JEE MAIN : CHAPTER WISE TEST PAPER-5

SUBJECT :- PHYSICS **DATE..**

CLASS :- 11th **NAME..**

CHAPTER :- WORK POWER ENERGY **SECTION..**

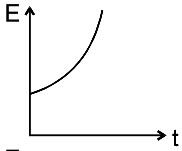
(SECTION-A)

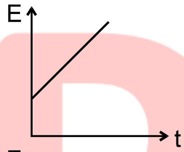
1. Two equal masses are attached to the two ends of a spring of spring constant k. The masses are pulled out symmetrically to stretch the spring by a length x over its natural length. The work done by the spring on each mass during the above pulling is

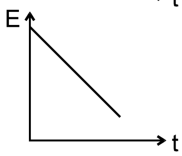
(A) $\frac{1}{2}kx^2$ (B) $-\frac{1}{2}kx^2$

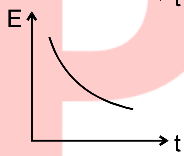
(C) $\frac{1}{4}kx^2$ (D) $-\frac{1}{4}kx^2$

2. 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) 

3. A rod of length 1m and mass 0.5 kg hinged at one end, is initially hanging vertical. The other end is now raised slowly until it makes an angle 60° with the vertical. The required work is :(use g = 10 m/s²)

(A) $\frac{5}{2}$ J (B) $\frac{5}{4}$ J

(C) $\frac{17}{8}$ J (D) $\frac{5\sqrt{3}}{4}$ J

4. A small mass slides down an inclined plane of inclination θ with the horizontal. The co-efficient of friction is $\mu = \mu_0 x$ where x is the distance through which the mass slides down and μ_0 is a constant. Then the distance covered by the mass before it stops is:

(A) $\frac{2}{\mu_0}\tan\theta$ (B) $\frac{4}{\mu_0}\tan\theta$

(C) $\frac{1}{2\mu_0}\tan\theta$ (D) $\frac{1}{\mu_0}\tan\theta$

5. ________________ of a two particle system depends only on the separation between the two particles. The most appropriate choice for the blank space in the above sentence is

(A) kinetic energy

(B) total mechanical energy

(C) potential energy

(D) total energy

6. A spring of spring constant k placed horizontally on a rough horizontal surface is compressed against a block of mass m placed on the surface so as to store maximum energy in the spring. If the coefficient of friction between the block and the surface is μ, the potential energy stored the spring is :

(A) $\frac{\mu^2 m^2 g^2}{k}$ (B) $\frac{2\mu m^2 g^2}{k}$

(C) $\frac{\mu^2 m^2 g^2}{2k}$ (D) $\frac{3\mu^2 m g^2}{k}$

7. A running man has half the kinetic energy of that of a boy of half of his mass. The man speeds up by 1 m/s so as to have same kinetic energy as that of the boy. The original speed of the man will be

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

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

8. A car of mass m starts moving so that its velocity varies according to the law $v = \beta\sqrt{s}$, where β is a constant, and s is the distance covered. The total work performed by all the forces which are acting on the car during the first t seconds after the beginning of motion is

(A) $m\beta^4 t^2/8$ (B) $m\beta^2 t^4/8$

(C) $m\beta^4 t^2/4$ (D) $m\beta^2 t^4/4$

9. **Statement-1 :** Graph between potential energy of a spring versus the extension or compression of the spring is a straight line.

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

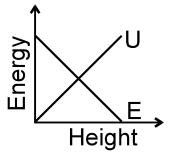
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

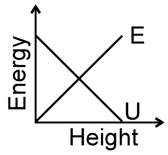
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

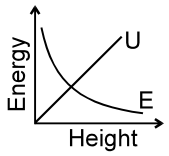
(C) Statement-1 is True, Statement-2 is False

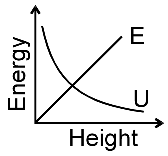
(D) Statement-1 is False, Statement-2 is True

10. Which of the following graphs is correct between kinetic energy (E), potential energy (U) and height (h) from the ground of the particle ($h << R_E$ and U = 0 at h = 0)

(A) 

(B) 

(C) 

(D) 

11. A ball is released from the top of a tower. The ratio of work done by force of gravity in first, second and third second of the motion of the ball is

(A) 1 : 2 : 3 (B) 1 : 4 : 9
(C) 1 : 3 : 5 (D) 1 : 5 : 3

12. A block of mass M is hanging over a smooth and light pulley through a light string. The other end of the string is pulled by a constant force F. The kinetic energy of the block increases by 20 J in 1s.

(A) the tension in the string is Mg
(B) the tension in the string is F
(C) the work done by the tension on the block is 20 J in the above 1 s.
(D) the work done by the force of gravity is – 20 J in the above 1s.

13. When a conservative force does positive work, the potential energy of the system associated with that force:

(A) decreases
(B) increases
(C) remains constant
(D) depends on whether other non conservative force is working or not.

14. A body is projected with kinetic energy k at angle ϕ with the vertical. Neglecting friction, its potential energy at the highest point will be

(A) $k \cos^2 \phi$
(B) $k \sin^2 \phi$
(C) k
(D) zero

15. A particles with constant total energy E moves in one direction in a region where the potential energy is U(x). The speed of the particle is zero when.

(A) U(x) = E (B) U(x) = 0
(C) $\frac{dU(x)}{d(x)} = 0$ (D) $\frac{d^2U(x)}{d(x)^2} = 0$

16. Two springs have their force constant as k_1 and $k_2 (k_1 > k_2)$. When they are stretched by the same force up to equilibrium -

(A) No work is done by this force in case of both the springs
(B) Equal work is done by this force in case of both the springs
(C) More work is done by this force in case of second spring
(D) More work is done by this force in case of first spring

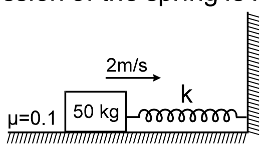
17. Work done by static friction on an object:

(A) may be positive (B) must be negative
(C) must be zero (D) none of these

18. A particle of mass m is moving with speed u. It is stopped by a force F in distance x . If the stopping force is 4F then :

(A)work done by stopping force in second case will be same as that in first case.
(B) work done by stopping force in second case will be 2 times of that in first case.
(C) work done by stopping force in second case will be 1/2 of that in first case.
(D) work done by stopping force in second case will be 1/4 of that in first case.

19. A block of mass 50 kg is projected horizontally on a rough horizontal floor. The coefficient of friction between the block and the floor is 0.1. The block strikes a light spring of stiffness k = 100 N/m with a velocity 2m/s. The maximum compression of the spring is :



(A) 1 m (B) 2 m (C) 3 m (D) 4 m

20. Two springs A and B ($k_A = 2k_B$) are strettched by applying forces of equal magnitudes at the four ends. If the energy stored in A is E, that in B is

(A) E/2 (B) 2E (C) E (D) E/4

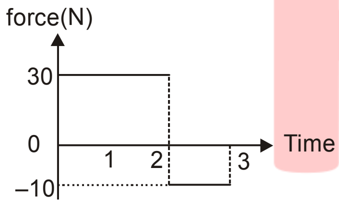
(SECTION-B)

21. If the unit of force and length each be increased by four times, then How many times unit of energy is increase ?

22. A particle is moved by a force $\vec{F} = 20\hat{i} - 30\hat{j} + 15\hat{k}$ along a straight line from point A to point B with position vectors $2\hat{i} + 7\hat{j} - 3\hat{k}$ and $5\hat{i} - 3\hat{j} - 6\hat{k}$ respectively. Find the work done.

23. A force of $(3\hat{i} - 1.5\hat{j})$ N acts on a 5 kg body. The body is at a position of $(2\hat{i} - 3\hat{j})$ m and is travelling at 4 ms^{-1}. The force acts on the body until it is at the position $(\hat{i} + 5\hat{j})$ m. Assuming no other force does work on the body, the final speed of the body is $\sqrt{n}$ ms^{-1}. Find the value of n.

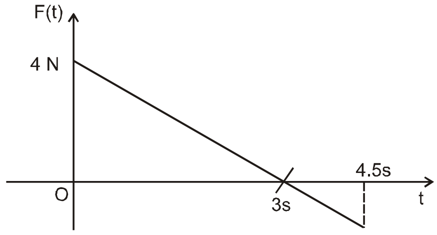
24. Starting at rest, a 10 kg object is acted upon by only one force as indicated in figure. Then the total work done by the force is



25. A block weighing 10 N travles down a smooth curved track AB joined to a rough horizontal surface (figure). The rough surface has a friction coefficient of 0.20 with the block. If the block starts slipping on the track from a point 1.0 m above the horizontal surface, the distance it will move on the rough surface is :

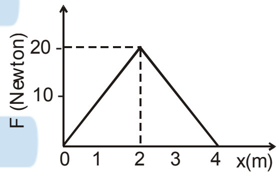
26. A spring of force constant 800 N/m has an extension of 5cm. The work done in extending it from 5cm to 15cm is

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



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

29. 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



30. A particle is projected vertically upwards with a speed of 16 m/s, after some time, when it again passes through the point of projection, its speed is found to be 8 m/s. It is known that the work done by air resistance is same during upward and downward motion. Then the maximum height attained by the particle is (Take g = 10 m/s^2) :