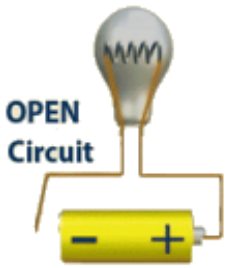
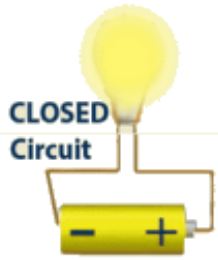
SOL 4.3 Electricity

-- Key concepts:

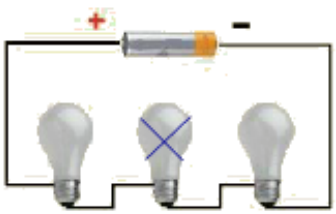
a. conductors and insulators;
b. basic circuits;
c. static electricity;
d. the ability of electrical energy to be transformed into light and motion, and to produce heat;
e. simple electromagnets and magnetism; and
f. historical contributions in understanding electricity.

CIRCUITS



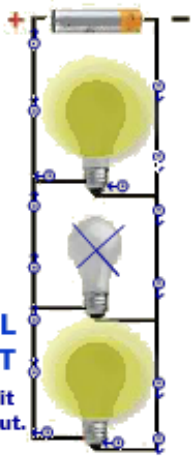


- A continuous flow of negative charges (electrons) creates an **electric current**
- The pathway taken by an electric current is a **circuit**
- **Closed circuits** allow the movement of electrical energy.
- **Open circuits** prevent the movement of electrical energy.
- In a **series circuit**, there is only one pathway for the current, but in a **parallel circuit** there are two or more pathways for it.



SERIES CIRCUIT

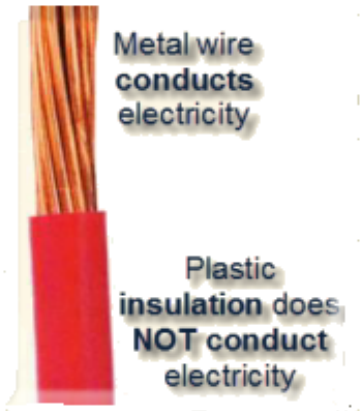
When one bulb dies, circuit breaks so all lights go out.



PARALLEL CIRCUIT

Other bulbs remain lit when one bulb goes out.

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**.

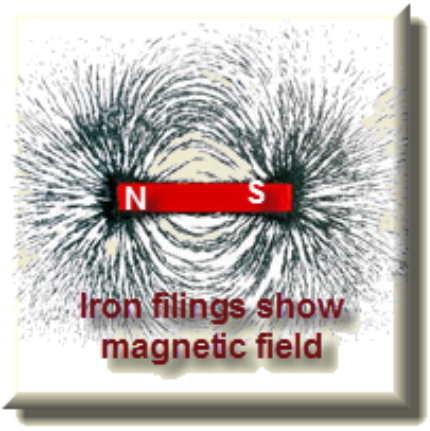
STATIC ELECTRICITY

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

ENERGY TRANSFORMATIONS

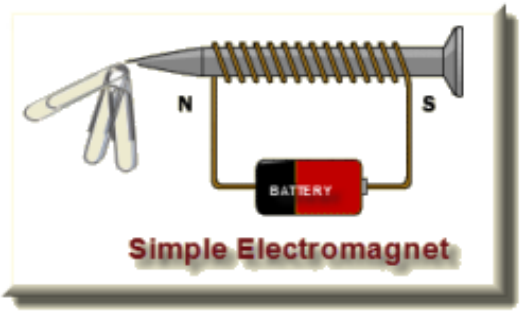
- Electrical energy can be **transformed** into light or motion, and can produce thermal energy.
- describe the types of energies (i.e., **thermal**, **radiant**, and **mechanical**) that are transformed by various household appliances (e.g., lamp, toaster, fan).

ENERGY TRANSFORMATIONS		
electrical to mechanical (motion)	electrical to light (radiant)	electrical to thermal (heat)
		



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.



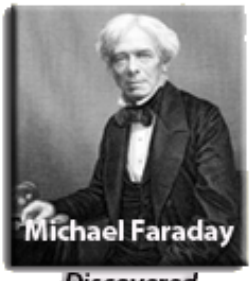
- An electric current creates a **magnetic field.**
- A moving magnetic field creates an **electric current.**
- A **current flowing through a wire** creates a magnetic field.
- Wrapping a wire around certain iron-bearing metals (iron nail) and creating a closed circuit is an example of a **simple electromagnet.**

HISTORICAL CONTRIBUTIONS

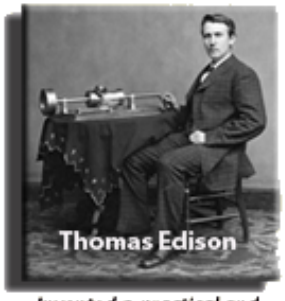
- Benjamin **Franklin**, Michael **Faraday**, and Thomas **Edison** made important discoveries about electricity.

"Benjamin Franklin Drawing Electricity from the Sky"
Painting by Benjamin West in 1818

Discovered that lightning is electricity



Discovered electromagnetism



Invented a practical and affordable light bulb, the phonograph, and the motion picture camera

1750 1830 1880