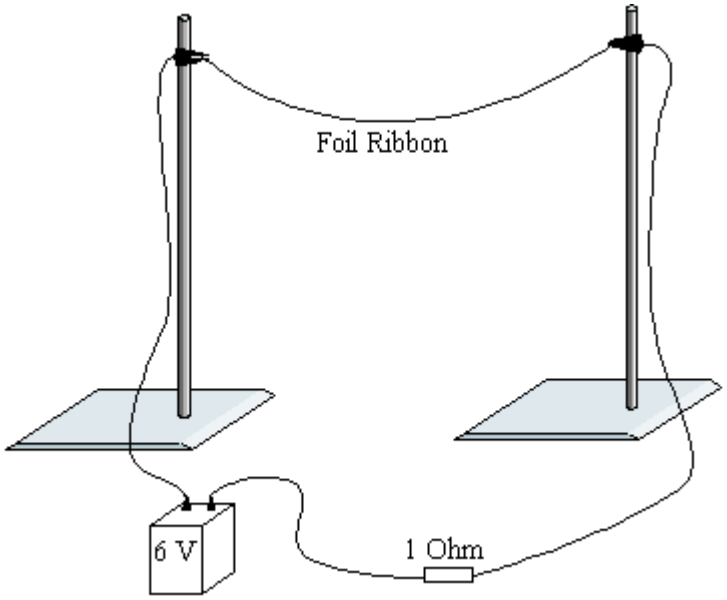
Name:_____

Force on a Current Carrying Wire Handout



Objectives:

- Predict and test the direction of the magnetic force on a current carrying wire.
- Predict and test the effects of switching the direction of the current in the wire.

Materials:

Item	Quantity
Compass	1
Permanent Magnet	1
Lab Stand	2
Masking Tape	1 roll
6V Lantern Battery	1
1 Ohm 20 Watt Resistor	1
Wires with Alligator Clips	3
Aluminum Foil	1 thin sheet

Initial Thoughts:

1. Consider a positive current moving from left to right. Sketch four diagrams showing a magnetic field oriented up, down, into the page, and out of the page with an arrow indicating the force on the wire.

2. Find is the current flowing through a wire connected to a six volt battery and a one ohm resistor. Then find the magnitude of the magnetic force on 1 cm of wire if the strength of the magnetic field is 1000 Gauss and the current and field are oriented in any of the positions in the above diagrams.

Procedure:

1. Use the compass to determine the direction of the magnetic field in your permanent magnet, and use masking tape to mark this direction on your magnet.
2. Attach two of the alligator clips near the tops of the lab stands with masking tape as shown in the diagram.
3. Cut a very thin ribbon of aluminum foil from your sheet, and attach this to both clips on the tops of the lab stands.
4. Complete a circuit as shown on the diagram above, so that the conventional current is flowing from left to right.
5. With the permanent magnet, try creating a field near the wire in each of the four orientations that you sketched, and note the behavior of the wire in each orientation.
6. Switch the connections to the positive and negative terminals of the battery, and repeat step five.

Conclusions:

1. Describe the behavior of the wire in each orientation, and state if you saw evidence of a force on the wire in the direction you expected.

2. Explain the change in the current when you switched the battery connections, and how this affected the behavior of the wire.

3. While conventional current is thought of as positive charge moving from higher to lower potential, in reality negative charge (electrons) are moving from lower to higher potential. Explain why this should not affect your predictions or results.

4. How is this related to an MRI machine?

5. What have you learned during this experiment about creating a safe environment around an MRI machine?