
LAB 4. FIELDS

Problem

- What are electric and magnetic fields?
- How can we understand the shape and properties of fields?
- How do electric and magnetic fields affect matter?

Equipment

1. two balloons, one suspended by a thread, fur
2. electric field visualizer bottle, stand, glass and plastic rods, balloons
3. glass or plastic rod, fur, bubble soap, stream of water, empty aluminum can, bar magnet
4. two bar magnets
5. bar magnet, thread, magnetic compass
6. electromagnet, white paper, iron filings, magnetic compass
7. magnets of different configurations, iron filings

Activities

Here we look at electric and magnetic fields, particularly to visualize them and understand the direction and magnitude of forces on items subject to the fields.

This lab consists of several stations. You may do them in any order. Record all observations on this paper.

1. Charge-Charge Forces

1. Charge a balloon suspended by a thread by rubbing it with fur. Hold another balloon in your hand and charge it in the same manner. Slowly bring the balloon in your hand toward the suspended balloon. What happens?
2. Re-charge the suspended balloon by rubbing it with fur. Remove the fur piece and then slowly bring it toward the balloon. What happens?
3. Rub a balloon in your hair. Slowly pull the balloon away from your head. What happens?

3. Place an empty aluminum can on its side on a level surface, so that it can roll freely. Bring the charged balloon near the side of the can. What happens?
4. Bring a magnet near a falling stream of water, soap bubbles in air, and an empty aluminum can on its side. What happens?

4. Bar Magnets

1. Place one bar magnet flat on the table. Individually, bring each end of the other magnet slowly toward each end of the magnet on the table. What happens in each of the four cases?

5. Earth's Magnetic Field

1. Tie a thread around the middle of a bar magnet. Pick up the magnet by the thread and adjust the position of the thread loop so that the hanging magnet balances horizontally. In what orientation (north-south, east-west, etc.) does the hanging magnet eventually come to rest?
2. Bring a compass toward each end of the bar magnet. How does the compass react to each of the two ends of the magnet?

6. Electromagnet

Run a direct electrical current from a battery or other DC power supply through the coil.

1. Bring a compass toward each end of the energized coil. How does the compass react to each of the two ends?
2. What happens to the shape, direction, and poles of the magnetic field when you reverse the current through the coil?

