GALVANOMETERS

A *galvanometer* is a device used in the construction of both ammeters and voltmeters. Its operation is based on the fact that a torque acts on a current loop in the presence of a magnetic field. **Figure 14** shows a simplified arrangement of the main components of a galvanometer. It consists of a coil of wire wrapped around a soft iron core mounted so that it is free to pivot in the magnetic field provided by the permanent magnet. The torque experienced by the coil is proportional to the current in the coil. This means that the larger the current, the greater the torque and the more the coil will rotate before the spring tightens enough to stop the movement. Hence, the amount of deflection of the needle is proportional to the current in the coil. When there is no current in the coil, the spring returns the needle to zero. Once the instrument is properly calibrated, it can be used in conjunction with other circuit elements as an ammeter (to measure currents) or as a voltmeter (to measure potential differences).

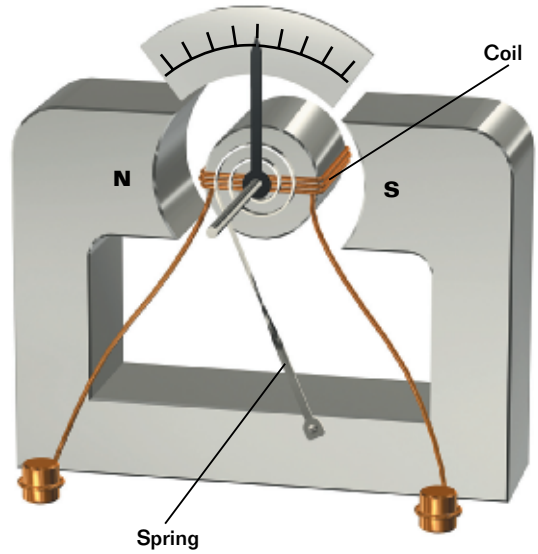

Figure 14
In a galvanometer, when current enters the coil, which is in a magnetic field, the magnetic force causes the coil to twist.

SECTION REVIEW

1. A particle with a charge of 0.030 C experiences a magnetic force of 1.5 N while moving at right angles to a uniform magnetic field. If the speed of the charge is 620 m/s, what is the magnitude of the magnetic field the particle passes through?
2. An electron moving north encounters a uniform magnetic field. If the magnetic field points east, what is the direction of the magnetic force on the electron?
3. A straight segment of wire has a length of 25 cm and carries a current of 5.0 A. If the wire is perpendicular to a magnetic field of 0.60 T, then what is the magnitude of the magnetic force on this segment of the wire?
4. Two parallel wires have charges moving in the same direction. Is the force between them attractive or repulsive?
5. **Interpreting Graphics** Find the direction of the magnetic force on the current-carrying wire in **Figure 15.**

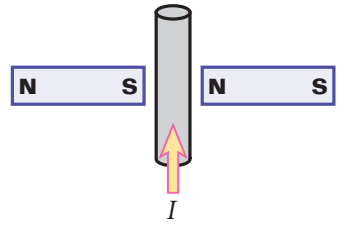

Figure 15