PHYS Exploring Magnets & Electricity Name_____
Chapter 24

Date_____Hour____

DIRECTIONS: Complete all lab stations, making observations and answering the following questions. Be sure to complete all *PREDICTIONS* before doing the tasks.

Station 1: Compass and Solenoid:

1. Describe what the solenoid looks like. _____

2. Lay the solenoid horizontally on the counter with the openings facing E→W. Connect the leads of the battery to the screws on the solenoid base(s). How does that change the solenoid? Can you see the change?

_____

3. Using the appropriate Right Hand Rule, predict the effect the solenoid will have on a compass if placed near one of the openings.

_____

4. Now place the compass in the opening. Attach and un-attach a lead and observe. What happened?

_____

5. Now, reverse the leads on the power supply, thus reversing the current, and try again. What happens this time?

_____

Station 2: *Interaction between a Compass and a Genecon®*

Here you will find a Genecon that is attached to a wire that has been wrapped around a compass. While keeping the compass secured on the counter, turn the handle of the Genecon in a clockwise direction. Look closely at the label on the Genecon that explains which terminal is (+) and which is (-).

1. The current is flowing out of the Genecon through the _____ wire and back into the Genecon through the _____ wire.
   (copper/silver) (copper/silver)

2. Why does the compass needle turn towards the east when you turn the handle one way, but toward the west when you turn the handle in the other direction?

_____

_____

3. Here, we have created what is commonly referred to as a galvanometer. What do you suppose a galvanometer is?

_____

_____

Station 3: *Floating Magnets*

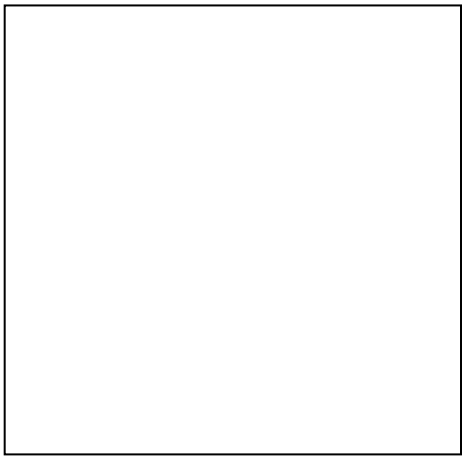
1. Describe what you see here. _____

_____

2. If the bottom of the bottom magnet has a north polarity, what is the polarity of the top of the top magnet?

_____

Explain your answer with a picture:



Station 4: *Crank Flashlight*

Carefully look at the inside mechanics of the crank flashlight. One side contains gears, while the other contains temporary and permanent magnets.

1. How many temporary electromagnets do you see inside? Describe what the magnet(s) look like.

_____

_____

2. How many permanent magnets do you see? Describe what the magnet(s) look like.

_____

_____

3. ***Slowly*** squeeze the handle of the flashlight until the bulb lights up. While you are squeezing the handle, what do you observe happening to the magnets?

_____

_____

4. Is this flashlight an example of a motor or a generator? Explain.

_____

_____

Station 5: *Interaction between a Genecon and a Light Bulb*

Here you will find a Genecon attached to a holiday light. Crank the Genecon ***very slowly***. Then crank the Genecon ***a little faster.*** (Careful! Not too fast!)

1. What happens to the light as you crank the handle at different speeds? Explain.

_____

_____

2. Now, turn the handle in the opposite direction. What effect did this have on the light bulb? Explain.

_____

_____

Station 6: *Interaction between a Compass and a Current-Carrying Wire*

Here you will find a more elaborate *galvanometer.* You saw (or will see) a more simplistic galvanometer at station 2.

1. Before connecting the wire to the power supply, describe the direction in which the compass needles are pointing.

_____

2. Using the 2nd Right Hand Rule, ***predict*** what will happen if you connect the right clip to the positive terminal of the battery and the left clip to the negative terminal of the battery.

_____

_____

3. Now, connect the wires as previously described to the terminals of the battery. Describe the direction in which the compass needles are pointing now.

_____

4. Using the 2nd Right Hand Rule, ***predict*** what will happen if you reverse the power supply.

_____

5. Disconnect the clips and reverse their connection to the battery terminals. Describe the direction in which the compass needles are pointing now.

_____

6. Explain why the direction of the needle changes when you switch the wires to the opposite terminals.

_____

Station 7: *Interaction between a Battery and a Genecon.*

While one partner holds the base of the Genecon, attach its wires to the battery.

1. Describe what happened to the Genecon. _____

_____

2. Reverse the leads to the battery. What happens?

_____

3. Is the Genecon acting as a motor or a generator here? Explain.

_____

Station 8: *Crank and a Bulb*

Here you will find a device that allows you to power a light bulb using mechanical energy. Firmly grasp the curved black part of the base and crank the handle several times.

1. What do you see occurring? _____

2. Is this device an example of a generator or a motor? Explain.

_____

Station 9: *Interaction between a Genecon and a Capacitor*

A capacitor is a device that can be charged up and then acts as a power source in a circuit – so it's kinda like a battery. With the leads of the Genecon attached to the terminals on the capacitor, turn the crank on the Genecon for about 10 seconds. Then let go of the crank.

1. What do you observe happening to the Genecon? How long does it last?

_____

_____

2. What does the capacitor help the Genecon to act as (generator/motor)? Explain.

_____

_____

Station 10: *Shake Flashlight* **(do station 9 before station 10)**

This flashlight does not need batteries to work. Take a look through the clear plastic casing at the inner mechanics of the flashlight.
With the switch in the OFF position, shake the flashlight back and forth for about 10 seconds. You will notice that a permanent magnet will slide back and forth inside of a coil of wire. Now, turn the switch ON.

1. Does this flashlight work as a motor or a generator? Explain.

_____

_____

2. Is it necessary to continue to shake the flashlight while the light is on? Explain.

_____

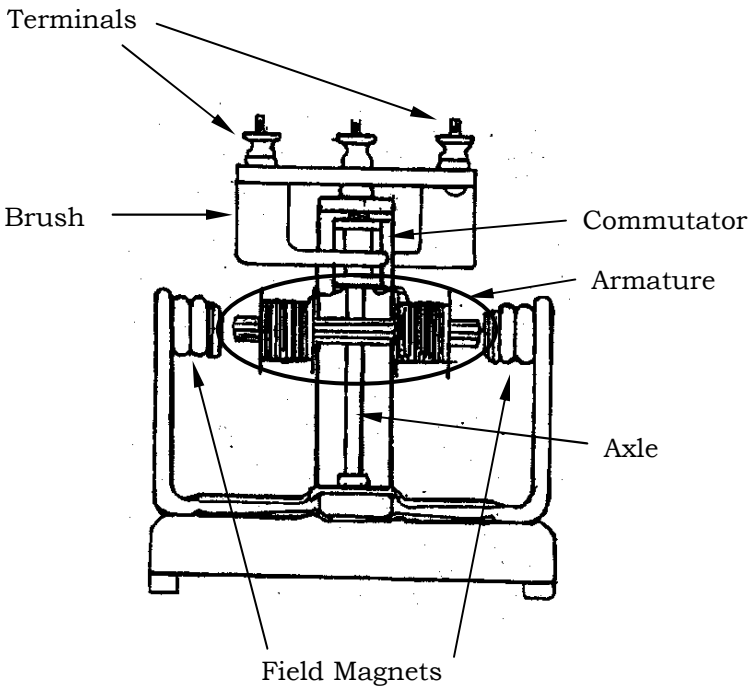
3. What do you suppose is in the top of the flashlight that holds on to the charge that you've created? (think about what you've seen at previous lab stations).

_____

Station 11: *Motor*

Before you begin this station, complete the following questions to familiarize yourself with the components of your motor.

ST. LOUIS MOTOR



Fill in the blanks with the correct part of a motor based on the descriptions below.

A. _____ consists of permanent magnets.

B. _____ contains electromagnets and rotates around the axle.

C. _____ round object that is made up of a conducting metal and an insulating plastic.

D. _____ stationary vertical rod that the armature rotates around.

E. _____ where the wires from the power supply are attached.

Now that you've learned a little about the parts of a motor, answer the following:

1. Connect the power supply to the terminals of the motor. Give the armature a small nudge. What happens?

_____

2. Reverse the leads and the current direction from the power supply. What happens? Explain why.

_____

_____

3. Knowing the difference between a motor and a generator, describe how you could utilize this St. Louis Motor to generate an electrical current. (Ask your teacher for a voltmeter to test your hypothesis.)

_____

_____

CONCLUSIONS: (Note: You may want to use your book/notes to help with these.)

1. Briefly explain how a current is induced in a wire, through the use of magnets.

_____

_____

2. What is this process called? _____

3. Briefly explain how a magnetic field is created, through the use of a current carrying wire.

_____

_____

4. What is this process called? _____