Episode No – 9

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Work, Energy & Power

1. Potential energy of a system increases if work is done
   (A) Upon the system by a conservative force

   (B) Upon the system by a non-conservative force

   (C) By the system against a conservative force

   (D) By the system against a non-conservative force

2. A block of mass m is attached to the lower end of a vertical spring of constant k whose other end is fixed to the ceiling. The mass is released from rest when the spring is unstretched. The maximum extension produced in the spring will be

   (A) $\frac{2mg}{k}$ (B) $\frac{4mg}{k}$ (C) $\frac{mg}{2k}$ (D) $\frac{mg}{k}$

3. A vertical spring with force constant k is fixed on the table. A ball of mass m from a height h above the free end of the spring falls vertically on the spring so that the spring compresses by a distance d. The net work done in the process is

   (A) $mg\left(h-d\right)+\frac{1}{2}kd^2$ (B) $mg\left(h+d\right)+\frac{1}{2}kd^2$

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

4. The upper half of an inclined plane of inclination θ smooth while lower half is rough. A block starting from rest from the top of the plane comes to rest at the bottom of the plane if the coefficient of friction between the block and the lower half of the plane is

   (A) $« = \frac{1}{\tan^{-}}$ (B) $« = \frac{2}{\tan^{-}}$ (C) $« = 2\tan^{-}$ (D) $« = \tan^{-}$

5. A body of mass 1 kg is thrown upwards with a speed of 20 m/s. It momentarily comes to rest after reaching a height of 18 m. How much energy in joules is lost due to air friction (g = 10 ms^{-2})

   (A) 30J (B) 40J (C) 10J **(D) 20J**

6. When a body moves in a circular path, no work is done by the force since,

(A) There is no displacement
(B) There is no net force
(C) Force and displacement are perpendicular to each other.
(D) The force is always from the centre.

7. The work done in carrying a charge q once round a circle of radius R with charge Q at its centre is

(A) $\frac{qQ}{4\pi\varepsilon_0 R}$ (B) $\frac{qQ}{4\pi\varepsilon_0^{\ 2} R^2}$

(C) $\frac{qQ}{4\pi\varepsilon_0 R^2}$ **(D) None of these**

8. A truck accelerates from speed v to 2v. Work done during this is
(A) Three times the work done in accelerating it from rest to v
(B) Same as the work done in accelerating it from rest to v
(C) Four times the work done in accelerating it from rest to v
(D) Less than the work done in accelerating it from rest to v

9. 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 jet. What is the rate at which kinetic energy is imparted to water?

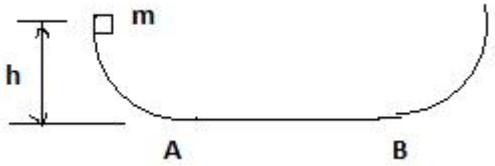
(A) mv^2 (B) $\frac{1}{2}mv^2$ (C) $\frac{1}{2}m^2v^2$ **(D)** $\frac{1}{2}mv^3$

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

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

11. A spherical ball of mass 20 kg at rest on top of a hill of height 100 m rolls down a smooth surface to the ground, climbs up another hill to a height of 30 m also smooth and finally rolls down to a horizontal base 20 m above the ground. The velocity attained by the ball on the horizontal base is

(A) 40 m/s (B) 20 m/s (C) 10 m/s (D) 10√30 m/s

12. 

A small block of mass m is released from a height h from the horizontal surface AB. The curved portions are smooth and the horizontal part AB is rough with coefficient of friction μ. The block slides down, moves on the part AB, then climbs on the curved portion on the other side, slides down again, moves on the part BA and again climbs. This is repeated enough times before it finally stops. At what distance from A does the block finally stop?

13. The P.E Function

a) 2 J b) =4 J **c) 1 J** d) ½ J

14. The P.E Function ass with

a) $U = -2x^2y$ b) $-2x^2y+const$ c) $2x^2y+c=u$ **d) Not Defined**

15. Work done by a spring force is

a) Posi b) -ve c) Zero **d) Any of the Above**

16. Con of mechanical energy is applicable when

a) No External force is acting
b) External force is acting
c) Friction is present
d) Always applicable

17. In a inelastic collision of 2 bodies the avlantity

a) KE
b) Total linear momentum
c) Total energy
d) None of system