10-Electric Motor Lab

Materials:

- Styrofoam cup
- D size battery
- 2 jumbo, uncoated, metal paper clips
- Masking tape
- Large rubber band
- 24" - #20 to #26 lacquer coated magnet wire
- Sandpaper
- ¾ inch diameter dowel
- ¾ inch disc magnet

Build the Motor

1. Tip the cup upside down and tape the batter securely to the bottom.
2. Unbend the outer wire of the paper clips to make a cradle with a leg to suspend the motor coil.
3. Attach the paper clips to either end of the battery with the rubber band.
4. Cut a 24-inch piece of magnet wire.
5. Leave 2 ½ inch on the wire straight and wrap it around the dowel about 7 ½ times. This should leave 2 ½ inches straight at the other end of the wire, too.
6. Slide the coil off the dowel. Wrap the straight ends of the wire through and around the coil at least one full turn (tightly and exactly opposite each other). The ends should be sticking out in opposite directions.
7. Use the sandpaper to scrape off the coating on one side of the straight sections of the wire. Make sure you remove the coating from the same side of the wire on both ends.
8. Put the magnet on top of the battery – right in the middle.
9. Take the coil of wire and put it into the cradle created by the paperclips.

You may have to adjust the height of the paperclip cradle by sliding them up and down (just make sure that the coil does not touch the magnet). If the coil is balanced properly it will start spinning on its own. – if it does not, gently push the coil to start it spinning. If it still does not start spinning – check to make sure that all the insulation has been sanded off the wires on either side of the coil. Also – check the balance of the coil in the cradle – make sure that it is directly in the center and even.

Modify the Motor

1. The spinning of the motor is due to torque on the coil. What quantities does the torque depend on? (see formula in your book)
2. Try adjusting one of those quantities on the motor and see how it changes how your motor works.
    a. What did you adjust?
    b. According to the formula, how should this affect your motor?
    c. How did it affect your motor?
3. Try adjusting another quantity.
    a. What did you adjust?
    b. According to the formula, how should this affect your motor?
    c. How did it affect your motor?