

VII...Exploring Magnetic Fields

Introduction:

What are magnetic fields? In physical science, a "field of force " is a region or space in which an object can cause a push or pull. This field extends infinitely in all directions but gets weaker as you get farther from the source of the field. Magnetic lines of force show the strength and direction of this field. The students will explore the lines of force of magnets and compare them to the lines of force on the sun and the earth.

When the students are using the iron filings to define the magnetic lines of force, it is important to stress that the procedure must be done slowly and carefully to have the best effects.

Use safety goggles when working with iron filings.

Materials:

Strong Magnets- enough for class or small groups

Plastic wrap

Iron filings

Plastic teaspoon

Paper- white

Plastic tray

Compass

Photograph of sunspot/magnetic loops on the sun

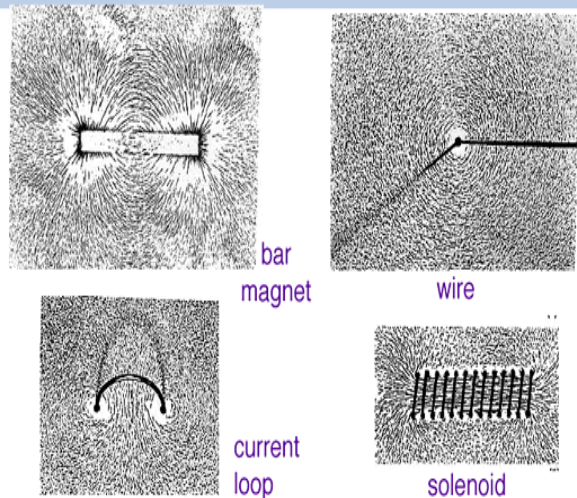
Also available through the TRACE satellite site at

<http://vestige.lmsal.com/TRACE/>

Objectives:

- The students will explore the magnetic field lines of a magnet.
- The students will investigate the magnetic field lines between two attracting and two repelling magnetic poles.
- The students will learn that the earth and the sun have magnetic properties.

Examples of Iron Filings Defining Magnetic Field Lines



Procedures:

*****Caution the students that the iron filings should not be eaten or blown into eyes. *****

- Cover the magnets with plastic wrap to keep the iron filings off them. Place the covered magnet in the plastic tray and place the paper on top. The students should carefully use the spoon to sprinkle a small amount of the iron filings on the paper. The iron filings will stay in a pattern that indicates the lines of force of that magnet. The students should draw their observations in their learning logs. After the students have completed their observations, the iron filings can be poured off the paper and the tray back into the container.
- Give each group of students a pair of covered magnets. Place the covered magnets about an inch apart in the plastic tray and place the paper on top. The students should carefully sprinkle a small amount of the iron filings on the paper. The iron filings will stay in a pattern that indicates the lines of force between the magnets. The students should look at the lines of force and determine whether the magnetic poles are alike or different. Have the students record their observations in their learning logs.
- Have the students repeat the activity of finding lines of force, but this time one of the magnets must be reversed so that its opposite pole is about an inch away from the other magnet. The students should look at the lines of force and determine whether the magnetic poles are alike or different. The students should record their observations in their learning logs.
- Display the photograph or the TRACE website of magnetic loops on the sun's surface without informing the students of the source. Question the students about what they observe in the photograph. The image should resemble the magnetic lines of force the students saw in the previous activity. The students, as scientists, should understand that they are seeing magnetic properties on the sun. Discuss with the students what other property the shapes on the sun need to share with a magnetic field if they are in fact, magnetic. Answer - They should display a definite North and South polarity as well as loops. Scientists have in fact confirmed this using other observations.
- Discuss the student's observations.
- Display a compass to the students. Explain that in the Northern Hemisphere the needle of the compass will point to the magnetic north because it is magnetized. When a compass is held on the earth, the earth's magnetic field exerts a force on the needle. This should help the students understand that the earth also has magnetic properties. If the "north" part of a compass is attracted to the magnetic north pole of the Earth, what is the polarity of the Earth's north magnetic pole? Answer - South!

Conclusions:

The students will gain an understanding of the presence of magnetic fields around magnets, the sun and the earth. The students will learn that the magnetic poles attract when they are different and repel when they are the same.

Sunspots also have magnetic fields, and they look a lot like the kind you see with a bar magnet. This view (note the earth for scale) is provided by the NASA, TRACE satellite shows million-degree gases flowing along the lines of magnetism and illuminating them. How does the pattern compare to the iron filings near a bar magnet?

