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MECHANICS
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For B.Sc.(Physics & Chemistry)
(Rotational Dynamics)

Principle of conservation of angular momentum

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Principle of conservation of angular momentum

“When the external torque acting on a system of particles is zero, the total angular momentum of the system remains constant.

$$\text{Since, } \vec{\tau} = \vec{r} \times \vec{F} = \frac{d\vec{J}}{dt},$$

$$\text{If, } \vec{\tau} = 0, \text{ then } \frac{d\vec{J}}{dt} = 0 \\ \Rightarrow \vec{J} = \text{constant}$$



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in case of rigid body, $\vec{J} = I\vec{\omega}$, then if $\vec{\tau} = 0$

Then, $I\vec{\omega} = \text{Constant}$

$$\Rightarrow I_1\vec{\omega}_1 = I_2\vec{\omega}_2$$

Example:

- The angular velocity of a planet around the sun increases when it comes near the sun.
- The destructive effect of a tornado is greater near the centre of disturbance than near the edges.
- A ball dancer can vary her angular speed by out stretching her legs and arms increasing moment of inertia decreasing angular velocity.



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Reference

Mechanics by *D. S. Mathur*, S. Chand, chp-6.14

