

Name _____

Date _____

Making Magnets

Equipment:

- Battery (D-cell)
- Compass
- Nail with wire wrapping it
- Bar magnet (blue/red bar)

1. Use the compass needle to find the North and South poles of the bar magnet. Remember, *opposite* magnetic poles are attracted to each other. This means we can use a compass needle to *discover* a magnetic field. Draw the compass and the magnet when the needle is attracted to the magnet.



2. Connect the ends of the wire wrapping the nail to the two terminals (ends) of the battery. You will need to hold the wire so that the silvery (stripped) piece at the end touches the battery terminal. Bring the nail near the compass. What happens? What does electric current flowing around the coils do to the nail?

3. Switch the wires so they connect to the battery in the opposite direction. Bring the nail near the compass. What has happened? Has anything changed?

4. Using the length of wire left, wind the wire around the nail an additional 50 times. ***Be sure that you are winding the wire in the same direction as it was wound before!*** Connect the wires to the battery and bring the nail near the compass again. What has changed?

5. If you have time, try to borrow a second battery from another group. Can you connect the nail to *two* batteries? What happens?

Making a Current

Equipment:

- Large coil
- Battery
- Wire-wrapped nail
- Light-emitting diode (LED)
- Banana plug wires (2)
- Alligator clips (2)

1. In this experiment, we want to have strong electromagnets, so we will use coils that are wound 3000 times. As we saw, this makes magnetic effects stronger. Put the compass needle inside the large coil. What do you think will happen if we connect the large coil to the battery?

Try it! Connect two banana-plug wires to the large coil, and touch their other ends to the battery.

What happened?

2. Now take one of the wires connected to the coil and, instead of the battery, connect it to one of the legs of the LED using an alligator clip. Using the third wire and the other alligator clip, connect the other end of the LED back to the battery. Now, when current flows through the coil it will also flow through the LED. What happens to the LED when you touch the wires to the battery? What happens to the compass?

3. An LED is not like a lightbulb. Current can only flow through an LED in one direction. Try

reversing the wires connected to the battery.
What happens now?

4. Now we want to see if we can make a current flow through the LED without connecting it to the battery at all. Connect the LED to the large coil with two wires. Put your wrapped nail inside the large coil. Connect the two ends of the wrapped wire to the battery and hold them connected. Current is now flowing through the wrapped wire and the nail is creating a magnetic field. What happens to the LED?

5. Let's see what happens to the LED when the magnetic field created by the nail *changes*. To do this we will hold one of the wires to one terminal of the battery and touch the other to the

battery's other terminal. This turns the current through the nail on and off, so it also turns the magnetic field on and off. What happens to the LED when you touch the wire to the battery?

6. What do you think happens in the large coil when the magnetic field near (or inside) it changes?

7. Try touching the wires to the battery in the opposite direction. Can you see a difference in what happens with the LED? Can you try to explain this?
