

NAME: _____ **Sec. #** _____ **Date:** _____ **Partners:** _____

Activity: Magnets and Magnetic Fields

Introduction

In this activity you will investigate the properties of permanent magnets, the magnetic fields they produce and the forces between magnets and other objects.

Equipment

Two permanent bar magnets.

Set of 6 to 8 small disc shaped magnets.

Objects of conducting material: iron, steel, copper, aluminum, or similar.

Objects of insulating material: glass or plastic or similar.

Compasses. String and tape. Iron filings in kerosene sealed in plastic container.

1. Permanent Magnets and Forces

Equipment: bar magnets, conducting and insulating objects.

Permanent magnets interact with each other as well as other objects. Begin with at least two permanent magnets (these should have poles labeled “North” and “South”) and other objects from the list above. (Metal objects should include at least iron, copper and aluminum, insulators can be glass and plastic.) Systematically investigate the interaction between the magnets and the other objects.

What happens when you bring “unlike” ends of the magnets together?

What happens when you bring “like” ends of the magnets together?

Compare the magnets to an electric dipole.

Describe the interactions of the magnets with conducting materials. Is the interaction with the different ends of the magnet the same or different?

Describe the interactions of the magnets with insulating materials.

How does the magnetic “behavior” of the materials compare to their electrical properties?
Is the comparison simple?

2. Magnet Orientation

Equipment: *two magnets, string, tape, compass*

Now you will investigate how a magnet orients itself in space relative to another magnet.

Tie a string firmly around the middle of a bar magnet and secure it with tape. Suspend the magnet. Bring a second magnet near and move it around to observe the affect.

Describe the affect.

Does the affect vary with distance?

Next place a compass on the table and observe the affect of bringing a magnet near it. Move the magnet around.

What is the compass needle made of?

Which end points where?

3. Magnetic Field Lines

Equipment: *Bar magnets , iron filings in kerosene sealed in a flat, plastic container.*

Place a permanent bar magnet on the filings container. The needle shaped iron filings should orient themselves along the magnetic field lines so you can create an image of the magnetic field around the magnet.

Sketch the magnetic field lines.

Compare your sketch to the electric field lines around an electric dipole. (See text Figure 23.21, page 727.)

4. Breaking Apart a Magnet

Equipment: Six to eight small disc magnets, two bar magnets, pieces of iron or steel.

Investigate the small disc magnets.

- a) Does each appear to have both a “North” and a “South” pole? Explain how your observations reveal this.

Assemble the disc magnets into a stack. Investigate the behavior of the stack of magnets compared to the single bar magnet.

- b) How does the stack behave compared to a single bar magnet? Does it have a “North” and “South” pole?

Now divide your magnets into two smaller stacks. Investigate their behavior.

- c) How does each small stack behave compared to either the larger stack or the single magnet?

- d) Is the behavior of a single disc magnet by itself the same as the behavior of a disc when it is in the center of a stack?

Pull the stacks completely apart again.

- e) Speculate on what might happen if you continued to divide the magnets in half.