

Invisible Force

Overview:

Students use iron filings to bring out the force fields around magnets and learn that the shape of Earth’s magnetic field is similar to the shape of the force field around a rectangular magnet. They also learn that magnetic fields exist in three dimensions.

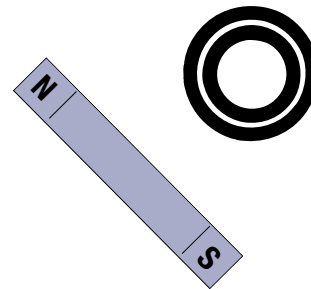
Objectives:

The student will:

- observe magnets have an invisible force field;
- determine the invisible force field around a magnet exists in three dimensions;
- explain magnets of different shapes have force fields of different shapes;
- identify a force field around a rectangular magnet that is strongest at the top and bottom; and
- conclude that the shape of the force field around Earth is similar to the shape of the force field around a rectangular magnet.

Materials:

- Paper cup
- Iron filings
- Magnets of different shapes and sizes
- Magnet and magnetic observation box*
- STUDENT INFORMATION SHEET: “Invisible Force”
- STUDENT WORKSHEET: “Invisible Force”

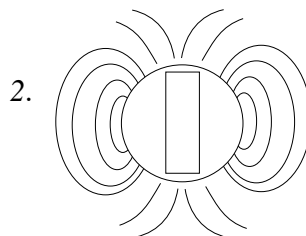
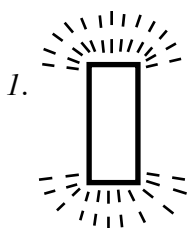


(*both items can be purchased from Arbor Scientific, PO Box 2750, Ann Arbor, MI 48106-2750, tel. 1-800-367-6695)

Activity Procedure:

Distribute the STUDENT INFORMATION SHEET: “Invisible Force,” and the STUDENT WORK-SHEET: “Invisible Force.” Guide students through activities Part I, II, & III allowing time for students to complete the worksheet.

Answers to Student Worksheet:



3. A: at its poles

4. A: at its poles

5. true

Invisible Force

Activity Procedure:

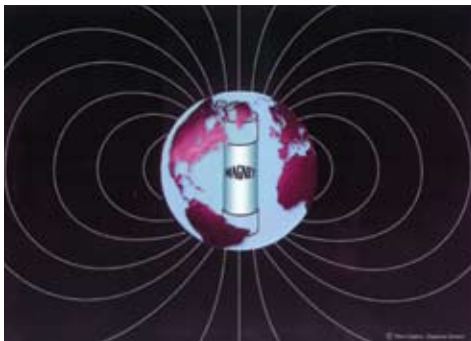
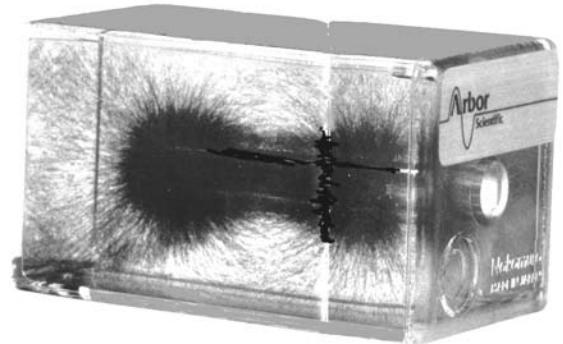


Part I

1. Pour the iron filings into the paper cup.
2. Place magnets of different shapes and sizes on a table.
3. Cover the magnets on the table with a sheet of paper.
4. Sprinkle a thin layer of iron filings on the paper over the magnets.
5. Observe how the iron filings show the invisible force field around the magnet.

Part II

1. Shake up the clear Magnetic Observation Box.
2. Insert the magnet into the box.
3. Observe the magnetic field around the magnet in three dimensions.

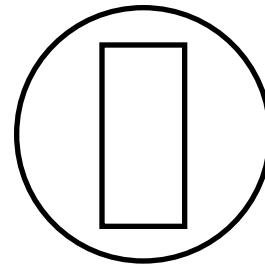
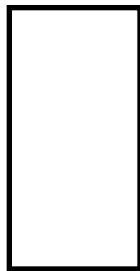


Part III

On the *Aurora Alive* video linked in the description of this lesson, view the magnetic field lines drawn around Earth. Notice that the shape of Earth's magnetic field is the same as the shape of the force field around a rectangular magnet.

Invisible Force

1. In the space below, sketch the magnetic field lines around a rectangular magnet.
2. In the space below, draw the magnetic field lines around the rectangular magnet inside Earth.



3. Where is the pull strongest around a rectangular magnet?
 - A) at its poles
 - B) at its sides
 - C) in the middle
 - D) the pull is the same all around the magnet
4. Where is the pull of Earth's magnetic field strongest?
 - A) at its poles
 - B) at its sides
 - C) in the middle
 - D) the pull is the same all around the magnet
5. True or false: A magnetic field is a force field that exists in three dimensions around a magnet and Earth. _____.