SOL 4.3 Part 3 - Electromagnets

### Electromagnets and Magnetism

1. We have learned that electricity is a form of energy that is found in nature but that can be produced artificially by man. It involves the continuous flow of electrons from atom to atom. Another form of energy is also created by the movement of electrons. This form of energy is called magnetism.

2. Magnetism and electricity share a very unique relationship; magnetism can produce an electric current and an electric current can produce a magnetic field known as an electromagnet. Let’s investigate this interesting connection between electricity and magnetism!

3. **Magnets** are made of materials like iron, nickel, and cobalt. They have electrons that all move or flow in the same direction. All magnets have two ends called poles. These poles are called North and South and are attracted to one another. For example, if you place two magnets beside each other, the North Pole of one magnet will attach itself to the South Pole of the second magnet.

4. There are two basic kinds of magnets: **permanent** and **electromagnetic**. *Permanent magnets* occur in nature but can also be man-made. In a permanent magnet the magnetic properties (electrons flowing in the same direction and two opposite poles) are always present.

5. **Electromagnets**, however, are temporary. They are produced by taking a solid piece of metal, like a nail, and wrapping it with a wire that is carrying an electric current from a source such as a battery. The current flowing through the coiled wire creates a magnetic field. The strength of an electromagnet can be increased or decreased by changing the number of coils or the strength of the electrical current flowing through the coiled wire.

6. While the electric current is flowing, a magnet is created. However, as soon as the current stops, the magnetic properties stop. Electromagnets are used when very strong magnets are needed. Electric motors, televisions, telephones, computers and many other modern machines use electromagnets.
Paragraph 1
1. What is another form of energy created by the movement of electrons?

Paragraph 2
1. How are magnetism and electricity related?

Paragraph 3
1. What are some materials used to make magnets?
2. What is the name of the two poles of a magnet?

Paragraph 4
1. What are the two basic types of magnets?
2. What is a permanent magnet?

Paragraph 5
1. What are electromagnets?
2. How is an electromagnet created?

Paragraph 6
1. What are some machines that use electromagnets?