LAB 61: MAGNETIC FIELD LINES

Magnets can be purchased inexpensively at discount stores. Sets of refrigerator magnets of letters or numbers can be purchased for less than a dollar, and they usually contain 50 or more magnets. Each item contains two or more magnets that can be popped out with a screwdriver. Note that some of these magnets have their poles at the ends and some have them on the top and bottom. Figure out which type you have and mark them accordingly.

Mark each of the magnets with some paint to identify common poles. It really doesn't matter which pole is which color as long as all of the north poles are one color and south poles are another. Just choose a magnet and paint half of it. Then find the side of the other magnets that repel the painted end and paint them, too.

This activity will introduce students to the idea of magnetic field lines—a concept they have probably encountered but may not fully grasp. Completing this activity and reading the corresponding background information should enable students to understand classroom discussions about magnetic fields and field lines.

SCILINKS. THE WORLD'S A CLICK AWAY

Topic: Magnetic Fields
Go to: *www.sciLINKS.org*
Code: THP37

Post-Lab Answers

1. Answers will vary but should be consistent with the student's drawing.
2. This answer will likely come out wrong because the north-seeking end of the compass needle is the south pole of the magnet. The south pole of the compass needle will be attracted to the north pole of the magnet, not repelled. Students should understand that when using a compass to draw magnetic field lines, they should draw the arrows opposite the compass needle. Taking them through this realization will help them remember this fact.
3. Answers will vary. Whichever end it is attracted to is the north pole of the magnet. This will not match with the answer to #2 for the reasons discussed above. The answer to #3 is the correct answer. All of the magnetic field lines in #2 are backward.

LAB 61: MAGNETIC FIELD LINES

QUESTION

How are magnetic field lines drawn?

SAFETY

Small magnets can present a choking hazard for young children.

MATERIALS

2 small magnets, compass, paper

PROCEDURE

Magnetic field lines are a model for thinking about how magnets act. Although magnetic field lines do not really exist, they are a convenient way to model magnetic fields. The magnetic field lines represent the direction that magnetic fields are exiting and entering a magnet and how relatively strong the magnetic field is at a certain point. Keep in mind that there *is* a magnetic field between the field lines.

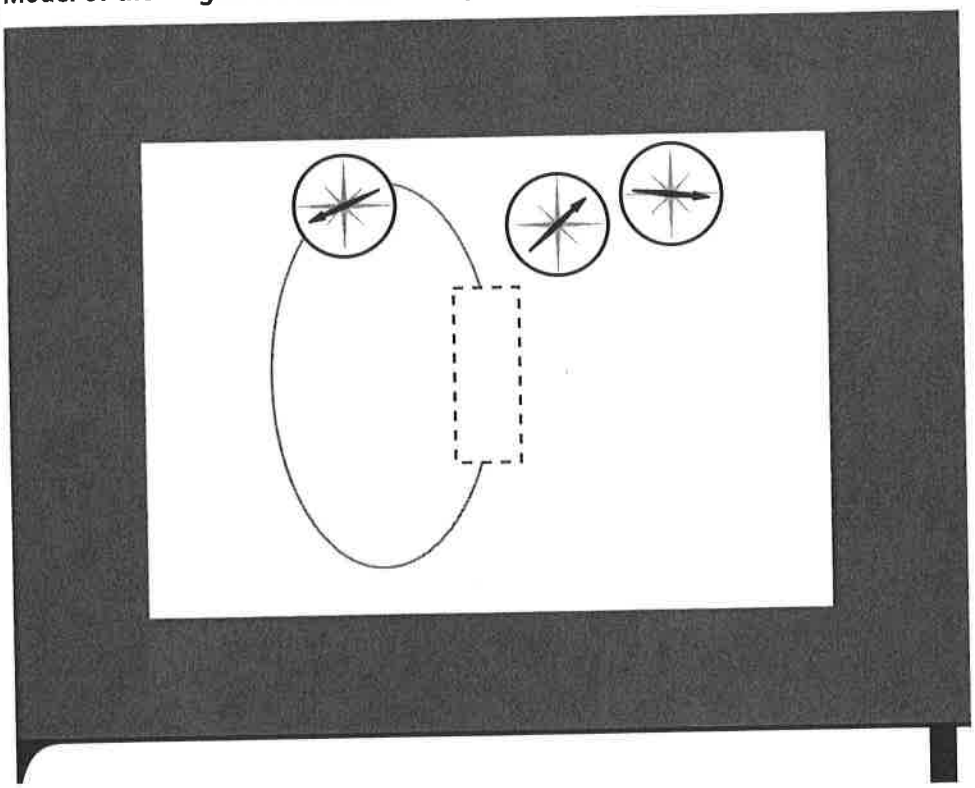
Note that the magnetic field lines that you see in books follow along a line where the magnetic strength is the same. Because we cannot measure the magnetic strength, we will have a model of magnetic field lines that will not be exact.

1. Place a small magnet under a sheet of paper. One end has been marked with a color; note that in your drawing. Use a pencil to draw the outline of the magnet.
2. Place your compass on the paper near the magnet. Notice which way the arrow (north-seeking end) of the compass needle is pointing. If it is pointing north, make sure that it is close enough to the magnet.

3. Lift the compass and draw an arrow on the paper in the same direction that the north-seeking end of the compass needle was pointing. Make a note of which direction north is. If the compass points that way, it could be too far from the magnet.
4. Repeat this procedure as you move the compass around the magnet (see Figure 61.1). Do at least 20 measurements at different distances and on different sides.
5. Magnetic field lines are continuous coming out of one side of the magnet, going all the way around and then entering the other side. Draw circles that go through each one of your arrows and then symmetrically back to the other end of the magnet. This approximates a magnetic field line.

Figure 61.1

Model of the Magnetic Field Lines Setup



Post-Lab Questions

1. Where did the magnetic field lines come out of the magnet (compass pointed away from the end of the magnet)?
2. By convention, magnetic field lines come out of the north pole and enter the south pole of the magnet. Which end of the magnet is the north pole according to the magnetic field lines?
3. Was there actually a magnetic field between the lines that you drew? Does the space between magnetic field lines mean that there is no magnetic field there? Put the compass between two lines to see.

Extension

Perform this experiment again, but with the two magnets in different configurations. Separate them by a few centimeters with like poles facing each other and map the magnetic field lines between them and around them. Repeat with opposite poles facing each other.