



Electricity & Magnetism

Focus: Electrical Engineering

Grades K-8

Background:

The basis for the electricity portion of this lesson is to explain how positive and negative charge results from movement of electrons. Relative to the number of protons: If there are an equal number of electrons it has neutral charge, more electrons than protons it has a negative charge, and less electrons than protons it has a positive charge. Like charges repel and unlike charges attract. The movement of electrons is called electricity. The basis for the magnetic portion of the lesson is to explain the interaction of north and south seeking magnetic poles. Like electric charge, like pole repel and unlike poles attract.

Objectives:

- ✓ Students will be able to explain basic electricity and magnetism.
- ✓ Students will demonstrate the effects of electrical charges.
- ✓ Students will observe the effects of a high electric field produced by a Van De Graaf generator.
- ✓ Students will be able to speculate what will happen when positive and negative charges interact and north and south seeking magnetic poles interact.

Learning outcomes:

Learning outcomes from this lesson parallel the 4th grade Ohio proficiency test.

- ✓ Select instruments, make observations and/or organize observations of an event , object or organism.
- ✓ Identify and/or compare the mass, dimensions and volume of familiar object in standard and/ or non-standard units.
- ✓ Analyze a series of events and/or simple daily or seasonal cycles and predict the next likely occurrence in the sequence.
- ✓ Evaluate a simple procedure to carry out an exploration.
- ✓ Identify and/or discuss the selection of resources and tools used for exploring scientific phenomena.
- ✓ Demonstrate an understanding of safe use of materials and/or equipment in science activities.
- ✓ Identify characteristics of a simple physical change.



Electricity & Magnetism Cont.

Lesson #1: Overview

- ✓ Discuss types of fields.
- ✓ Introduce the terms **proton** and **electron**.
- ✓ Discuss electrical charges and ions.
- ✓ Explain how attraction and repulsion works
- ✓ Introduce the Van De Graaf generator.
- ✓ Introduce terms **north seeking pole, south seeking pole, flux lines** and **electromagnet** .

Activity: Fields

1. Discuss the different kinds of fields (gravitational field, electric field & magnetic field).
2. Gravitational field is demonstrated by holding a plum bob and observing the direction in which it moves. Gravity will force it in a downward motion demonstrating how gravity pulls things down.
3. Electric field is demonstrate by taking a plastic rod, rubbing it with a silky cloth and placing it next to an aluminum can to observe the static electrical charge which will pull the can close to the rod.
4. Magnetic field is demonstrated by a compass reacting to earth's magnetic field.

Activity: Electricity

Demonstrate the effects that the high charge of the Van de Graaf generator exhibits, repulsion, attraction, ion generation and "lightning". In addition students encounter a hair-raising experience it gives them a real charge about science.

Activity: Magnetism

1. Hand out two donut-shaped magnets and a pencil. Place magnets on the pencil to demonstrate repulsion and attraction and how the resulting force changes with distance.
2. Discuss magnetic field and hand out flux detector which is small tethered magnet which tracks and therefore shows the shape of magnetic fields.
3. Discuss the magnetic north and south seeking poles of a magnet. (Explain to older children how the earth's geographic north pole is the south seeking pole of the earth's magnet). Demonstrate / Discuss effects of a moving magnetic field near a metal.