



INDIAN SCHOOL DARSAIT DEPARTMENT OF PHYSICS



Subject : Physics	Chapter : System of particles and Rotational Motion	Worksheet No. 7
Resource Person : Mrs. Jayalakshmi Ratish		Date :
Name of the Student : _____	Class & Division : XI A/B	Roll Number : ____

1. Which physical quantity is represented by the product of the moment of inertia and the angular velocity? 1
2. Give an example each for a body where the centre of mass lies inside the body and outside the body. 1
3. Where does the centre of mass of following bodies lie – 1
 - a) Triangular lamina of uniform mass density
 - b) Sphere of uniform mass density
4. State the law of conservation of angular momentum. Give the SI units of angular momentum. 1
5. Why can't we open or close a door by applying force at the hinges? 1
6. Is the radius of gyration of a body constant quantity? Why? 2
7. A solid sphere rolls down two different inclined planes of the same height but different angles of inclination. 2
 - (a) will it reach the bottom with same speed in each case?
 - (b) in which plane will it take longer to reach the ground?
8. Obtain the moment of inertia of a hollow sphere about an axis passing through the tangent of the sphere if the moment of inertia of the hollow sphere about an axis through its center is $\frac{2}{3}MR^2$. 2
9. How will you distinguish between a hard-boiled egg and a raw egg by spinning each on a table top? 2
10. Find the torque of a force $7i + 3j - 5k$ about the origin. The force acts on a particle whose position vector is $i - j + k$. 2
11. Why a fly wheel is used in an engine of a train (vehicle)? 2
12. Find the moment of inertia of a solid sphere of mass, M and radius, R about an axis which is tangent to the sphere. 2
13. Three point masses of 1 kg, 2 kg and 3 kg lie at (1,2) (0,-1) and (2,-3) respectively. Calculate 3

the co-ordinates of the centre of mass of the system.

14. If no external force is acting on a two-body system, what will happen to – 3
(i) Velocity of COM
(ii) Angular momentum
15. To maintain a rotor at a uniform angular speed of 200 rad/s, an engine needs to transmit a torque of 180 Nm. What is the power required by the engine? 3
16. Three particles of masses, m are placed at three corners of an equilateral triangle of length, l . Find the position of centre of mass in terms of co-ordinates. 3
17. Energy of 484 J is spent in increasing the speed of a flywheel from 60 rpm to 360 rpm. Find the moment of inertia of the flywheel. 3
18. Find the - 3
(i) The radius of gyration (ii) The moment of inertia
of a rod of mass 100 g and length 100 cm about an axis passing through its centre and perpendicular to its length.
19. A disc of mass 5 kg and radius 50 cm rolls on the ground at the rate of 10 m/s. Calculate the K.E of the disc. 3
20. Four bodies have been arranged at corners of a rectangle as shown in fig. Find the centre of mass of the system – 3
- The diagram shows a rectangle with four masses placed at its corners. The top-left corner has a mass of $2m$, the top-right corner has a mass of $3m$, the bottom-left corner has a mass of m , and the bottom-right corner has a mass of $2m$. The length of the rectangle is labeled a and the width is labeled b .
21. Write the expression for MOI of a circular ring of mass, M and radius, R – 3
(i) About an axis passing through the centre and perpendicular to its plane
(ii) About its diameter
(iii) About a tangent in its own plane
(iv) About a tangent perpendicular to plane of ring
22. A disc of mass 5 kg and radius 0.5 m rolls on the ground at the rate of 10 m/s. Calculate the kinetic energy of the disc. 3
23. The moment of inertia of a disc about an axis through its edge and perpendicular to its plane is 2400 kgm^2 . Find the moment of inertia of disc about its diameter. 3
24. If the Earth suddenly contracts, explain how the duration of the day will be affected? Give relevant equations. 3
25. Three mass points m_1 , m_2 and m_3 are located at the vertices of an equilateral triangle of side, a . What is the moment of inertia of the triangle about an axis passing through altitude of triangle and passing through m_1 . 3