Physics 132
General Physics II
Grinnell College

Homework Unit Xa

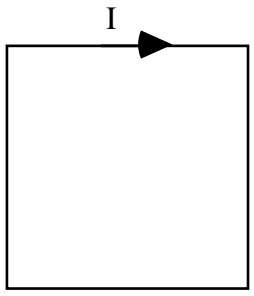
Session X.1

1. If you have two compasses, each one is a dipole, and depending on the strength of the magnetic fields they produce, their own interactions may overcome their interactions with the earth's field. Assume this is true, and we put two compasses next to one another. Draw a stable configuration (each compass points the direction of the other compass's magnetic field) of needles. Is this the only stable configuration? Explain.

2. Imagine that magnetic fields could be produced by monopoles--for example, a single isolated north pole. How would you detect this with a compass? Sketch what you would see.

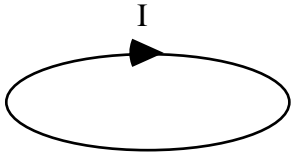
Session X.2

3. One way of expressing the rule for magnetic field lines around a current-carrying wire is that if you point your right thumb in the direction of the current flow, your fingers wrap around the wire in the direction of the field lines. Use this information to describe and sketch the direction of field lines in a circuit like below:



4. A current-carrying wire is wound uniformly over the surface of a cylinder. What do you expect the resulting magnetic field to look like? Why?

5. Current is flowing through a wire loop (shown below, as if we are looking from the top). Sketch the magnetic field lines. Explain why this looks like a dipole, and where you might imagine a north and south pole for an equivalent permanent magnet.



near edge of loop is here