

# Magnetic Field Lines

## Introduction

Magnets are used in many everyday objects, such as TV's, videotapes, and speakers. Not only that, we are also living on one giant magnet – the Earth. All magnets produce magnetic fields, and magnetic field lines are a way to visualize these magnetic fields.

Magnets are made from dipoles which have North/South poles and give rise to an overall N/S polarity of the magnet. Magnetic field lines always travel from N to S, and they form closed loops. Magnetic field lines indicate the strength and direction of the magnetic field at a certain point. An area that has a higher density of lines has a stronger field strength than an area with a smaller density of lines. A variety of magnetic fields will be observed using iron filings to visualize the field lines of different magnets/combination of magnets.

## Materials

Iron filing plates

- paper plate
- gallon size ziplock bag
- $\frac{1}{2}$  tsp iron filing per bag

Bar magnets

## Methods

1. Using knowledge of the way magnetic field lines travel, HYPOTHESIZE what the magnetic field lines will look like for each of the magnets.
2. Carefully place an iron filing plate on each magnet/magnet combination.
  - a. Shake the plate so that the iron filings form a thin, homogenous layer on the plate.
  - b. Place it on top of the magnet and tap the plate lightly with your fingers to bring out the field lines.
3. Observe the field lines and draw the results on the page provided. Do the observed magnetic field lines match the hypothesized lines? Why or why not?

## Discussion Questions

1. What field lines were expected for each of the experimental cases?
2. What do you think would happen if you put a paper clip next to the magnet? Why?

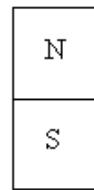
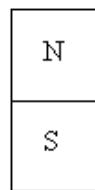
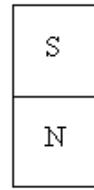
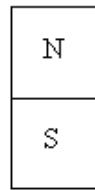
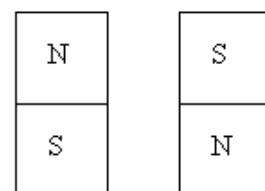
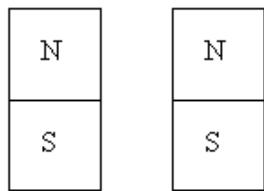
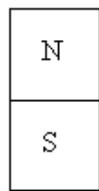
## Assessment questions

The Earth's core can be considered a bar magnet due to the convection of iron and nickel in the outer core. What would the magnetic field lines look like around the Earth?

The direction of the Earth's magnetic field can be determined by using a **compass**. A compass is actually a small magnet that will align itself with the Earth's magnetic field. Which way would the compass point at different points along the Earth's magnetic field?

### Student Worksheet:

First, HYPOTHEZIE the field lines around each of the magnet/magnet pairs:



Now draw the field lines you see on the iron filing plates:

