SOL 4.3 Electricity

-- Key concepts:

a. conductors and insulators;
b. basic circuits;
c. static electricity;
d. the ability of electrical energy to be transformed into light and motion, and to produce heat;
e. simple electromagnets and magnetism; and
f. historical contributions in understanding electricity.

Circuits

- A continuous flow of negative charges (electrons) creates an electric current.
- The pathway taken by an electric current is a circuit.
- Closed circuits allow the movement of electrical energy.
- Open circuits prevent the movement of electrical energy.

- In a series circuit, there is only one pathway for the current, but in a parallel circuit there are two or more pathways for it.

Conductors and Insulators

- Electrical energy moves through materials that are conductors (metals).
  Insulators (rubber, plastic, wood) do not conduct electricity well.
- Among conducting materials, the rate at which energy flows depends on the material's resistance.

Static Electricity

- Rubbing certain materials together creates static electricity.
- Lightning is the discharge of static electricity in the atmosphere.
ENERGY TRANSFORMATIONS

- Electrical energy can be transformed into light or motion, and can produce thermal energy.
- describe the types of energies (i.e., thermal, radiant, and mechanical) that are transformed by various household appliances (e.g., lamp, toaster, fan).

<table>
<thead>
<tr>
<th>ENERGY TRANSFORMATIONS</th>
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<tbody>
<tr>
<td>electrical to mechanical (motion)</td>
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<tr>
<td>electrical to light (radiant)</td>
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<tr>
<td>electrical to thermal (heat)</td>
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MAGNETIC FIELDS

- Certain iron-bearing metals attract other such metals (also nickel and cobalt).
- Lines of force extend from the poles of a magnet in an arched pattern defining the area over which magnetic force is exerted.

- An electric current creates a magnetic field.
- A moving magnetic field creates an electric current.
- A current flowing through a wire creates a magnetic field.
- Wrapping a wire around certain iron-bearing metals (iron nail) and creating a closed circuit is an example of a simple electromagnet.

HISTORICAL CONTRIBUTIONS

- Benjamin Franklin, Michael Faraday, and Thomas Edison made important discoveries about electricity.

1750 1830 1880