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Floating Clip

Intermolecular Forces

Introduction

Use magnets to show the attraction of cations and anions, induced dipole moments, and other analogies.

Concepts

- Atomic attractions
- Analogies

Materials

Aluminum sheet, 4-inch square
Balls, tennis, 2
Cardboard, 4-inch square
Clamp, thermometer
Copper sheet, 4-inch square
Cork borer to fit cow magnet
Lead sheet, 4-inch square
Magnet, cow
Magnets, neodymium, 2
Paper clip, large
Retractable knife
Scissors, steel
Styrofoam® balls, 2
Support stand
Thread, nylon, clear or fishing line
Wood, 4-inch square

Safety Precautions

Although the materials in this lab are not considered hazardous, follow all standard laboratory safety procedures. Wash hands thoroughly with soap and water before leaving the laboratory.

Preparation

1. Use the retractable knife to cut a slit along the seam of the tennis balls (see Figure 1).
2. Slip one neodymium material into each tennis ball.
3. Use a cork borer to bore through the center of one of the Styrofoam balls (see Figure 2).
4. Insert the cow magnet into the hole.
5. Insert a large paper clip through the center of the second Styrofoam ball (see Figure 3).
6. Tie a short length of clear nylon thread to one end of the large paper clip.
7. Secure the thermometer clamp to the support stand.
8. Hang the Styrofoam ball with the cow magnet from the thermometer clamp.

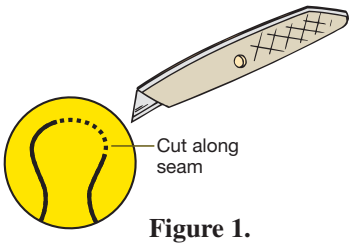

Figure 1.

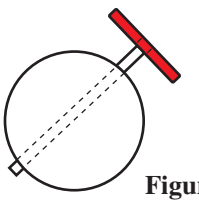
Figure 2.

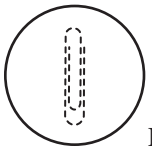
Figure 3.

9. Secure the free end of the clear nylon thread under the support stand. The thread should be just long enough to keep the paper clip containing ball from attaching to the cow magnet (see Figure 4).

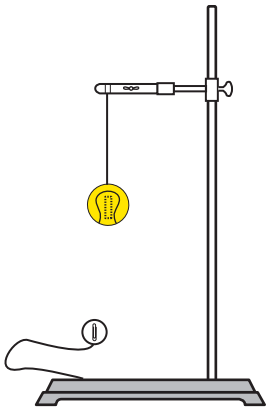

Figure 4.

Procedure

1. Toss the tennis balls toward each other.
2. With the paper clip containing ball hanging below the cow magnet ball, pass the cardboard square between the paper clip and the cow magnet.
3. Repeat step 2 with the metal and wood sheets.
4. Repeat step 2 with the steel scissors and the paper clip containing ball will fall as the scissors are attracted to the cow magnet.

Tips

- Use the demonstration to explain induced dipole moments, hydrogen bonding, proton-electron attraction, etc. Remind students that these bonds are not due to magnetism.
- Remind students that all analogies have limitations.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12
Evidence, models, and explanation
Content Standards: Grades 5–8
Content Standard B: Physical Science, properties and changes of properties in matter, motions and forces
Content Standards: Grades 9–12
Content Standard B: Physical Science, structure of atoms, structure and properties of matter, motions and forces

Flinn Scientific—Teaching Chemistry™ eLearning Video Series

A video of the *Floating Clip* activity, presented by Mike Roadruck, is available in *Intermolecular Forces*, part of the Flinn Scientific—Teaching Chemistry eLearning Video Series.

Materials for *Floating Clip* are available from Flinn Scientific, Inc.

Catalog No.	Description
A0018	Aluminum Sheet, 12-inch Square
AP1039	Clamp, Thermometer
C0370	Copper Sheet, 12-inch Square
L0089	Lead Sheet, 250-g
AP1944	Magnet, Cow
AP5666	Magnets, Neodymium, 2

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.