DPP

DAILY PRACTICE PROBLEMS

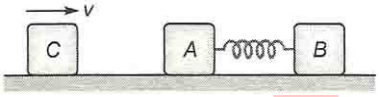
CLASS : XITH **SUBJECT : PHYSICS**

DATE : **DPP NO. : 7**

Topic :- SYSTEM OF PARTICLES AND ROTATIONAL MOTION

1. A solid sphere rolls down two different inclined planes of same length, but of different inclinations. In both cases
   a) Speed and time of descent will be same
   b) Speed will be same, but time of descent will be different
   c) Speed will be different, but time of descent will be same
   d) Speed and time of descent both are different

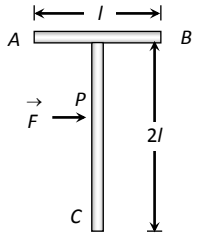
2. The blocks A and B, each of mass m, are connected by massless spring of natural length L and spring constant k. The blocks are initially resting on a smooth horizontal floor with the spring at its natural length, as shown in figure. A third identical block C, also of mass m, moves on the floor with a speed v along the line joining A and B, and collides with A. Then



   a) The KE o the A - B system, at maximum compression of the spring, is zero
   b) The KE of the A - B system, at maximum compression of the spring is $\frac{1}{4}mv^2$
   c) The maximum compression of the spring is $v\sqrt{\frac{m}{k}}$
   d) The maximum compression of the spring is $v\sqrt{\frac{m}{2k}}$

3. A reel of thread unrolls itself falling down under gravity. Neglecting mass of the thread, the acceleration of the reel is
   a) g b) $g/2$ c) $2g/3$ d) $4g/3$

4. A 'T' shaped object with dimensions shown in the figure, is lying on a smooth floor. A force '$\vec{F}$' is applied at the point P parallel to AB, such that the object has only the translational motion without rotation. Find the location of P with respect to C



a) $\frac{4}{3}l$ b) l c) $\frac{2}{3}l$ d) $\frac{3}{2}l$

5. If the external forces acting on a system have zero resultant, the center of mass
   a) May move but not accelerate b) May Accelerate
   c) Must not move d) None of the above

6. A bomb at rest explodes in air into two equal fragments. If one of the fragments is moving vertically upwards with velocity v_0, then the other fragment will move
   a) Vertically up with velocity v_0 b) Vertically down with velocity v_0
   c) In arbitrary direction with velocity v_0 d) Horizontally with velocity v_0

7. A body is rolling down an inclined plane. Its translational and rotational kinetic energies are equal. The body is a
   a) Solid sphere b) Hollow sphere c) Solid cylinder d) Hollow cylinder

8. A drum of radius R and mass M, rolls down without slipping along an inclined plane of angle θ. The frictional force
   a) Converts translational energy to rotational energy
   b) Dissipates energy as heat
   c) Decreases the rotational motion
   d) Decreases the rotational and translational motions

9. A solid sphere of mass 2 kg rolls on a smooth horizontal surface at 10 ms^{-1}. It then rolls up a smooth inclined plane of inclination 30^0 with the horizontal. The height attained by the sphere before it stops is
   a) 700 cm b) 701 cm c) 7.1 m d) None of these

10. Two bodies are projected from roof with same speed in different directions. If air resistance is not taken into account then
   a) They reach at ground with same magnitude of momenta if bodies have same masses
   b) They reach at ground with same kinetic energy
   c) They reach at ground with same speed
   d) Both (a) and (c) are correct

11. A cylinder rolls down an inclined plane of inclination 30°, the acceleration of cylinder is

a) $\frac{g}{3}$ b) g c) $\frac{g}{2}$ d) $\frac{2g}{3}$

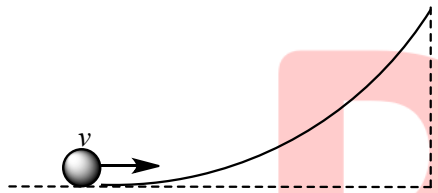
12. A ball moving with a certain velocity hits another identical ball at rest. If the plane is frictionless and collision is elastic, the angle between the directions in which the balls move after collision, will be

a) 30° b) 60° c) 90° d) 120°

13. A ring of radius R is first rotated with an angular velocity ω_0 and then carefully placed on a rough horizontal surface. The coefficient of friction between the surface and the ring is μ. Time after which its angular speed if reduced to half is

a) $\frac{\omega_0 \mu R}{2g}$ b) $\frac{2\omega_0 R}{\mu g}$ c) $\frac{\omega_0 R}{2\mu g}$ d) $\frac{\omega_0 g}{2\mu R}$

14. A small object of uniform density roll up a curved surface with an initial velocity v. If reaches up to a maximum height of $\frac{3v^2}{4g}$ with respect to the initial position. The object is



a) Ring b) Solid sphere c) Hollow sphere d) Disc

15. A cylinder of 500 g and radius 10 cm has moment of inertia (about its natural axis)

a) $2.5 \times 10^{-3}\ kg\text{-}m^2$ b) $2 \times 10^{-3}\ kg\text{-}m^2$
c) $5 \times 10^{-3}\ kg\text{-}m^2$ d) $3.5 \times 10^{-3}\ kg\text{-}m^2$

16. Two objects of masses $200g$ and $500g$ possess velocities $10\hat{i}\ m/s$ and $3\hat{i} + 5\hat{j}\ m/s$ respectively. The velocity of their centre of mass in m/s is

a) $5\hat{i} - 25\hat{j}$ b) $\frac{5}{7}\hat{i} - 25\hat{j}$ c) $5\hat{i} + \frac{25}{7}\hat{j}$ d) $25\hat{i} - \frac{5}{7}\hat{j}$

17. The moment of inertia of a sphere of mass M and radius R about an axis passing through its centre is $\frac{2}{5}MR^2$. The radius of gyration of the sphere about a parallel axis to the above and tangent to the sphere is

a) $\frac{7}{5}R$ b) $\frac{3}{5}R$ c) $\left(\sqrt{\frac{7}{5}}\right)R$ d) $\left(\sqrt{\frac{3}{5}}\right)R$

18. A thin uniform rod of length l and mass m is swinging freely about a horizontal axis passing through its end. Its maximum angular speed is ω. Its centre of mass rises to maximum height of

a) $\frac{1}{3}\frac{l^2\omega^2}{g}$ b) $\frac{1}{6}\frac{l\omega}{g}$ c) $\frac{1}{2}\frac{l^2\omega^2}{g}$ d) $\frac{1}{6}\frac{l^2\omega^2}{g}$

19. A circular disc rolls down an inclined plane. The ration of rotational kinetic energy to total kinetic energy is

a) $\frac{1}{2}$ b) $\frac{1}{3}$ c) $\frac{2}{3}$ d) $\frac{3}{4}$

20. Two particles of masses m_1 and m_2 in projectile motion have velocities $\vec{v}_1$ and $\vec{v}_2$ respectively at time $t = 0$. They collide at time t_0. Their velocities become $\vec{v}'_1$ and $\vec{v}'_2$ at time $2t_0$ while still moving in air. The value of $[(m_1\vec{v}'_1 + m_2\vec{v}'_2) - (m_1\vec{v}_1 - m_2\vec{v}_2)]$ is

a) Zero b) $(m_1 + m_2)gt_0$ c) $2(m_1 + m_2)gt_0$ d) $\frac{1}{2}(m_1 + m_2)gt_0$