17 Electromagnetism

Name_____

Lab: Electromagnetic Induction

Inquiry Physics

You have now deduced the basic properties of magnets from classroom demonstrations and experiments. You know that all magnets have two poles, and that like poles repel and unlike poles attract. You also know that magnets have magnetic fields surrounding them.

We are going to make use of that knowledge **and** your knowledge of electricity in this lab. You know that when electrical charges move they cause a current. There is, in other words, a relationship between static electricity and current electricity. Magnetism, however, has so far been studied by itself. In this investigation you will explore how electricity and magnetism are related.

Please bring your lab group equipment to your table at this time.

You will be using a galvanometer. It is a device that measures the presence of very small amounts of current. A galvanometer does not, therefore, measure "galvans". It measures current in fractions of amperes. The name "galvanometer" refers to the 18th century physician Luigi Galvani (1737-1798) who discovered how electricity affects muscles. That finding of Galvani's is an important part of the science of neurophysiology.

Look at your galvanometer. Notice that the "0" is in the middle of the scale. That means that this instrument can detect current going through it from either direction. It is thus simpler to hook into a circuit than a regular ammeter. The symbol for a galvanometer is a circle with a "G" in it.

THE EXPLORATION ANSWER IN COMPLETE SENTENCES

Connect the red coil to the galvanometer. The coil has a "lead" at each end for the hookup. Now push the **north** pole of a bar magnet half-way into the coil.

1. What happens to the galvanometer needle?

2. Move the magnet half-way into and out of the coil quickly and repeatedly. Now move it again, slowly. How does the speed with which you move the magnet affect what you observe?

3. Use the magnet and the galvanometer to determine what happens in each of the following instances. Simply give the direction the galvanometer needle swings. To control the variable of how the magnet is pushed into the coil of wire, insert it half-way into the same end of the coil each time.

   a. North pole pushed into the coil _____

   b. North pole pulled out of the coil _____

   c. South pole pushed into the coil _____

   d. South pole pulled out of the coil _____

4. Try several of the cases listed above with the magnet stationary and the coil being moved. Does it matter whether the coil moves or the magnet moves?

ANSWER IN COMPLETE SENTENCES

5. Now move the bar magnet into and out of the coil at a steady rate, inserting it only one-fourth of its length on each stroke. Then do the same, but insert the magnet to one-half of its length. Describe any difference you observed.

6. Now stack two bar magnets together, with both north poles facing the same direction (on top of each other). Insert the combination into the coil half-way. How does this change the amount of current created, when compared to using a single magnet?

7. Now hold the two bar magnets so that *unlike* poles are stacked together as they enter the coil. How does this affect the amount of current compared to using a single magnet?

8. The process of creating electrical current via magnetism is called *electromagnetic induction.* Describe in your own words what the basic requirements are for electromagnetic induction (equipment, procedures, etc.).

9. Identify three ways to maximize the amount of current produced by an electromagnetic induction process.

10. What is a factor which does NOT affect the *amount* of current produced via electromagnetic induction?