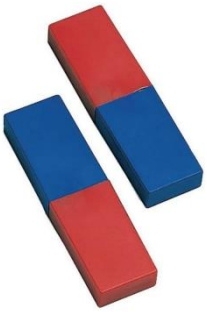
Magnetism Discovery Bundle

P8-9025

Contents



Plastic Covered Bar Magnet

Magnetic Color Chips

Magnaprobe

Horseshoe Magnet

Clear Compasses 20 Pack

Floating Magnet Demo

Magnetic Field Viewer

Revolution

Magnetic Globe

Item	Topic	Instructions
Plastic Covered Bar Magnets P8-1146	Magnetic materials Polarity Magnetic fields	Test different materials to see which are attracted to the magnet. Test the two ends of the magnet. How do the magnets affect each other? Investigate magnetic fields as described below.
Magnetic Color Chips (P8-1115)	Magnetic fields	Instructional Guide Included
Magnaprobe (P8-8006)	Polarity Magnetic fields	Use the Magnetic probe like a 3-D compass. Move it around a magnet to find the north and south poles and determine the direction of the magnetic field.
Horseshoe Magnet (P8-1128)	Magnetic materials Magnetic fields	Test different materials to see which are attracted to the magnet. Investigate magnetic fields as described above.
Clear Compasses 20 pack (P8-1170)	Magnetic fields Polarity	Arrange several compasses around a magnet for a more comprehensive view of the field and polarity. Can also be used to detect magnetic fields around current-carrying wires. Great for use on an overhead projector!
Floating Magnet Demo (P8-1129)	Magnetic force Polarity	Instructions included
Magnetic Field Viewer (P8-1152)	Magnetic fields	Place a bar, horseshoe, or another magnet under the viewer. See the magnetic field on the viewer.
Revolution (P3-6050)	Magnetic Force Magnetic Levitation	To demonstrate magnetic levitation, place the spindle in the base so that the point rests against the clear plastic panel. It will balance there. (The end panel is necessary because static magnetic fields will not provide stable levitation.)
Magnetic Globe (P8-1130)	Magnetic fields Earth's magnetic field	Instructional Guide Included

Related Products

3D Magnetic Field Observation Box (P8-1180) This self-contained device reveals the proper, three-dimensional nature of magnetic lines of force. The sealed acrylic box contains iron filings suspended in a silicone oil solution.

Electromagnetic Force Demonstrator (P6-2625) The Electromagnetic Force Demonstrator is a dynamic way of showing the interaction between magnetism and electricity. Watch how the aluminum pipe travels along the track in the direction the current is applied, reinforcing the interrelated concepts of Current, Magnetic fields and the Lorentz Force.

World's Simplest Motor (P8-8300) By building and observing a motor that converts electrical energy into motion, students discover and explore first-hand several key properties of electricity and magnetism.

Magnetic Color Chips

P8-1115

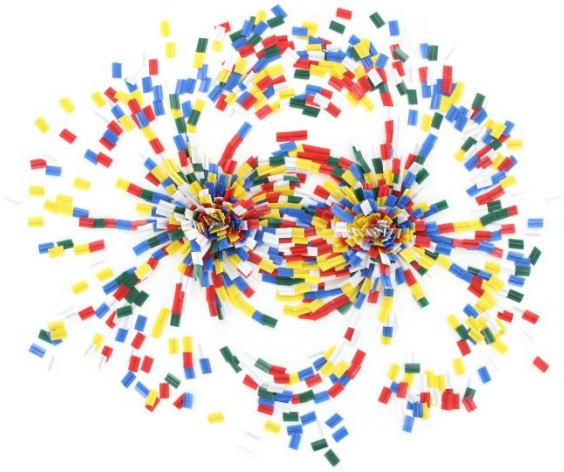
INSTRUCTIONAL GUIDE

Contents

- 100 g bag of colorful magnetic chips
- Instructional Guide

Required but not Included:

- Magnets of different shapes and sizes
- Tray or sheet of card stock



Background

Magnetism has been known for quite a while. Observations of lodestones attracting small pieces of iron were recorded by ancient Greeks. Lodestones are pieces of the mineral magnetite which was originally discovered in Magnesia, a region of Ancient Greece. It wasn't until the end of the 11th century that Shen Kuo, a Chinese scientist, philosopher, and statesman, employed a lodestone and an iron needle to discover the concept of true north. This form of compass was in widespread use by Chinese navigators in the 12th century. French scientist Petrus Peregrinus de Maricourt mapped the poles of a spherical magnet in 1269 and was the first to suggest that the earth itself is a magnet. Now we know that magnetic fields surround subatomic particles and entire galaxies.

Set-Up

Using the Magnetic Color Chips to observe magnetic fields is a much tidier process than with the traditional iron filings. We suggest using a piece of paper or the top of a shoe box to make clean up even easier. Having a variety of magnets on hand will set the stage for a great demonstration or experiment. Horseshoe magnets make for great demonstrations of the magnetic fields around two points, and bar magnets can demonstrate a cross-section model of Earth's magnetic field.

Experiment

The Magnetic Color Chips are a great open-ended resource for exploring magnetism. Place whatever magnet you're using under a tray or piece of paper and sprinkle the chips on top. Colorful lines will start to appear between the poles of the magnet. This method is kind of like making a pencil rubbing to see the veins of a leaf. Placing a magnet directly into a pile of the magnetic chips does a great job of illustrating 3D magnetic fields. Spherical magnets, like the one used by Petrus Peregrinus de Maricourt, demonstrate the magnetic fields of planets, stars, and subatomic particles.

Conclusion

Students will garner an appreciation for the fundamental qualities of magnetic fields. This experience will build a solid foundation for further exploration into electricity and magnetism where the ability to visualize fields is key.

Related Products

3D Magnetic Field Observation Box (P8-1180) This self-contained device reveals the proper, three-dimensional nature of magnetic lines of force. The sealed acrylic box contains iron filings suspended in a silicone oil solution.

Magnetic Field Model (P8-1138) Visualize magnetic fields in an instant! The magnetic field model is one of the quickest and easiest ways to demonstrate invisible magnetic fields to your students.

Magnetic Field Observation Window (P8-1010) Your days of cleaning up iron filing messes are over! The Magnetic Field Observation Window provides a clean & quick way to visualize magnetic fields. A must have for any magnetism lesson. Magnets sold separately.

Magnetic Globe

P8-1130

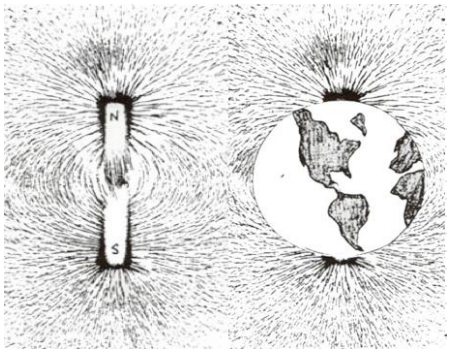
INSTRUCTIONAL GUIDE

Contents

Recommended for Activities:

- Magnaprobe (P8-8006)

Background



The magnetic globe was invented by Dr. Paul Doherty, director of The Exploratorium in San Francisco. The Magnetic Globe consists of a powerful magnet inserted into a “squesh” globe. Since the earth behaves like it has a giant bar magnet at its center, the Magnetic Globe offers a unique opportunity to view the earth’s magnetism from the “outside.”

> “The earth acts like there is a large bar magnet placed near its center. However, the earth is not a magnetized chunk of iron like a bar magnet. It is too hot for individual atoms to remain aligned. Currents in the molten part of the earth beneath the crust provide a better explanation for the earth’s magnetic field. Most earth scientists think that moving charges looping around within the earth create its magnetic field. Because of the earth’s great size, the speed of moving charges would have to be less than one millimeter per second to account for the field. Another candidate for the earth’s magnetic fields is convection current that result from heat rising from the earth’s core. Earth’s heat comes from the release of nuclear energy C radioactive decay. Perhaps such convection currents combined with the rotational effects of the earth produce the earth’s magnetic field” (Hewitt, 562-563).

Whatever the cause, the magnetic field of the earth is not stable, but rather has been wandering around throughout geological time. Geologists know this by studying rock containing iron. Just before the rock solidified, its iron content lined up with the earth’s magnetic field. Geologists can now date the rock and analyze what direction the iron is pointing in. That’s where the north and south magnetic poles of the earth were at the time the rock was formed. Right now, the magnetic poles are somewhere over the Hudson Bay region of northern Canada and just south of Australia.

Activities

To help conceptualize it, visualize the magnetic field lines created by a bar magnet. Now place a globe in the center of the magnetic field. We exist on the outside surface of the earth, where the field is curved. It helps to visualize yourself with a compass standing on the globe in the picture. What direction would the compass point in? When you think about it from this vantage point, compasses behave quite understandably. _____

What would a compass do at the Equator, North Pole, and South Pole?

Place a **Magnaprobe** (P8-8006) at the Equator of the Magnetic Globe.

Q: Is the gimbal-mounted bar magnet dipping north, south or perpendicular?
A: The gimbal-mounted bar magnet is perpendicular to the Equator.

Move the **Magnaprobe** from the Equator towards the North Pole.

Q: As you move the 3D Magnetic Compass from the Equator towards the North Pole what happens to the tilt of the magnet?
A: The magnet begins to tilt until the red end of the magnet is pointing down towards the earth.

Continue your journey around the Globe resting at the South Pole.

Q: How is the magnet pointing now?
A: The magnet should tilt until the blue end is pointing straight down.

What is "Magnetic inclination"?

The **Magnaprobe** points up and down at certain angles depending on where you are at on the Magnetic Globe

Q: why don't compasses do that?
A: Compasses are restricted to 2 dimensions and therefore can't show tilt.

To demonstrate the inclination of the earth's field you need a three-dimensional compass and a Magnetic Globe. The **Magnaprobe** is a gimbal-mounted bar magnet that floats freely enough to line up with any magnetic field in three dimensions.

The angle at which the magnet leans is called the field's "Magnetic inclination."

What are the Van Allen radiation belts?

1. Use Arbor Scientific's **Magnaprobe** to map out the Magnetic Globe's surrounding magnetic field.
2. The Van Allen radiation belts are charged particles that get trapped in the earth's magnetic field. They move back and forth between the magnetic north and south Polar Regions. These trapped particles interact with the earth's atmosphere to produce the dazzling spectacle of the aurora.

Related Products

Magnetic Color Chips (P8-1115) Multi-colored plastic-coated iron chips are not only easy to handle and clean up, but also heaps of fun!

3D Magnetic Field Observation Box (P8-1180) This self-contained device reveals the proper, three-dimensional nature of magnetic lines of force.

Magnetic Field Model (P8-1138) Visualize magnetic fields in an instant! The magnetic field model is one of the quickest and easiest ways to demonstrate invisible magnetic fields to your students.

Bibliography

Conceptual Physics by Paul G. Hewitt. Pearson Education, Inc.