

Electrifying Experiments!

Day One

I. Introductions and Expectations

Age, background and interest of students shared

II. Brainstorming Session

- A. Plasma Ball
 - 1. Share observations
 - 2. Neon Bulb experiment
- B. What's Going On?
 - 1. What do you know?
 - 2. What do you want to know?

Day Two

I. Brainstorming Session

- A. Question:
 - 1. What do you know about electricity?
 - 2. Are Magnetism and Electricity related to one another?
(An electric current produces a magnetic field)

II. Magnets

- A. Introduction and terminology
 - North and South Poles
 - Opposites attract, likes repel
- B. Activity: Iron filings and bar magnets
- C. Magnetic Fields
 - Question: Are magnetic fields limited to magnets?

III. Simple Circuits

- A. Question: What is a simple circuit?
 - Diagram with symbols: switch, energy source, and resistor
- B. Activity: Build a simple circuit
- C. Activity: Place compasses around the circuit
(An electric current produces a magnetic field)

Day Three

I. Review Simple Circuits

A. Terminology:

Resistor: Uses electrical energy as it interferes with the flow of charge

Resistance: Opposition to the movement of charge through a material

II. Explorations

A. Activity: Insert various “test objects” between alligator clips

Concept explored: Insulators and Conductors

B. Activity: Parallel versus Series circuits

Which would you rather light your house with and why?

III. Electromagnets

A. What is an electromagnet? How might you make one?

B. Students receive “kits” to design and build electromagnet for a “competition”

Day Four

I. Review

– What did we learn about last week?

- What did you learn/research about electromagnets?

II. Electromagnet Competition

- The electromagnet magnet that lifts the most paperclips wins!

- Winning design investigation: What worked the best? Why?

III. Demonstration

A. Review resistance, etc.

B. Big Circuit Board, multiple resistors, 9V energy source, and series circuit

C. What are the sources of resistance in this demonstration?

Day Five

I. Plumbing Analogy

A. Hydraulic circuit: Narrow Pipe, Valve and Pump

The rate of water flow in a pipe depends on the pressure behind the water and the resistance offered by the pipe.

B. Electrical circuit: Resistance, Switch and Voltage Source

The resistance of a wire depends on the conductivity of the material and also on its thickness and length. Electrical resistance is less in thick wires and at lower temperatures.

II. Introduction to Terminology

Ampere – Unit of electric current; charge flowing through a circuit.

Volt – Unit of electrical potential; “push” of charge through a circuit

Ohm – Unit of electrical resistance

III. Zero Electrical Resistance

A. Demonstration: Cool wire with liquid nitrogen on Big Circuit Board

– What happens to resistance?

B. Activity: Superconducting Magnets!!

- Either demonstration or activity = depends on student maturity

- Safety Hazard: Liquid Nitrogen is dangerous. Handle carefully.

VII. Closure

A. What is a superconducting material?

B. Why are superconducting materials important?