Faraday's Experiment

NAME:
Block:

Conventions:

1. What charge do electrons have?

2. Name and describe the two directions that we use to describe current.

3. How are magnetic poles labeled?

4. What is the magnetic polarity of the geographic North Pole of the Earth?

5. Historically the Earth's Magnetic Field was defined as moving in the direction of Polaris, the Pole Star. Therefore, what is the convention of the direction of a magnetic field?

6. What is the direction of the magnetic field surrounding a current carrying wire? Use a diagram in your explanation.

Magnetic Fields:
Go to: http://phet.colorado.edu/simulations/sims.php?sim=Magnet_and_Compass

6. What are the two factors that determine the strength of the magnetic field? What determines the direction of the magnetic field?

Electromagnets:
a. Go to: http://phet.colorado.edu/simulations/sims.php?sim=Faradays_Electromagnetic_Lab
b. Click the tab for electromagnet

7. Notice that the electrons moving through the wire loops create a magnetic field. Sketch a diagram that shows the flow of electrons in an electromagnet and its north and south poles.

What happens to the magnetic field if the direction of current in the wire loop is reversed? What happens to the strength of the magnetic field as more electrons move (as current increases)?

8. When there is no voltage applied the electrons are still moving randomly. Since the number of electrons moving one direction is balanced by electrons moving the opposite direction then there is no net magnetic field. There is no magnetic field because there is no net flow of electrons. Predict what you think will happen if a magnet approaches a wire loop. Will the movement of electrons producing the same magnetic field be encouraged or discouraged? Will the movement of electrons producing the opposite magnetic field be encouraged or discouraged?

Pickup Coil:
a. Go to: http://phet.colorado.edu/simulations/sims.php?sim=Faradays_Electromagnetic_Lab
b. Click the tab for pickup coil

9. Slowly move the north end of the magnet towards the coil, what happens to the electrons in the wire as the field from the north pole of the magnet increases in strength?

10. Slowly move the south end of the magnet towards the coil, what happens to the electrons in the wire?

11. Slowly move the north end of the magnet away from the coil, what happens to the electrons in the wire?

12. Slowly move the south end of the magnet away from the coil, what happens to the electrons in the wire?

13. Consider your prediction from question number eight. A general rule for how a pickup coil will respond to a magnetic field might be:

Electrons in a pickup coil will move to minimize the disturbance in a changing magnetic field. They will tend to move so that the polarity of the coil is opposite the change in the field.

Explain, in your own words, what you think is happening to cause the electrons to move.

Generator:
a. Go to: http://phet.colorado.edu/simulations/sims.php?sim=Faradays_Electromagnetic_Lab
b. Click the tab for generator

14. Sketch a diagram of a generator and label all of the necessary components.

How does a generator use the effect you noticed in the pickup coil to generate electrical energy?

Describe all of the energy transformations that are taking place.

Why does a generator make alternating current?

What change would have to be made to make direct current? (Hint a generator that makes direct current is called an alternator…)

Transformer:
a. Go to: http://phet.colorado.edu/simulations/sims.php?sim=Faradays_Electromagnetic_Lab
b. Click the tab for transformer.

15. Describe how the energy from the battery reaches the light bulb.

16. Explain why this device is not effective when used with DC current. (hint—look at the changes of the magnetic field)

17. What effect does changing the number of coils or the size of the coils have on the brightness of the light bulb?

18. The **primary** coil is the one where the current originates and the **secondary** coil is the one that has current induced in it. Try varying the number of primary and secondary coils and determine the relationship between the ratio of primary/secondary coils and:

i. The ratio of primary/ secondary voltage

ii. The ratio of primary to secondary current

19. Describe how a transformer could be used to change the voltage of AC current.