Electromagnetism

Activity 14

Iron Core

	1	2	3	AVG.
100 turn coil				
200 turn coil				

Key Concepts

1. An electromagnet consists of a coil of wire, and iron core, and an electric current going through the coil.
2. When the current in the coils stops, the electromagnet loses its magnetism.
3. The strength of an electromagnet is directly proportional to the number of turns in the coil and the strength of the current.
4. Cores made of materials other than iron tend to be ineffective.
5. The polarity of an electromagnet depends upon the direction of the current flowing through the coil.

Teaching Tips

1. Call attention to those instances when one or two paper clips remain attached to the electromagnet even after the GENECON operation stops. This is called residual magnetism: it is temporary. Quickly reversing the rotation of the GENECONs handle will change the polarity of the electromagnet, and the paper clips will fall off.
2. Conceptually, the most important understanding here is that electricity and magnetism are interrelated phenomena; thus the term **"electromagnetism"** is appropriate.

Materials

GENECON with output cord
Electromagnet Set, consisting of
- *2 coils (100 turns; 200 turns)*
- *4 Core rods (iron, copper, aluminum, glass)*
- *4Rubber "donut" retainers*
- *Steel paper clips*

Procedure

1. Connect the leads of the GENECON to the tabs of the 100-turn coil (the skinnier one). While one student operates the GENECON briskly, another student should attempt to attract the steel paper clips by touching them with the opposite end of the coil. Result?
2. Next, put up a rubber "donut" retainer on the very end of each of the four core rods. (The "donut" retainer will prevent the cores from falling out of the coils after they are inserted.) Start by inserting the **iron** core in the **100**-turn coil which is still connected to the GENECON. Touch the protruding end of the core to a pile of paper clips while the GENECON is being operated. How many paper clips can it pick up? Repeat this activity two more times, report the date in the table below, and calculate and average number of paper clips lifted with this coil.
3. Now change over to the **200**-turn coil and repeat the above procedures. Record the data in the table as before. Which coil produces the greater magnetism?
4. Try each of the other cores (copper, aluminum, glass) in the 200-turn coil. Results?
5. Use the 200-turn coil, the iron core, some paper clips, and the GENECON to determine how changing the **current** produced (by rotation speed of the GENECONs handle) affects the strength of the electromagnet.
6. Finally, approach the magnetic compass with the protruding end of the electromagnet. What effect does it have? Quickly reverse the direction of the current through the coil (by rotating the handle of the GENECON in the opposite direction). Result?