4\hat{i} + 2\hat{j} + 3\hat{k}$ in its own direction. If the work done is $6\,J$, then the value of $'c'$ is

(A) 0 (B) 1 (C) 6 (D) 12

5. 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 kinetic energy is constant
(D) It moves in a straight line

6. A particle moves under the effect of a force *F* = *Cx* from *x* = 0 to $x = x_1$. The work done in the process is

(A) Cx_1^2 (B) $\frac{1}{2}Cx_1^2$

(C) Cx_1 (D) Zero

7. 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

8. The spring extends by *x* on loading, then energy stored by the spring is :
(if *T* is the tension in spring and *k* is spring constant)

(A) $\frac{T^2}{2k}$ (B) $\frac{T^2}{2k^2}$

(C) $\frac{2k}{T^2}$ (D) $\frac{2T^2}{k}$

9. 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 constants and *x* is the distance between the atoms. The atom is in stable equilibrium when

(A) $x = \sqrt[6]{\frac{11a}{5b}}$ (B) $x = \sqrt[6]{\frac{a}{2b}}$

(C) $x = 0$ (D) $x = \sqrt[6]{\frac{2a}{b}}$

10. 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

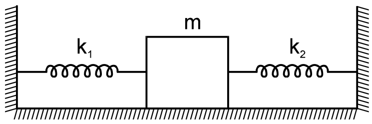
11. A body of mass 2 *kg* is thrown up vertically with K.E. of 490 joules. If the acceleration due to gravity is 9.8 m/s^2, then the height at which the K.E. of the body becomes half its original value is given by
(A) 50 *m* (B) 12.5 *m*
(C) 25 *m* (D) 10 *m*

12. If the *K.E.* of a body is increased by 300%, its momentum will increase by
(A) 100% (B) 150%
(C) $\sqrt{300}\,\%$ (D) 175%

13. A light and a heavy body have equal kinetic energy. Which one has a greater 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

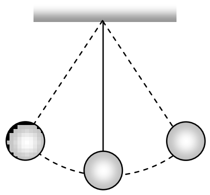
14. A 4 *kg* mass and a 1 *kg* mass are moving with equal kinetic energies. The ratio of the magnitudes of their linear momenta is
(A) 1 : 2 (B) 1 : 1
(C) 2 : 1 (D) 4 : 1

15. A block of mass m is attached to two unstretched springs of spring constants k_1 and k_2 as shown in figure. The block is displaced towards right through a distance x and is released. Find the speed of the block as it passes through the mean position shown.



(A) $\sqrt{\frac{k_1+k_2}{m}}\,x$ (B) $\sqrt{\frac{k_1k_2}{m(k_1+k_2)}}\,x$
(C) $\sqrt{\frac{k_1^2k_2^2}{m(k_1^2+k_2^2)}}\,x$ (D) $\sqrt{\frac{k_1^3k_2^3}{m(k_1^3+k_2^3)}}$

16. 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 $g = 9.8\,m/s^2$)

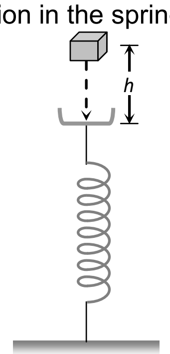


(A) 0.6 *m/s* (B) 1.4 *m/s*
(C) 1.8 *m/s* (D) 2.2 *m/s*

17. A bomb of mass 9*kg* explodes into 2 pieces of mass 3*kg* and 6*kg*. The velocity of mass 3*kg* is 1.6 *m/s*, the K.E. of mass 6*kg* is.
(A) 3.84 *J* (B) 9.6 *J*
(C) 1.92 *J* (D) 2.92 *J*

18. A bomb of mass 3.0 *Kg* 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) 4.8 *kJ*

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

20. A body of mass *m* accelerates uniformly from rest to v_1 in time t_1. 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) $\frac{mv_1^2t}{t_1^2}$

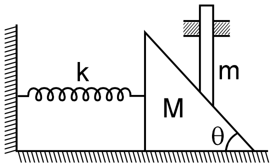
21. A weight lifter lifts 300 *kg* from the ground to a height of 2 *meter* in 3 *second*. The average power generated by him is
(A) 5880 *watt* (B) 4410 *watt*
(C) 2205 *watt* (D) 1960 *watt*

22. A 60 *kg* man runs up a staircase in 12 seconds while a 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

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

(A) 9.5 *W* (B) 7.5 *W*
(C) 6.5 *W* (D) 4.5 *W*

24. A wedge of mass M fitted with a spring of stiffness 'k' is kept on a smooth horizontal surface. A rod of mass m is kept on the wedge as shown in the figure. System is in equilibrium. Assuming that all surfaces are smooth, the potential energy stored in the spring is :



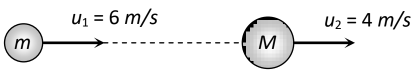
(A) $\frac{mg^2 \tan^2\theta}{2K}$ (B) $\frac{m^2 g \tan^2\theta}{2K}$

(C) $\frac{m^2 g^2 \tan^2\theta}{2K}$ (D) $\frac{m^2 g^2 \tan^2\theta}{K}$

25. 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 is '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

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

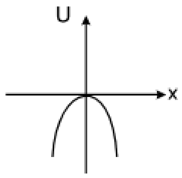


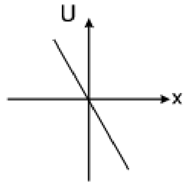
(A) 2*m*/*sec* in original direction
(B) 2 *m*/*sec* opposite to the original direction
(C) 4 *m*/*sec* opposite to the original direction
(D) 4 *m*/*sec* in original direction

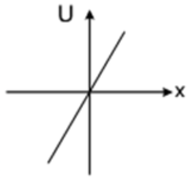
27. A steel ball of radius 2 *cm* is at rest on a frictionless surface. Another ball of radius 4*cm* moving at a velocity of 81 *cm*/*sec* collides elastically with first ball. After collision the smaller ball moves with speed of

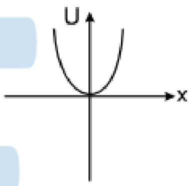
(A) 81 *cm*/*sec* (B) 63 *cm*/*sec*
(C) 144 *cm*/*sec* (D) None of these

28. A particle moves under the influence of a force F = kx in one dimensions (k is a positive constant and x is the distance of the particle from the origin). Assume that the potential energy of the particle at the origin is zero, the schematic diagram of the potential energy U as a function of x is given by

(A) 

(B) 

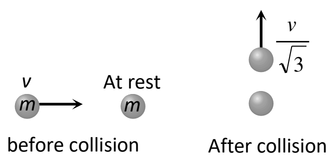
(C) 

(D) 

29. 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

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



(A) $\frac{2}{\sqrt{3}}v$ (B) $\frac{v}{\sqrt{3}}$

(C) *v* (D) $\sqrt{3}\,v$

31. A bullet hits and gets embedded in a solid block resting on a horizontal frictionless table. What is conserved ?

(A) Momentum and kinetic energy

(B) Kinetic energy alone

(C) Momentum alone

(D) Neither momentum nor kinetic energy

32. A moving body of mass *m* and velocity 3 *km*/*h* collides with a rest body of mass 2*m* and sticks to it. Now the combined mass starts to move. What will be the combined velocity

(A) 3 *km*/*h* (B) 2 *km*/*h*

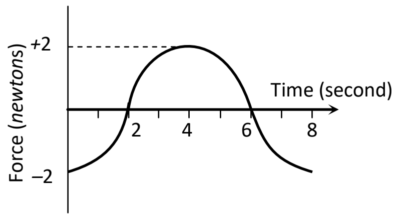
(C) 1 *km*/*h* (D) 4 *km*/*h*

33. A metal ball of mass 2 *kg* moving with a velocity of 36 *km*/*h* has an head on collision with a stationary ball of mass 3 *kg*. If after the collision, the two balls move together, the loss in kinetic energy due to collision is

(A) 40 *J* (B) 60 *J*

(C) 100 *J* (D) 140 *J*

34. 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*

35. 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*

(SECTION-B)

36. Assertion : The rate of change of total momentum of a many particle system is proportional to the sum of the internal forces of the system.

Reason : Internal forces can change the kinetic energy but not the momentum of the system.

(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.

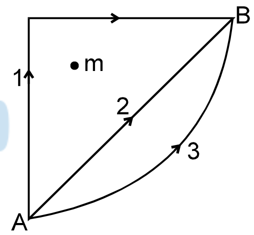
(D) Both assertion and reason are false

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

(A) 12 *J* (B) 9 *J*

(C) 6 *J* (D) 3 *J*

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



(A) $W_1 > W_2 > W_3$

(B) $W_1 = W_2 = W_3$

(C) $W_1 < W_2 < W_3$

(D) $W_2 > W_1 > W_3$

39. 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*

40. An engine pumps water through a hose pipe. Water passes through the pipe and leaves it with a velocity of 2 m/s. The mass per unit length of water in the pipe is 100 kg/m. What is the power of the engine?

(A) 400 W (B) 200 W

(C) 100 W (D) 800 W

41. 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) $W_2 = 0.5W_1$

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

(A) 0.15 *m* (B) 0.12 *m*

(C) 1.5 *m* (D) 0.5 *m*

43. A car of mass m starts from rest and accelerates so that the instantaneous power delivered to the car has a constant magnitude P_0. The instantaneous velocity of this car is proportional to :

(A) t^2P_0 (B) $t^{1/2}$

(C) $t^{-1/2}$ (D) $\frac{t}{\sqrt{m}}$

44. Power of a water pump is 2 *kW*. If $g = 10\ m/\sec^2$, the amount of water it can raise in one minute to a height of 10 *m* is

(A) 2000 *litre* (B) 1000 *litre*

(C) 100 *litre* (D) 1200 *litre*

45. How much work does a pulling 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) 160 *J*

(B) 277 *J*

(C) 784 *J*

(D) None of the above

46. 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 by

(A) $\frac{1}{2}m\frac{v}{t_1}t^2$ (B) $m\frac{v}{t_1}t^2$

(C) $\frac{1}{2}\left(\frac{m\,v}{t_1}\right)^2 t^2$ (D) $\frac{1}{2}m\frac{v^2}{t_1^2}t^2$

47. 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

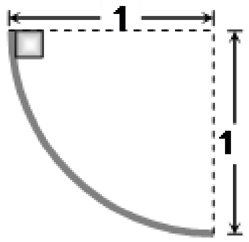
(D) None of the above

48. 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

49. 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) 4.43 *m/sec* (B) 2 *m/sec*

(C) 0.5 *m/sec* (D) 19.6 *m/sec*

50. **Match the column I with column II.**

Column I

(i) When a body does work against friction, its kinetic energy

(ii) Work done by a body is

(iii) Power of a body varies inversely as

(iv) When work done over a closed path is zero

Column II

(p) independent of time

(q) time

(r) force must be conservative

(s) decreases

(A) i-p,ii-q, iii-r,iv-s

(B) i-q,ii-r, iii-s,iv-p

(C) i-s,ii-r, iii-q,iv-p

(D) i-s,ii-p, iii-q,iv-r