WORK POWER ENERGY

DPP SHEET

ONLY ONE OPTION CORRECT TYPE

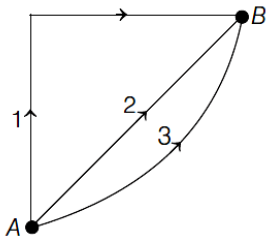
1. A uniform chain of length *L* and mass *M* is lying on a smooth table and one-third of its length is hanging vertically down over the edge of the table. If *g* is acceleration due to gravity, the work required to pull the hanging part on to the table is

(a) MgL (b) MgL/3 (c) MgL/9 (d) MgL/18

2. A particle of mass *m* is moving in a circular path of constant radius *r* such that its centripetal acceleration a_c is varying with time *t* as $a_c = k^2rt^2$, where *k* is a constant. The power delivered to the particle by the force acting on it is

(a) $2\pi mk^2r^2$ (b) mk^2r^2t (c) $\frac{\left(mk^4r^2t^5\right)}{3}$ (d)zero

3. 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 and 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

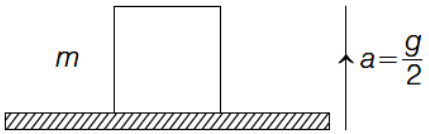


(a) $W_1 > W_2 > W_3$ (b) $W_1 = W_2 = W_3$ (c) $W_1 < W_2 < W_3$ (d) $W_2 > W_1 > W_3$

4. A body of mass m = 10^{-2}kg is moving in a medium and experiences a frictional force $F = -kv^2$. Its initial speed is $v_0 = 10\ ms^{-1}$. If after 10 s, its energy is $\frac{1}{8}mv_0^2$, the velocity of k will be

(a) $10^{-3}kgs^{-1}$ (b) $10^{-4}kgs^{-1}$ (c) $10^{-1}kgm^{-1}s^{-1}$ (d) $10^{-3}kgm^{-1}$

5. A block of mass *m* is kept on a platform which starts from rest with constant acceleration $\frac{g}{2}$ upwards as shown in figure. Work done by normal reaction on block in time *t* is



(a) $\frac{mg^2t^2}{8}$ (b) $\frac{3mg^2t^2}{8}$ (c) 0 (d) $-\frac{mg^2t^2}{8}$

6. A spring of spring constant 5 × 10^3 N/m is stretched initially by 5cm from the unstretched position. Then the work required to stretch it further by another 5 cm is

(a) 12.50 Nm (b) 18.75 Nm (c) 25.00 Nm (d) 6.25 Nm

7. A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to 8×10^{-4} J by the end of the second revolution after the beginning of the motion ?

(a) 0.1 m/s^2 (b) 0.15 m/s^2 (c) 0.18 m/s^2 (d) 0.2 m/s^2

8. A body is moved along a straight line by a machine delivering a constant power. The distance moved by the body in time '*t*' is proportional to

(a) $t^{3/4}$ (b) $t^{3/2}$ (c) $t^{1/4}$ (d) $t^{1/2}$

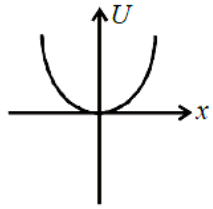
9. A ball is thrown vertically downwards from a height of 20 m with an initial velocity v_0. It collides with the ground and loses 50% of its energy in collision and rebounds to the same height. The initial velocity v_0 is : (Take g = 10 ms^{-2})

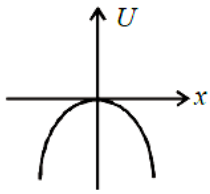
(a) 20 ms^{-1} (b) 28 ms^{-1} (c) 10 ms^{-1} (d) 14 ms^{-1}

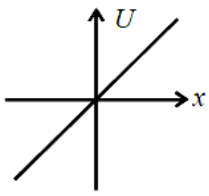
10. When a rubber-band is stretched by a distance x, it exerts restoring force of magnitude $F = ax + bx^2$ where a and b are constants. The work done in stretching the unstretched rubber-band by L is:

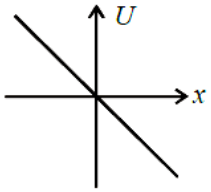
(a) aL^2+bL^3 (b) $\frac{1}{2}\left(aL^2+bL^3\right)$ (c) $\frac{aL^2}{2}+\frac{bL^3}{3}$ (d) $\frac{1}{2}\left(\frac{aL^2}{2}+\frac{bL^3}{3}\right)$

11. A particle is acted by a force $F = kx$, where k is a +ve constant. Its potential energy at $x = 0$ is zero. Which curve correctly represents the variation of potential energy of the block with respect to x

(a) 

(b) 

(c) 

(d) 

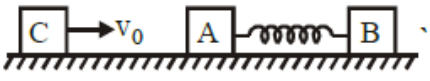
12. A moving body with a mass m_1 and velocity u strikes a stationary body of mass m_2. The masses m_1 and m_2 should be in the ratio m_1/m_2 so as to decrease the velocity of the first body to 2u/3 and giving a velocity of v to m_2 assuming a perfectly elastic impact. Then the ratio m_1/m_2 is

(a) 5 (b) 1/5 (c) 1/25 (d) 25

13. A body is allowed to fall freely under gravity from a height of 10m. If it looses 25% of its energy due to impact with the ground, then the maximum height it rises after one impact is

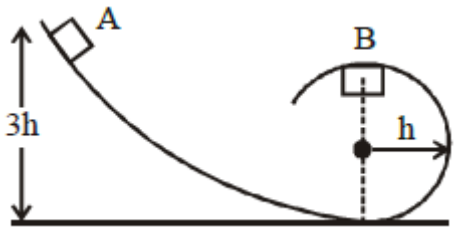
(a) 2.5m (b) 5.0m (c) 7.5m (d) 8.2m

14. A block C of mass m is moving with velocity v_0 and collides elastically with block A of mass m and connected to another block B of mass 2m through spring constant k. What is k if x_0 is compression of spring when velocity of A and B is same?



(a) $\frac{mv_0^2}{x_0^2}$ (b) $\frac{mv_0^2}{2x_0^2}$ (c) $\frac{3}{2}\frac{mv_0^2}{x_0^2}$ (d) $\frac{2}{3}\frac{mv_0^2}{x_0^2}$

15. In the figure shown, a particle of mass m is released from the position A on a smooth track. When the particle reaches at B, then normal reaction on it by the track is



(a) mg (b) 2mg (c) $\frac{2}{3}$mg (d) $\frac{m^2g}{h}$

16. A bullet of mass 20 g and moving with 600 m/s collides with a block of mass 4 kg hanging with the string. What is the velocity of bullet when it comes out of block, if block rises to height 0.2 m after collision?

(a) 200 m/s (b) 150 m/s (c) 400 m/s (d) 300 m/s

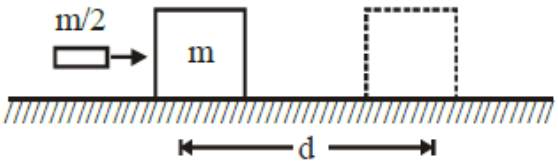
17. A body of mass m kg is ascending on a smooth inclined plane of inclination $\theta\left(\sin\theta=\frac{1}{x}\right)$ with constant acceleration of a m/s^2. The final velocity of the body is v m/s. The work done by the body during this motion is (Initial velocity of the body = 0)

(a) $\frac{1}{2}mv^2(g+xa)$ (b) $\frac{mv^2}{2}\left(\frac{g}{2}+a\right)$ (c) $\frac{2mv^2x}{a}(a+gx)$ (d) $\frac{mv^2}{2ax}(g+xa)$

18. The potential energy of a 1 kg particle free to move along the x-axis is given by $V(x)=\left(\frac{x^4}{4}-\frac{x^2}{2}\right)$J. The total mechanical energy of the particle is 2 J. Then, the maximum speed (in m/s) is

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

19. A block of mass m rests on a rough horizontal surface (Coefficient of friction is μ). When a bullet of mass m/2 strikes horizontally, and get embedded in it, the block moves a distance d before coming to rest. The initial velocity of the bullet is $k\sqrt{2\mu gd}$, then the value of k is



(a) 2 (b) 3 (c) 4 (d) 5

20. 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) 576mj (b) 450mJ (c) 490mJ (d) 530mJ

21. A steel ball of mass 5g is thrown downward with velocity 10 m/s from height 19.5 m. It penetrates sand by 50 cm. The change in mechanical energy will be (g = 10 m/s^2)

(a) 1J (b) 1.25 J (c) 1.5 J (d) 1.75 J

22. A 10 H.P. motor pumps out water from a well of depth 20 m and fills a water tank of volume 22380 litres at a height of 10 m from the ground. The running time of the motor to fill the empty water tank is (g = 10ms^{-2})

(a) 5 minutes (b) 10 minutes (c) 15 minutes (d) 20 minutes

23. A 2 kg block slides on a horizontal floor with a speed of 4m/s. It strikes a uncompressed spring, and compresses it till the block is motionless. The kinetic friction force is 15N and spring constant is 10,000 N/m. The spring compresses by

(a) 8.5 cm (b) 5.5 cm (c) 2.5 cm (d) 11.0 cm

24. A body of mass 50kg is projected vertically upwards with velocity of 100 m/sec. After 5 seconds this body breaks into two pieces of 20 kg and 30 kg. If 20 kg piece travels upwards with 150 m/sec, then the velocity of other block will be

(a) 15 m/sec downwards (b) 15 m/sec upwards (c) 51 m/sec downwards (d) 51 m/sec upwards

25. The K.E. acquired by a mass m in travelling a certain distance d, starting form rest, under the action of a constant force is directly proportional to

(a) m (b) $\sqrt{m}$ (c) $\frac{1}{\sqrt{m}}$ (d) independent of m

Answer Key

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
D	B	B	B	B	B	A	B	A	C
11.	**12.**	**13.**	**14.**	**15.**	**16.**	**17.**	**18.**	**19.**	**20.**
B	A	C	D	A	A	D	A	B	A
21.	**22.**	**23.**	**24.**	**25.**					
B	C	B	A	D					

SOLUTION VIDEO LINK :CLICK HERE TO OPEN