

# Magnetic Torque

Phy 344

**Introduction:**

A magnetic dipole moment  $\vec{\mu}$  in a magnetic field will experience a torque given by:

$$\vec{\tau} = \vec{\mu} \times \vec{B}. \quad (1)$$

For this project, you will perform several experiments to investigate this magnetic torque, following the descriptions in the student lab manual from TeachSpin.

**Objectives**

- Measure the torque experienced by a magnetic dipole in a magnetic field.
- Study the consequences of this torque.
- Investigate the force on a magnetic dipole in a magnetic field gradient

**Suggested Reading:** The writeup from TeachSpin is quite thorough, so please follow this. In addition, it would be helpful to review an electromagnetism textbook, such as Griffiths, *Introduction to Electrodynamics* for background material on the torque experienced by a magnetic dipole in a magnetic field and the net force on a magnetic dipole in a magnetic field gradient.

**Suggested Apparatus:**

1. Magnetic torque apparatus from TeachSpin.
2. Balance for measuring mass of ball.

**Experiments**

1. **Comparing magnetic and gravitational torques**
2. **Harmonic oscillation of a spherical pendulum**
3. **Precessional motion of a spinning sphere**
4. **Net force in a magnetic field gradient**