Name: _____ Period: _____

Building an Electromagnet

Testable Question: How can the magnetic force of an electromagnet be increased?

Hypothesis:

Materials: battery, a common nail 8 cm long, paper clips, 2 m of wire, and a rubber band (*Other materials will be necessary depending on the independent variable chosen*)

Directions:

1. Remove 1 cm of insulation from the ends of a 2 m length of wire. (This has been done for you)
2. Beginning 30 cm from the end of the wire, start wrapping the wire tightly around the nail from the head of the nail toward the point. Wrap the wire around the nail 15 times.
3. Attach one end of the wire at each end of the battery. ***CAUTION: WIRE MAY BECOME HOT TO THE TOUCH.***
4. Wait 5 seconds.
5. To test your electromagnet you will need a pile of paper clips.
6. Place the nail into a pile of paper clips. Carefully lift the nail out of the paper clips and move it to a clean spot over your desk.
7. Remove one end of the wire from the battery.
8. Count the number of paper clips your electromagnet picked up and record the number in the table below.
9. Repeat steps 3–8 for three trials.
10. Repeat steps 2–9 with (*Choose number of coils, core diameter, or number of batteries (voltage) and specify the next larger independent variable*): _____

    _____

Quantitative Observations

		Independent variable chosen:			
Number of Paper Clips Picked Up	**Trial 1**				
	Trial 2				
	Trial 3				
	Mean (Average)				

Qualitative Observations (Describe what happened):

_____

_____

_____

Analysis

1. Obtain results for teams investigating the other independent variables. Additional sheets of paper may be used for more detailed responses.

	Number of Coils			
Mean Number of Paper Clips Picked Up				

	Diameter of Core			
Mean Number of Paper Clips Picked Up				

	Number of Batteries (Voltage)			
Mean Number of Paper Clips Picked Up				

2. Graph your results on your own paper.
3. **Fill in the blanks to summarize the lab results**.
   a. As the number of coils increased, the number of paper clips picked up _____.
   b. As the core diameter increased, the number of paper clips picked up _____.
   c. As the number of batteries increased, the number of paper clips picked up _____.

4. Based on the data, which variable had the greatest impact on the force of an electromagnet? Include data to support your conclusion.

_____

_____

5. This investigation provides evidence that electrical energy can be transformed into mechanical energy. Explain how generators transform mechanical energy into electricity.

_____

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6. In addition to the chemical energy stored in batteries, what are some sources of electrical energy? Describe the transformations in energy that must take place.

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