Electromagnet Worksheet
"The Physicist's War:" Dr. Herman Branson and Scientific Training of African Americans during World War II

Name: _____ Date: _____

Group: _____ Period: _____

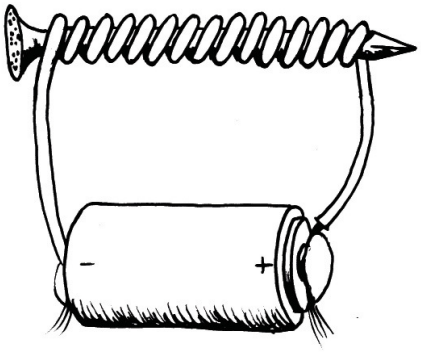
Note: This activity was adapted from "Electromagnetism—An Everyday Occurrence!"; an activity designed by TpT Store XIV and housed on *Teachers Pay Teachers*.

Materials Checklist:

- 1 D battery
- 3-inch iron nail
- 3-inch galvanized (zinc-coated) nail
- 3-inch stainless steel nail
- vinyl electrical tape
- roughly 10 paper clips
- several varied segments of copper wire

<u>Step 1:</u> Constructing an electromagnet

1. Taking the thinnest segment of wire, leave 7 inches loose from one end, and begin tightly coiling it around the length of the iron nail. Try to ensure that the remaining loose end is roughly the same 7-inch length when finished.
2. Attach either end of the coiled wire to the ends of the battery using pieces of the electrical tape, with the pointed end of the nail lining up with the positive node of the battery. This completes the electromagnet.
3. Place paperclips near the point of the nail, observing if they are attracted. Do this for three trials, and mark your results in the table below.
4. BE CAREFUL: The wires and battery produce heat, so disconnect the wires after testing. This will additionally preserve the life of the battery.



Clipart courtesy of Clipground.com

<u>Step 2:</u> Determining Variables and Experimenting

Determine what variables you could change in the construction of your electromagnet that would affect its performance or function. These are your **independent variables**. Mark them below, and remember to only change one at a time.

Independent Variable #1: _____

Independent Variable #2: _____

Independent Variable #3: _____

Determine what variable you are aiming to observe or measure. This will be your **dependent variable**. For this activity, focus on how the magnet affects the paperclips…

Dependent Variable: _____

Determine what variables or factors in the electromagnet construction you aim to keep or are inevitably constant. These are your **controls.**

Control #1: _____

Control #2: _____

Now, adjust your electromagnet by changing the independent variables you identified. Following each change, conduct three more trials using the same method from above. Record your results in the table below.

	Initial Electromagnet Results	**Independent Variable Changed: _____**
(# of paperclips picked up)		
Trial 1		
Trial 2		
Trial 3		
Dependent Variable:	**Average # of Paperclips Picked up: _____**	**Average # of Paperclips Picked up: _____**

	Initial Electromagnet Results	**Independent Variable Changed: _____**
(# of paperclips picked up)		
Trial 1		
Trial 2		
Trial 3		
Dependent Variable:	**Average # of Paperclips Picked up: _____**	**Average # of Paperclips Picked up: _____**

Reflection / (Analysis) Questions:

1. **Knowledge Level**: Describe the characteristics of magnetic domains:

_____

_____

_____

2. **Knowledge Level:** List two uses of an ordinary permanent magnet:

_____

_____

_____

3. **Comprehension Level:** Predict what would happen if you didn't use a conductor as the connective piece between the battery and the piece of metal?

_____

_____

_____

_____

4. **Application Level:** Illustrate the difference between a permanent magnet and a temporary electromagnet:

_____

_____

_____

_____

5. **Analysis Level**: Analyze your data table(s) and explain which independent variable had the *greatest effect* on your electromagnet's strength and why:

_____

_____

_____

_____

_____

_____

6. **Evaluation Level**: Give a circumstance where you would need an electromagnet instead of a regular magnet:

_____

_____

_____

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