Single Correct Answer Type

1. A particle moves on a rough horizontal ground with some initial velocity say v_0. If $\frac{3}{4}$th of its kinetic energy is lost in friction in time t_0. Then coefficient of friction between the particle and the ground is

(A) $\frac{v_0}{2gt_0}$ (B) $\frac{v_0}{4gt_0}$ (C) $\frac{3v_0}{4gt_0}$ (D) $\frac{v_0}{gt_0}$

2. A 15g ball is shot from a spring gun whose spring has a force constant of 600 N/m. The spring is compressed by 5 cm. The greatest possible horizontal range of the ball for this compression is _____ $\left(g = 10ms^{-2}\right)$.

(A) 6m (B) 12m (C) 10 m (D) 8m

3. A hole is drilled from the surface of earth to its center. A particle is dropped from rest at the surface of earth. The speed of the particle when it reaches the centre of the earth in terms of its escape velocity on the surface of earth v_e is _____

(A) $\frac{v_e}{2}$ (B) v_e (C) $\sqrt{2}v_e$ (D) $\frac{v_e}{\sqrt{2}}$

4. An ice cube of size $a = 10cm$ is floating in a tank (base area $A = 50cm \times 50cm$) partially filled with water. The change in gravitational potential energy, when ice melts completely is _____ (density of ice $900kg/m^3$)

(A) $-0.072J$ (B) $-0.24J$ (C) $-0.016J$ (D) $-0.045J$

5. A particle of mass 'm' is projected with velocity u, at an angle 'θ' with horizontal. During the period when the particle decends from highest point to the position where its velocity vector makes an angle $\frac{\theta}{2}$ with horizontal. Work done by gravity force is _____

(A) $\frac{1}{2}mu^2 \tan^2\theta$ (B) $\frac{1}{2}mu^2 \tan^2\frac{\theta}{2}$

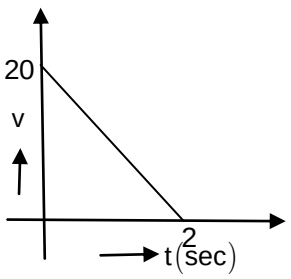
(C) $\frac{1}{2}mu^2 \cos^2\theta \tan^2\frac{\theta}{2}$ (D) $\frac{1}{2}mu^2 \cos^2\frac{\theta}{2}\sin^2\theta$

6. A force F acting on a body depends on its displacement s as $F \alpha S^{-1/3}$. The power delivered by F will depend on displacement as _____

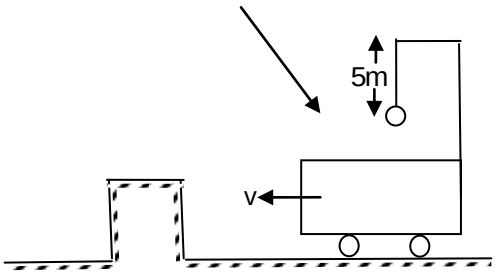
(A) $S^{2/3}$ (B) $S^{-5/3}$ (C) $S^{1/2}$ (D) S^0

7. Velocity –time graph of a particle of mass 2kg moving in a straight line is as shown in figure . Work done by all the forces on the particle is _____

(A) 400J
(B) $-400J$
(C) $-200J$
(D) 200J



8. A bob is suspended from a crane by a cable of length 5m. The crane and load are moving at a constant speed v. The crane is stopped by a bumper and the bob on the cable swings out an angle of 60°. The initial speed v is _____ $\left(g = 9.8 ms^{-2}\right)$.

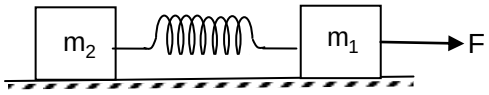


(A) $10 ms^{-1}$ (B) $7 ms^{-1}$ (C) $4 ms^{-1}$ (D) $2 ms^{-1}$

9. Force acting on a particle moving in a straight line varies with the velocity of the particle as $F = \frac{K}{U}$. Here 'K' is a constant. The work done by this force in time 't' is _____

(A) $\frac{k}{v^2}.t$ (B) $2kt$ (C) kt (D) $\frac{2kt}{v^2}$

10. Two blocks of masses $m_1 = 1kg$ and $m_2 = 2kg$ are connected by a non-deformed light spring . They are lying on a rough horizontal surface . The co-efficient of friction between the blocks and surface is 0.4 .what minimum constant force F has to be applied in horizontal direction to the block of mass m_1 in order to shift the other block ? $g = 10 ms^{-2}$

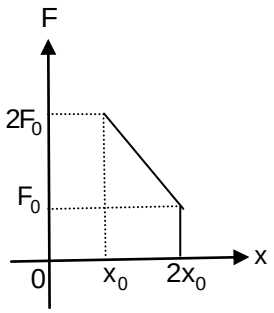


(A) 8N (B) 15N (C) 10N (D) 25N

11. Rain drops fall from a certain height with a terminal velocity 'v' on the ground. The viscous force is $F = 6\pi\eta rv$. Here 'η' is coefficient of viscosity. 'r' the radius of rain drop and 'v' is speed. The work done by all the forces acting on the ball till it reaches the ground is proportional to _____

(A) r^7 (B) r^5 (C) r^3 (D) r^2

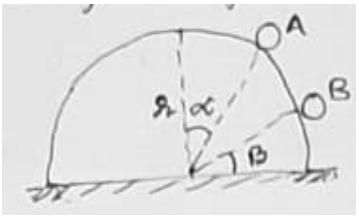
12. A particle of mass 'm' moving a straight line experiences force F which varies with the distance travelled as shown in the figure. If the velocity of the particle at 'x_0' is $\sqrt{\frac{2F_0x_0}{m}}$, then velocity at '$4x_0$' is _____



(A) $2\sqrt{\frac{2F_0x_0}{m}}$ (B) $2\sqrt{\frac{F_0x_0}{m}}$

(C) $\sqrt{\frac{F_0x_0}{m}}$ (D) none of these

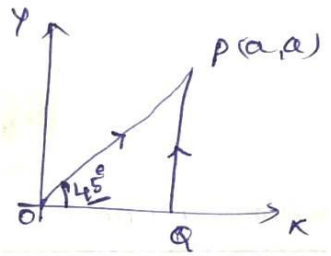
13. A particle moves from rest at 'A' on the surface of a smooth circular cylinder of radius r as shown. At B it leaves the cylinder. The equation relating α and 'β' is _____



(A) $3\sin\alpha = 2\cos\beta$ (B) $2\sin\alpha = 3\cos\beta$

(C) $3\sin\beta = 2\cos\alpha$ (D) $2\sin\beta = 3\cos\alpha$

14. A particle is moved from $(0,0)$ to (a,a) under a force $F=\left(3\hat{i}+4\hat{j}\right)$ from two paths. Path 1 is OP and path 2 is OQP. Let W_1 and W_2 be the work done by this force in these two paths. Then



(A) $w_1 = w_2$ (B) $w_1 = 2w_2$

(C) $w_2 = 2w_1$ (D) $w_2 = 4w_1$

15. An engine pumps up 100 kg of water through a height of 10m in 5 sec. Given that the efficiency of the engine is 60%. If $g = 10ms^{-2}$, the power of the engine is _____

(A) 3.3 KW (B) 0.33 KW (C) 0.033 KW (D) 33 KW

16. A spring of unstretched length 'l' has a mass 'm' with one end fixed to a rigid support. Assuming spring to be made of a uniform wire. The kinetic energy possed by it if its free end is pulled with uniform velocity 'v' is _____

(A) $\frac{1}{2}mv^2$ (B) mv^2 (C) $\frac{1}{3}mv^2$ (D) $\frac{1}{6}mv^2$

17. A constant power 'p is applied to a particle of mass 'm'. The distance travelled by the particle when its velocity increases from v_1 to v_2 is _____

(A) $\frac{3p}{m}\left(v_2^2 - v_1^2\right)$ (B) $\frac{m}{3p}\left(v_2 - v_1\right)$ (C) $\frac{m}{3p}\left(v_2^3 - v_1^3\right)$ (D) $\frac{m}{3p}\left(v_2^2 - v_1^2\right)$

18. A ball of mass 'm' and density 'ρ' is immersed in a liquid of density '3ρ' at a depth 'h' and released. To what height will be ball jump up above the surface of liquid _____

(A) h (B) $\frac{h}{2}$ (C) 2h (D) 3h

19. A smooth sphere of radius 'R' is made to translate in a straight line with a constant acceleration 'g'. A particle kept on the top of the sphere is released from there at zero velocity, with respect to the sphere. The speed of particle with respect to the sphere as a function of angle 'θ' as its slides down is _____

(A) $\sqrt{\frac{Rg(\sin\theta + \cos\theta)}{2}}$ (B) $\sqrt{Rg(1+\cos\theta - \sin\theta)}$

(C) $\sqrt{4Rg\sin\theta}$ (D) $\sqrt{2Rg(1+\sin\theta - \cos\theta)}$

20. A particle is given an initial speed 'v', inside a smooth spherical shell of radius '$R = 1m$'. That it is just able to complete the circle. Acceleration of the particle when its velocity is verticle is _____

(A) $g\sqrt{10}$ (B) g (C) $g\sqrt{2}$ (D) $g\sqrt{6}$

Numerical Based

21. Force acting on a particle is $\left(2\hat{i}+3\hat{j}\right)N$. Work done by this force is zero. When a particle is moved on the line $3y + kx = 5$. Here value of k is _____

22. If an ideal linear spring is stretched by 'x'. Then energy stored in it is E and when it is stretched by a further 2x then energy stored adds a further kE. Find the value of k _____

23. A car of mass 'm' accelerating on a level smooth road under the action of a single force 'F' acting along the direction of motion. The power delivered to the car is constant and equal to 'p'. If the velocity of the car at an instant is 'v'. Then after travelling a distance of $\frac{7mv^3}{3p}$. The velocity becomes kv. Then k is _____

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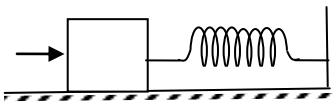
24. A particle of mass 0.2 kg is moving in one dimension under a force that delivers constant power 0.5 W to the particle . If the initial speed of the particle is zero, the speed after 5sec is _____

25. A block of mass 0.18 kg is attached to a spring of force constant $2\frac{N}{m}$.



The coefficient of friction between the block and the floor is 0.1. Initially the block is at rest and the spring is unstretched. An impulse is given to the block as shown in the fig. The block slides a distance of 0.06m and comes to rest for the first time. The initial velocity of the block in $m.s^{-1}$ is $\frac{N}{10}$. Then N is _____

KEY

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

❊ *Wish You all the Best* ❊