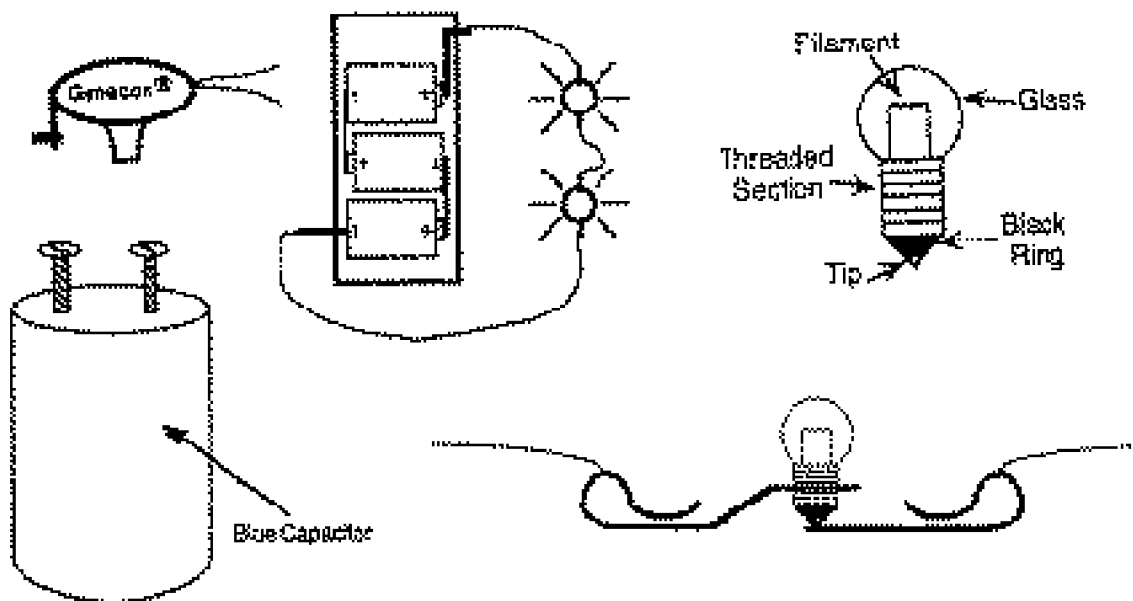


Title: Electric Circuits: Building Models

Object: To develop a mental model of how electricity flows by doing inquiry-based experiments.

Introduction: Electricity is usually invisible. The Capacitor-Aided System for Teaching and Learning Electricity (CASTLE) is a system to help students visualize the concepts. It utilizes batteries, wires, bulbs, compasses, and (of course) capacitors, some of which are pictured below.



Equipment: Each group of two students will need:

- 1 CASTLE Curriculum Guide in 3-ring binder (do not write in them)
- 1 battery holder (black)
- 3 D-cell batteries (yellow)
- 1 compass (green box)
- 1 bundle of ten wires
- 4 light bulb holders (red)
- 2 long light bulbs
- 2 round light bulbs
- 1 25000 μF capacitor (blue)
- 1 100000 μF capacitor (silver)
- 1 1 F capacitor (green)
- 1 Genecon (light blue)
- 1 stopwatch

Procedure and Results: Copies of the CASTLE Curriculum – Student Guide are provided for your use during this lab period. Please do not write on them; instead record your answers on your own paper (to be attached to this one). Strive to make your write-up communicate in the neatest and clearest way possible. Diagrams are good. Include conclusions.

In groups of *two*, do the following sections from the student guide (and read as many of the other sections as you have time for): 1.1, 1.2, 1.7, 1.8, 2.1, 2.2, 2.4, 2.5, 2.7, 3.1, 3.2, 3.3, 3.6, 3.8, 3.9, 3.14, 4.1.

Hints and Tips:

1. Read chapter 20 from your textbook before lab.
2. Disconnect circuits when not actually making observations so that the bulbs and batteries will last longer.
3. Unless instructed otherwise, you should not connect a single bulb across a 3-battery system (4.5 V) since the bulbs are rated for 2.0 V.
4. Don't crank the Genecon too quickly or you will burn out the bulbs (it can generate 6.0 V and the bulbs are rated for 2.0 V).