Phys 222 SI Session #20

**Topics:** Hall Effect, Magnetic torque, magnetic dipoles

Intro discussion: To crabs, are fish flying?

1. A circular loop of wire carries a constant current. If the loop is placed in a region with a uniform magnetic field, what is the net magnetic force on the loop?

2. A circular loop of wire of radius 0.50 m is in a uniform magnetic field of 0.30 T. The current in the loop is 2.0 A. What is the magnitude of the magnetic torque when the plane of the loop is parallel to the magnetic field?

3. A rectangular loop of wire carrying a 5.0-A current is placed in a magnetic field of 0.60 T. The magnitude of the torque acting on this wire when the plane of the loop makes a 30° angle with the field is measured to be 1.1 N m. What is the area of this loop?

4. A circular coil of wire of 100 turns and diameter 20.0 cm carries a current of 2.0 A. It is placed in a uniform magnetic field of 3.0 T with the plane of the coil making an angle of 45° with the magnetic field. What is the torque on the coil?

5. A coil with magnetic moment 3.5 A·m² is initially oriented with its magnetic moment pointing in the direction 0.6i − 0.8k. The coil is placed in a uniform magnetic field \( B = 1.0 \ T i − 1.5 \ T j \). How much energy, in J, must be expended to rotate the coil so that its magnetic moment is pointed in the direction 0.96j + 0.28k?

6. A current is passed from right to left through a rectangular slab of material in a vertical magnetic field. If a measurement taken with a voltmeter from front face to back face reads a potential less than zero, what can be said about the charge carriers in the material?