DPP
DAILY PRACTICE PROBLEMS

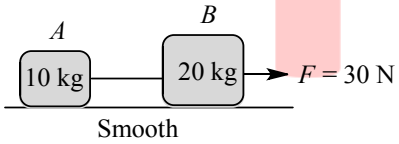
CLASS : XITH **SUBJECT : PHYSICS**
DATE : **DPP NO. : 7**

Topic :- SYSTEM OF PARTICLES AND ROTATIONAL MOTION

1. In case of explosion of a bomb, which of the following changes?
   a) Kinetic energy b) Mechanical energy
   c) Chemical energy d) Energy

2. There are two identical balls of same material, one being solid and the other being hollow. How will you distinguish them without weighing?
   a) By spinning them using equal torques
   b) By determining their moment of inertia
   c) By rolling them down an inclined plane
   d) By any one of these methods

3. Two blocks A and B are connected by a massless string (shown in figure). A force of 30 N is applied on block B. The distance travelled by centre of mass in 2 s starting from rest is



   a) 1 m b) 2 m c) 3 m d) None of these

4. Calculate the angular momentum of a body whose rotational energy is 10 $Joule$. If the angular momentum vector coincides with the axis of rotation and its moment of inertia about this axis is $8 \times 10^{-7}\ kg\ m^2$
   a) $4 \times 10^{-3}\ kg\ m^2/s$ b) $2 \times 10^{-3}\ kg\ m^2/s$
   c) $6 \times 10^{-3}\ kg\ m^2/s$ d) None of these

5. The acceleration of the centre of mass of a uniform solid disc rolling down an inclined plane of angle α is
   a) g sin α b) 2/3 g sin α c) 1/2 g sin α d) 1/3 g sin α

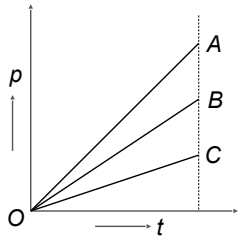
6. (1) Centre of gravity (C. G.) of a body is the point at which the weight of the body acts
(2) Centre of mass coincides with the centre of gravity if the earth is assumed to have infinitely large radius
(3) To evaluate the gravitational field intensity due to any body at an external point, the centre mass of the body can be considered to be concentrated at its C.G.
(4) The radius of gyration of any body rotating about an axis is the length of the perpendicular dropped from the C.G. of the body to the axis
Which one of the following pairs of statements is correct
a) (4) and (1) b) (1) and (2) c) (2) and (3) d) (3) and (4)

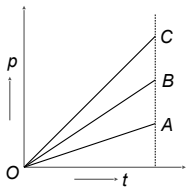
7. The ratio of the radii of gyration of a circular disc to that of a circular ring, each of same mass and radius, around their respective axes is
a) $\sqrt{2}:1$ b) $\sqrt{2}:\sqrt{3}$ c) $\sqrt{3}:\sqrt{2}$ d) $1:\sqrt{2}$

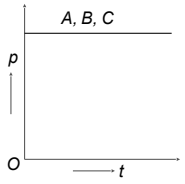
8. The centre of mass of a system of two particles divides. The distance between them is
a) In inverse ratio of square of masses of particles
b) In direct ration of square of masses of particles
c) In inverse ration of masses of particles
d) In direct ration of masses of particles

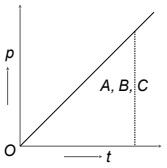
9. If the earth is a point mass of $6 \times 10^{24}\ kg$ revolving around the sun at a distance of $1.5 \times 10^{8}\ km$ and in time $T = 3.14 \times 10^{7} s$, then the angular momentum of the earth around the sun is
a) $1.2 \times 10^{18}\ kg\ m^2/s$ b) $1.8 \times 10^{29}\ kg\ m^2/s$
c) $1.5 \times 10^{37}\ kg\ m^2/s$ d) $2.7 \times 10^{40}\ kg\ m^2/s$

10. Three stationary particles A,B,C of masses m_A,m_B and m_C are under the action of same constant force for the same time. If $m_A > m_B > m_C$, the variation of momentum of particles with time for each will be correctly shown as

a) 

b) 

c) 

d) 

11. Three point masses each of mass m are placed at the corners of an equilateral triangle of side 'a'. Then the moment of inertia of this system about an axis passing along one side of the triangle is

a) ma^2 b) $3\,ma^2$ c) $3/4\,ma^2$ d) $2/3\,ma^2$

12. From a circular ring of mass M and R, an arc corresponding to a 90^0 sector is removed. The moment of inertia of the remaining part of the ring about an axis passing through the ring and perpendicular to the plane of ring is k times MR^2. Then the value of k is

a) $\frac{3}{4}$ b) $\frac{7}{8}$ c) $\frac{1}{4}$ d) 1

13. Radius of gyration of uniform thin rod of length L about an axis passing normally through its centre of mass is

a) $\frac{L}{\sqrt{12}}$ b) $\frac{L}{12}$ c) $\sqrt{12}\,L$ d) $12\,L$

14. The moment of inertia of a dumb-bell, consisting of point masses $m_1 = 2.0$ kg and $m_2 = 1.0$ kg, fixed to the ends of a rigid massless rod of length $L = 0.6$ m, about an axis passing through the centre of mass and perpendicular to its length, is

a) 0.72 kg m^2 b) 0.36 kg m^2 c) 0.27 kg m^2 d) 0.24 kg m^2

15. Two solid spheres (A and B) are made of metals of different densities ρ_A and ρ_B respectively. If their masses are equal, the ratio of their moments of inertia (I_B/I_A) about their respective diameters is

a) $\left(\frac{\rho_B}{\rho_A}\right)^{2/3}$ b) $\left(\frac{\rho_A}{\rho_B}\right)^{2/3}$ c) $\frac{\rho_A}{\rho_B}$ d) $\frac{\rho_B}{\rho_A}$

16. A solid sphere is given a kinetic energy E. What fraction of kinetic energy is associated with rotation?

a) 3/7 b) 5/7 c) 1/2 d) 2/7

17. The moment of inertia of a rectangular lamina about an axis perpendicular to the plane and passing through its centre of mass is

a) $\frac{M}{12}(l^2 + b^2)$ b) $\frac{M}{3}(l^2 + b^2)$ c) $\frac{2Ml}{12}$ d) $\frac{M(l+b)}{12}$

18. Moment of inertia of big drop in I. If 8 droplets are formed from big drop, then moment of inertia of small droplet is

a) $\frac{I}{32}$ b) $\frac{I}{16}$ c) $\frac{I}{8}$ d) $\frac{I}{4}$

19. A binary star consists of two stars A (mass 2.2 M_s) and B (mass 11 M_s), where M_s is the mass of the sun. They are separated by distance d and are rotating about their centre of mass, which is stationary. The ratio of the total angular momentum of the binary star to the angular momentum of star B about the centre of mass is

a) 7 b) 6 c) 9 d) 10

20. Three rods each of length L and mass M are placed along X,Y and Z axes in such a way that one end of each rod is at the origin. The moment of inertia of the system about Z-axis is

a) $\frac{ML^2}{3}$ b) $\frac{2ML^2}{3}$ c) $\frac{3ML^2}{2}$ d) $\frac{2ML^2}{12}$