Experimental 9 Solutions: Magnetic Force on Current-Carrying Wires

Group ______________________________________

Names ______________________________________

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PREDICTIONS

A. Magnetic Force on a Straight Wire

Prediction 1: With the current in the wire moving from left to right, predict the direction of the force on the wire, and draw it on Figure 9.1  Force is out of the page.

Figure 9.1 A wire placed above a magnet

Prediction 2: Now place the wire in front of the magnet in its midplane, with the current in the wire again running from left to right. Now predict the direction of the force on the wire, and draw it on Figure 9.2  Force is into the page.

Figure 9.2 A wire placed in front of the magnet

Prediction 3: Suppose you place the wire behind the magnet in its mid-plane, with the current in the wire again running from left to right. Now what is the direction of the force on the wire, that is, is it into or out of the page?  Force is into the page.
B. Magnetic Force on a Coil of Wire

Prediction 4: You now place a coil above the magnet, with the current in the coil running *counterclockwise* as seen from above. Will the coil be attracted to or repelled by the permanent magnet, or will it feel no force at all? **Coil will be attracted, coil looks like a magnet with is north pole upwards, so the “south pole” of the coil is closest to the real North pole of the magnet, opposite poles attract.**

![Figure 9.3 A circular coil placed above the magnet](image)

Question 1: Which of the two figurations (A or B) represents the TOTAL magnetic field configuration in this case (field of both magnet and coil of wire)? **Configuration A**

![A. B.](images)

Prediction 5: The current in the ring now runs *clockwise* as seen from the top. Will the coil of wire be attracted or repelled by the permanent magnet, or will it feel no force? **Coil will be repelled, coil looks like a magnet with is north pole down, so the “north pole” of the coil is closest to the real North pole of the magnet, same poles repel.**

![Figure 9.4 A circular coil placed above the magnet](image)

Question 2: Which of the two field figurations (A or B) shown just above represents the TOTAL magnetic field configuration in this case? **Configuration B**

EXPERIMENTAL VERIFICATION

Question 3: Now do the actual measurements. If any of your predictions were incorrect, briefly explain why.