

## Rotational Motion Test

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1. Calculate the Total K.E of the of a thin circular ring of mass  $M$  rolling on a smooth horizontal table with uniform linear velocity  
(a)  $1/2Mv^2$  (b)  $1/4M^2$  (c)  $3/4Mv^2$  (d)  $Mv^2$
2. The angular momentum of a body of momentum of Inertia  $I$  is  $L$ . Its kinetic energy is  
(a)  $L^2/I$  (b)  $L/2I$  (c)  $L^2/2I$  (d)  $1/2IL^2$
3. M.I of a sphere about an axis tangential to its surface is  
(a)  $2/3MR^2$  (b)  $2/5MR^2$  (c)  $7/5MR^2$  (d)  $5/3 MR^2$
4. M.I of circular wire of Mass  $M$  and radius  $R$  about is its diameter is  
(a)  $1/2 MR^2$  (b)  $MR^2$  (c)  $2MR^2$  (d)  $1/4 MR^2$
5. If earth's radius is Decreases to  $1/2$  of the original what will be the new length of the day in hours  
(a) 12 (b) 6 (c) 8 (d) 10

1. Derive an expression for M.I. of hollow cylinder about its Diameter
2. Define and proof theorem of parallel axis
3. Define Radius of Gyration and derive an expression for it
4. From a circular disc of radius  $R$  and mass  $9 M$ , a small disc of radius  $R/3$  removed from the disc. Find the momentum of inertia of the remaining disc about an axis perpendicular to the plane of the disc and passing through the point  $O$ .
5. Derive an expression for the coefficient of friction for rolling from a inclined plane
6. A rod of length  $L$  and mass  $M$  is hinged at point  $O$ . A small bullet of mass  $m$  hits the rod horizontally. The bullet gets embedded in the rod. Find angular velocity of the system just after just after impact
7. Initial angular velocity of a circular disc of mass  $M$  is  $w_1$ . Then two small mass  $m$  are attached gently to two diametrically opposite points on the edge of the discs. What is the final angular velocities of the discs