Name _____ Date _____ Hour _____

By the end of this activity, you will

- **Determine the factors that affect the strength of electric and magnetic forces.**
- **Provide evidence that fields exist between objects that are exerting forces even when not touching.**

Electromagnet Induction

Go to the following website and answer the following questions. https://nationalmaglab.org/education/magnet-academy/watch-play/interactive/electromagnetic-induction

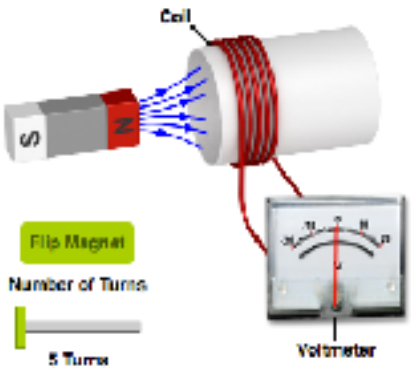
1. In 1831, Michael Faraday carried out numerous experiments to prove that

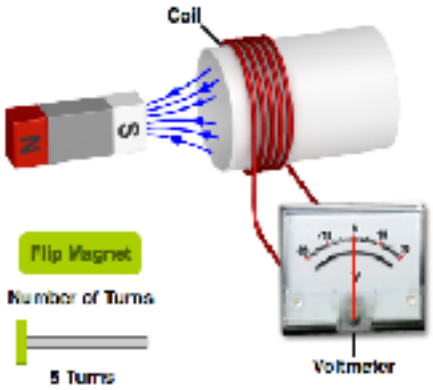
   _____ could be generated from _____.

2. Simulate Faraday's experiment with 5, 10 and 15 coils and complete the table below.

Number of Turns	Voltmeter Reading when North Pole enters the coil/ exits the coil	Voltmeter Reading when South Pole enters the coil / exits the coil
5	/	/
10	/	/
15	/	/

3. What happens to the direction of the current as the direction of the magnet force changes? Label the diagrams below.





4. How does changing the number of coils affect the voltage of the electric current produced by the magnet moving inside the coil?

5. What does the orientation of the magnet and the coils of wire tell you about the relationship between force and the distance between the interacting objects?

Electromagnets Virtual Lab

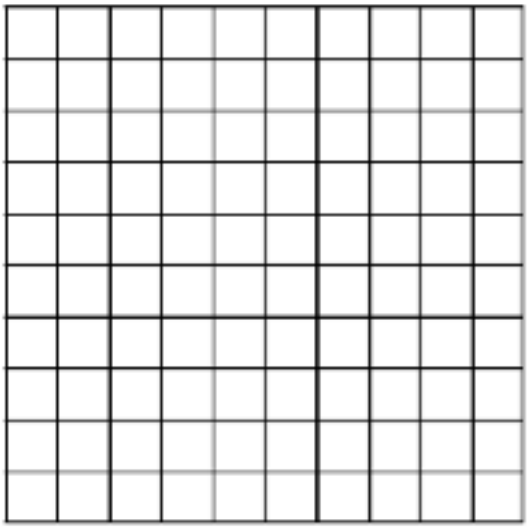
Go to the following website, read the instructions, and complete the electromagnets lab game.
http://www.harcourtschool.com/activity/electromagnets/

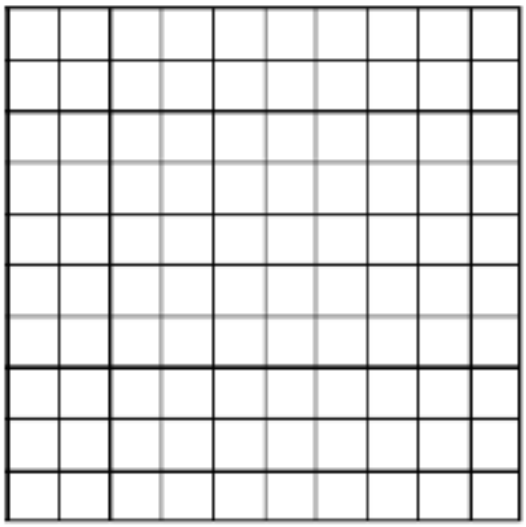
1. Click and read the "Instructions". Click "Start Game" to begin the game. You will do the game five times. Each spin represents a trial.
2. Click the hints button. How many paperclips can you pick up with 10 coils? _____
3. How many paper clips can you pick up with each battery? _____
4. In the table below, write down the number of paper clips you need to pick up, the number of batteries and coils that were required to pick up the paper clip. then indicate if you were successful. (*You will not be graded on your accuracy for meeting the goal, only your participation and your ability to accurately interpret the data you collect.)*

Trial	Number of paper clips to pick up	Number of batteries required	Number of coils required	Successful? Yes/No
1				
2				
3				
4				
5				

Analysis

Make two line graphs of the data from your table. On the first graph, put the independent variable (number of batteries) on the x-axis and the dependent variable (number of paper clips) on the y-axis. On the second graph, put the independent variable (number of coils) on the x-axis and the dependent variable (number of paper clips) on the y-axis. Don't forget to give each graph a title.





1.How does changing the number of coils affect the strength of the magnetic field?

2. How does changing the number of batteries affect the strength of the magnetic field?

3. If you could build an electromagnet with more batteries and more coils, predict the number of coils **and** batteries that would be required to pick up 38, 40, and 46 paperclips.

Number of Paperclips	Number of Batteries	Number of Coils
38		
40		
46		