CONSERVATION OF ANGULAR MOMENTUM

The conservation of angular momentum within a system occurs under the condition that the total external torque acting on the system is zero.

This means that:

$$\sum(\vec{\tau})_{\text{ext}} = \vec{0}$$

$$\Rightarrow \quad \sum \frac{d}{dt}(\vec{L}_{\text{ext}}) = \vec{0}$$

$$\Rightarrow \quad \sum \vec{L} = \text{Constant}$$

Conservation of Angular Momentum about an Axis:

When the total torque acting around a specific axis equals zero, it implies that the angular momentum around that axis remains constant.

$$\sum(\vec{\tau})_{ext} = \vec{0}$$

$$\Rightarrow \quad \sum \frac{d}{dt}(\vec{L}_{et}) = \vec{0}$$

$$\Rightarrow \quad \sum \vec{L} = \text{Constant}$$

1) Select the axis where the total torque equals zero.
2) When the total torque about the chosen axis is zero, the momentum remains conserved around that axis.