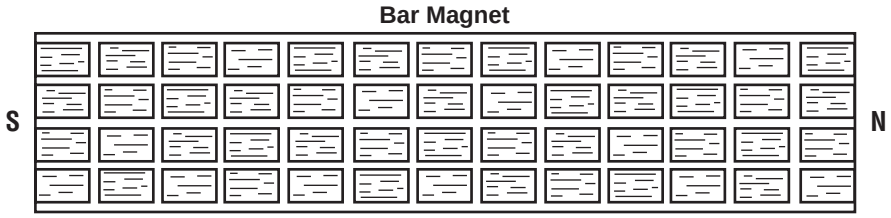
LAB 1 Laboratory Activity

Comparing Magnetic Fields

A magnetic material is made of small regions called magnetic domains. These magnetic domains can be pictured as small bar magnets. When the domains are aligned, as shown in Figure 1, the magnetic fields of the domain add together. This causes the material to be surrounded by a magnetic field.

The magnetic field surrounding a magnet exerts a magnetic force on other magnets and magnetic materials. The direction of the magnetic field around a magnet can be represented by magnetic field lines. Magnetic field lines always begin on the north pole of a magnet and end on the south pole. Magnetic field lines are closer together where the magnetic field is stronger, and farther apart where the field is weaker.

Figure 1



Strategy

You will observe the effect of a magnetic field around a magnet.
You will represent the shape of magnetic field lines by drawing an example.
You will compare and contrast the magnetic field lines around a bar magnet and a horseshoe magnet.
You will observe the interaction of two magnetic fields.

Materials

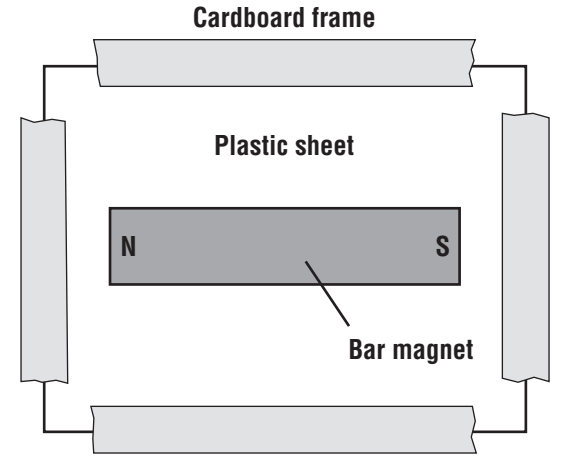
sheet of clear plastic
cardboard frame
masking tape
short bar magnets (2)
iron filings in a plastic container with a shaker top
small horseshoe magnet

Procedure

Part A—Magnetic Field of a Magnet

1. Attach the plastic sheet to the cardboard frame with masking tape.
2. Lay one bar magnet on a flat surface with its north pole at the left. Place the frame over the magnet so that the magnet is centered within the frame as shown in Figure 2.

Figure 2



Laboratory Activity 1 (continued)

3. Gently sprinkle iron filings onto the plastic sheet. Observe how the magnetic field of the magnet affects the iron filings. The iron filings line up along the magnetic field lines around the bar magnet.
4. Sketch the magnetic field lines around the bar magnet in Figure 3 in the Data and Observations section.
5. Remove the lid from the container of the iron filings. Remove the tape holding the plastic sheet to the frame. Carefully lift the sheet and pour the iron filings into the container. Pick up any spilled filings with the other bar magnet and return them to the container. Replace the lid on the container.
6. Repeat steps 1 through 5 with the horseshoe magnet. Use Figure 4 in the Data and Observations section to sketch the magnetic field lines around the horseshoe magnet.

Part B—Interaction of Magnetic Fields

1. Attach the plastic sheet to the cardboard frame with masking tape.
2. Lay two bar magnets end to end on a flat surface as shown in Figure 5 in the Data and Observations section. Place the frame over the magnets so that they are centered within the frame.
3. Gently sprinkle iron filings onto the plastic sheet.
4. Sketch the magnetic field lines around the two bar magnets in Figure 5 in the Data and Observations section.
5. Remove the plastic sheet and return the iron filings to the container as before.
6. Repeat steps 1 through 5 for each position of the magnets shown in Figure 6 through Figure 8 in the Data and Observations section.

Data and Observations

Part A—Magnetic Field of a Magnet

Figure 3

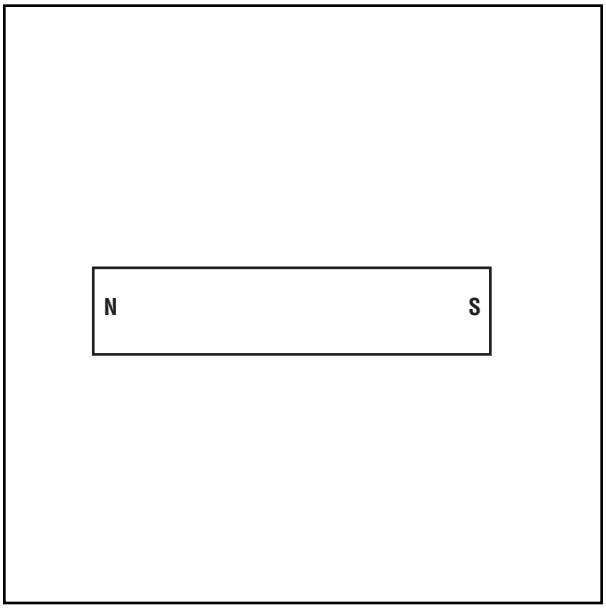
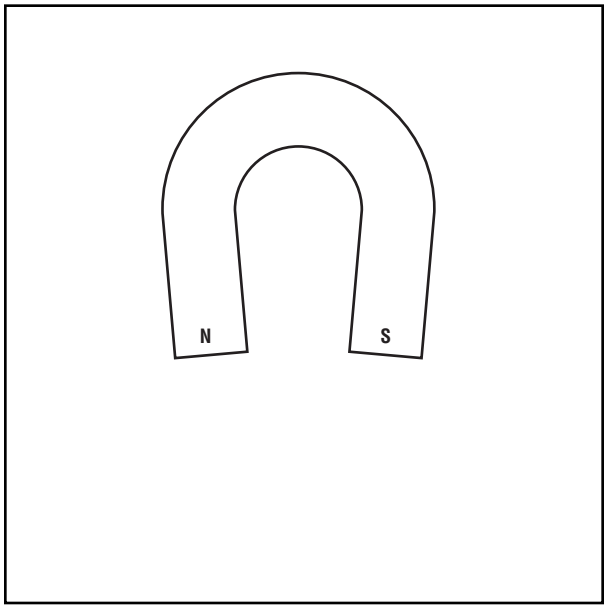


Figure 4



Laboratory Activity 1 (continued)

Part B—Interaction of Magnetic Fields

Figure 5

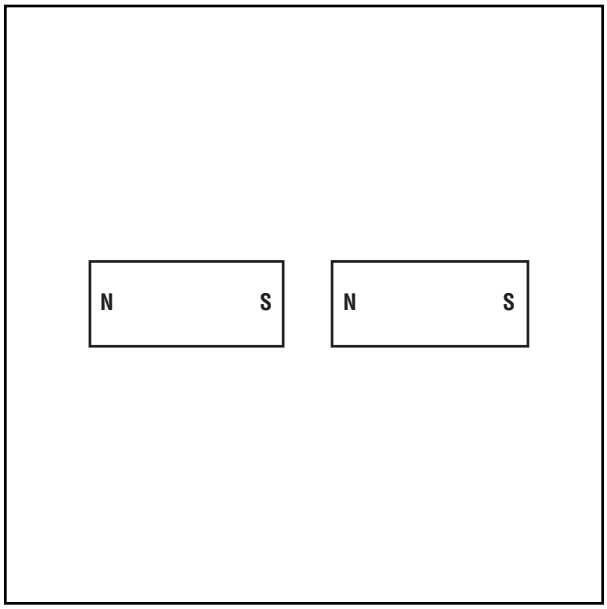


Figure 6

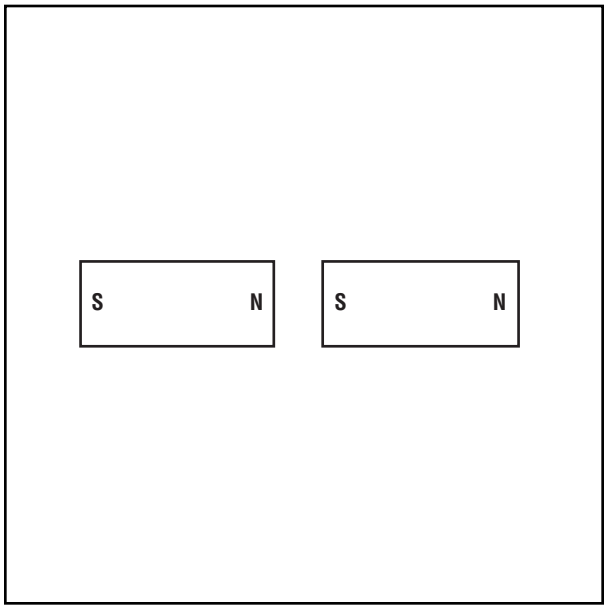


Figure 7

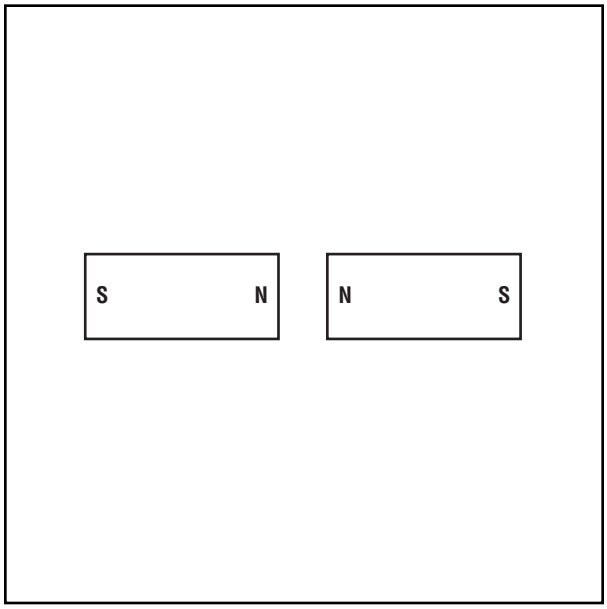
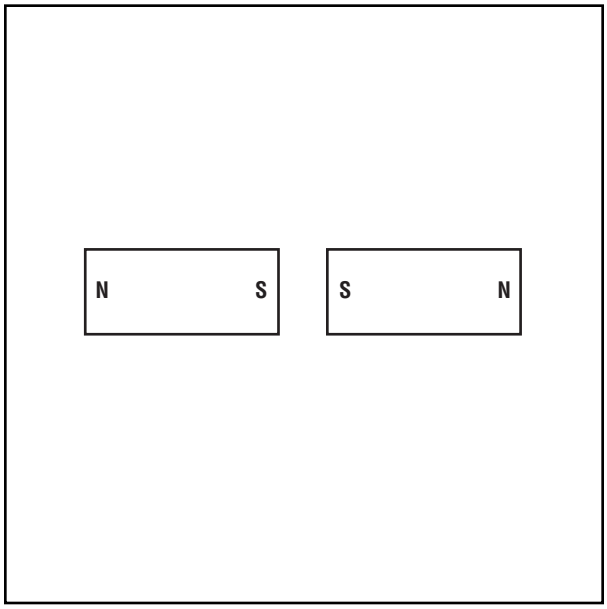


Figure 8



Laboratory Activity 1 (continued)

Questions and Conclusions

1. Why were you able to see the magnetic field lines using iron filings?

2. Which has greater strength—the bar magnet or the horseshoe magnet? How do you know?

3. What are the characteristics of the magnetic field surrounding two bar magnets with opposite poles near each other?

4. What are the characteristics of the magnetic field surrounding two bar magnets with like poles near each other?

Strategy Check

_____ Can you see the effect of a magnetic field around a magnet?

_____ Can you compare and contrast the magnetic field lines around a bar magnet and a horseshoe magnet?

_____ Can you observe the interaction of two magnetic fields?