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Mr. Willis
Conceptual Physics: _____
Date: _____

Unit IX
Electricity & Magnetism
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IX

Magnets Activity

As you know, two magnets can attract or repel each other depending on how they are positioned. If the north pole of one magnet is brought close to the south pole of another magnet, the two magnets will attract each other. If the north poles or the south poles of two magnets are brought together, the two magnets will repel each other.

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 45-1, the material has magnetic properties because it has a magnetic field surrounding it. A magnetic field is a region in which the effects of magnetic forces can be detected and observed.

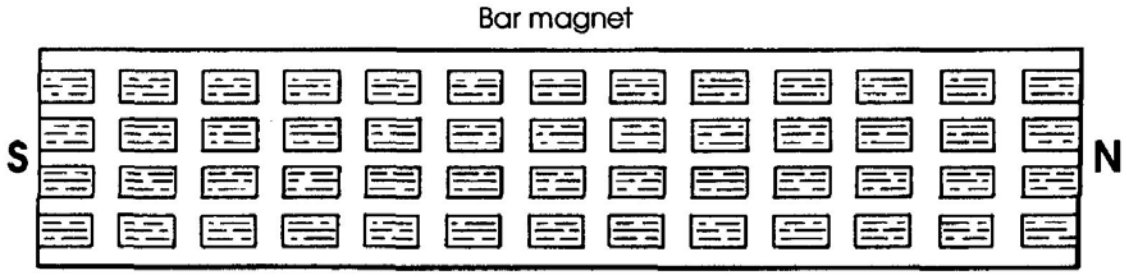

Figure 45-1.

Objectives
In this experiment, you will
- observe the effect of a magnetic field around a magnet,
- represent the shape of a magnetic field by a drawing,
- compare and contrast the magnetic fields of a bar magnet and a horseshoe magnet, and
- determine the interaction of two magnetic fields.

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

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 45-2.

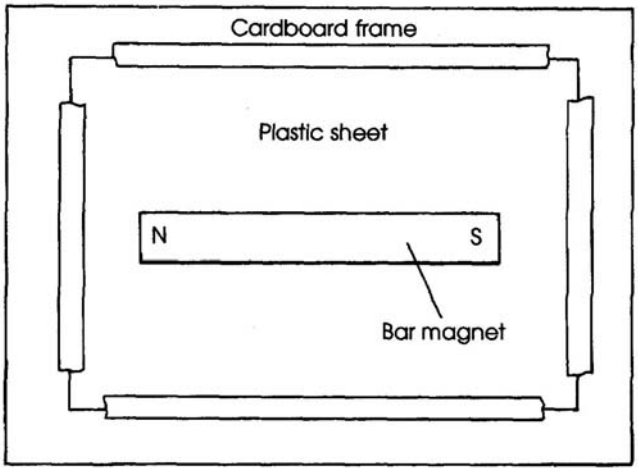

Figure 45-2.

3. Gently sprinkle iron filings onto the plastic sheet. Observe how the magnetic field of the magnet affects the iron filings. The pattern of the iron filings is the shape of the magnetic field of the bar magnet.

4. Sketch the magnetic field of the bar magnet in Figure 45-3 of 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—5 with the horseshoe magnet. Use Figure 45-4 in the Data and Observations section to sketch the magnetic field of the horseshoe magnet.

Part B—Interaction of Magnetic Fields

1. Attach the plastic sheet to the cardboard frame with the masking tape.

2. Lay two bar magnets end to end on a flat surface as shown in Figure 45-5 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 fields of the bar magnets in Figure 45-5 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—5 for each position of the magnets shown in Figure 45-6 through Figure 45-8 in the Data and Observations section.

Conclusions

1. Why were you able to see the effects of the magnetic fields 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 magnets with like poles near each other?

_____

Going Further
What happens to the magnetic field when opposite poles of two magnets touch? What happens to the magnetic field if the opposite poles are separated by a pencil? by an iron nail? Form a hypothesis to one of these questions. Design an experiment to test your hypothesis.

Discover
What is a monopole? What characteristics does it have? Have any monopoles ever been observed? Use reference materials to find out more about them. Write a brief report summarizing what you discovered.

Data and Observations
Part A—Magnetic Field of a Magnet

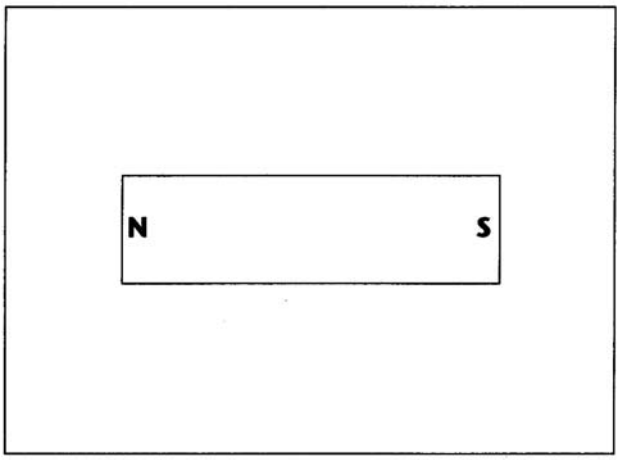

Figure 45-3.

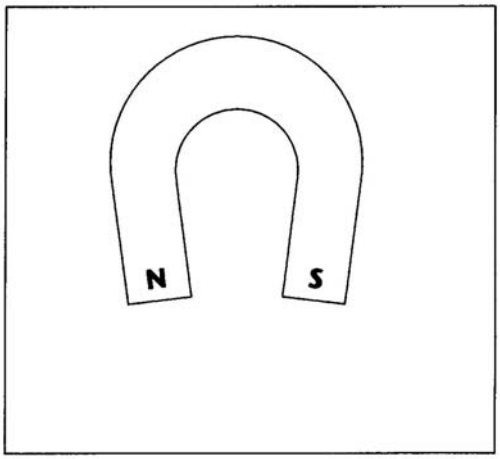

Figure 45-4.

Part B—Interaction of Magnetic Fields

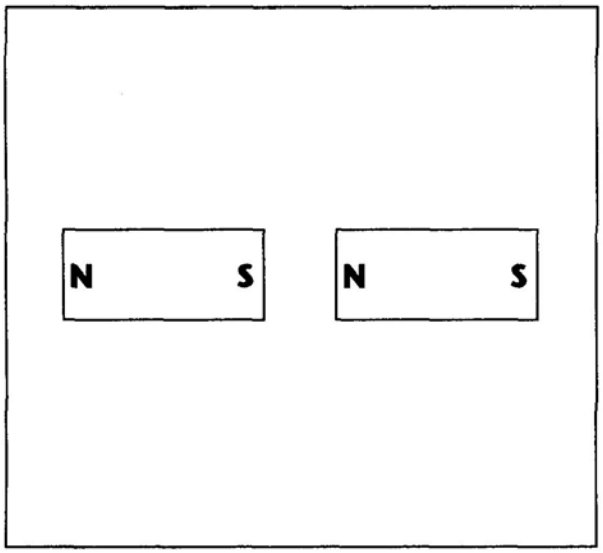

Figure 45-5.

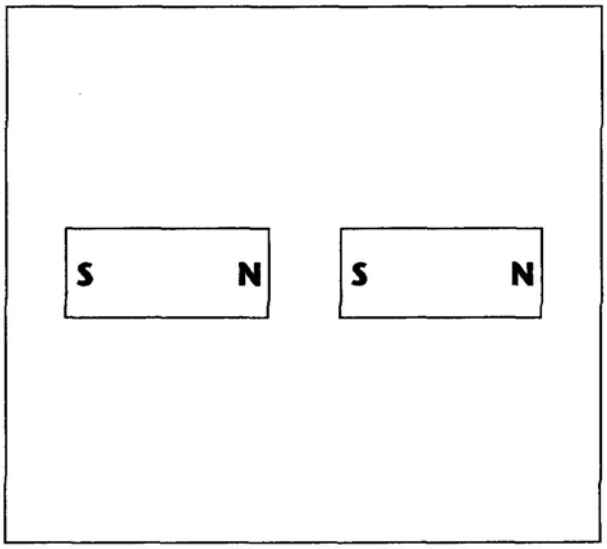

Figure 45-6.

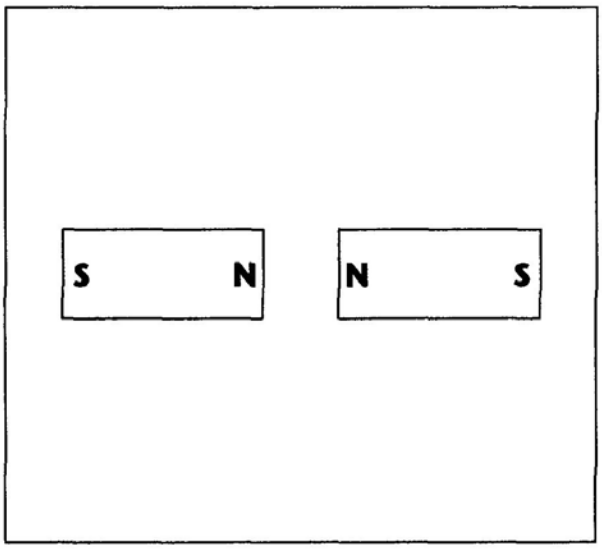

Figure 45-7.

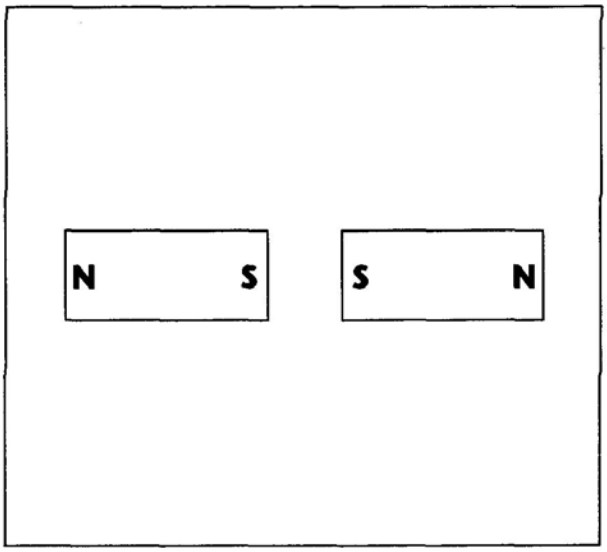

Figure 45-8.