

Magnetic Dipole in Uniform Magnetic Field



- Magnetic dipole moment: $\vec{\mu} = IA\hat{n}$
- Torque exerted by magnetic field: $\vec{\tau} = \vec{\mu} \times \vec{B}$
- Potential energy: $U = -\vec{\mu} \cdot \vec{B}$

$$U(\theta) = - \int_{\pi/2}^{\theta} \tau(\theta) d\theta = \mu B \int_{\pi/2}^{\theta} \sin \theta d\theta = -\mu B \cos \theta$$

Note: $\tau(\theta)$ and $d\theta$ have opposite sign.

