Sparking Discovery in the Classroom

TRAVELING SCIENCE WORKSHOPS

DISCOVERY MUSEUM

Magnets

Teacher Resource Guide

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MathWorks®

Magnets

Magnets are a big part of everyday life. Because a magnet's force is invisible, students may not realize how many items contain magnets. You'll find magnets not only on refrigerators, but also in electric motors, generators, televisions, computers, credit cards, telephones, and audio speakers. By making the force from a magnet "visible," we can show both its direction and its shape. The various hands-on, magnet-based activities that follow encourage speculation (forming hypotheses) and experimentation.

Push and Pull Activity:

This project will show that magnets can both attract and repel, depending on which magnetic poles face each other. Have your students mark the poles of your classroom magnets to facilitate thoughtful play during these activities.

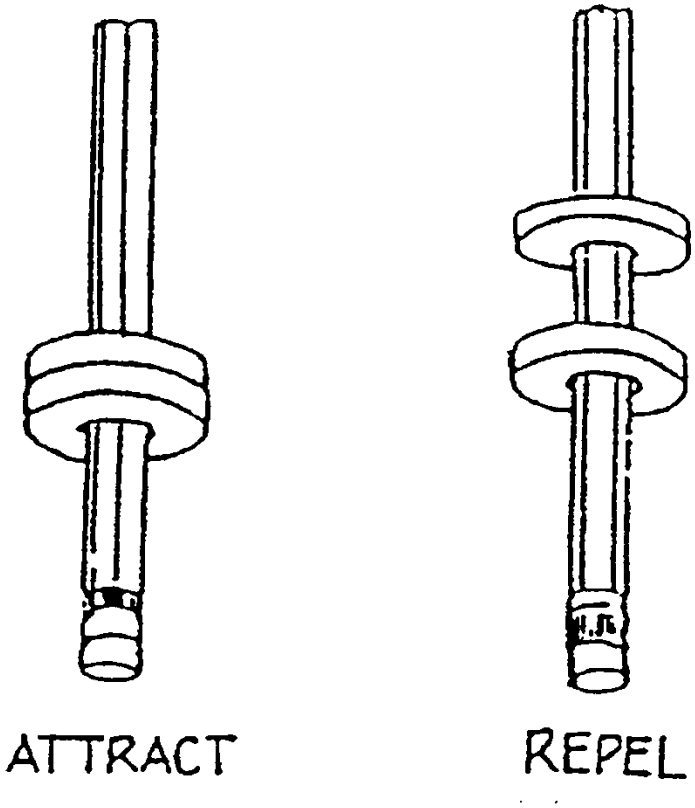
Materials

2 ring magnets per group
unsharpened pencil

Procedure

1. Pass out ring magnets and pencils.
2. Hold the pencil by one end.
3. Place both magnets on the pencil so that the magnets are sticking together (attracting).
4. Lift the top magnet up and turn it over on the pencil so it "floats" (repelling).

Have students think of everyday uses for magnets. Are the magnets attracting or repelling in their examples? For instance, refrigerator magnets attract, while magnetic trains repel, floating above the tracks.



Magnetic Mystery Boxes

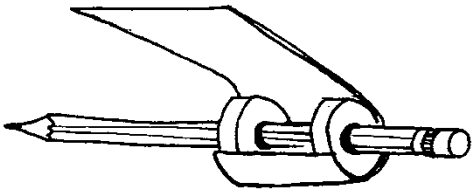
In the mystery box game, students try to stump one another by hiding the orientation of three magnets in a film container. Using the large magnetic field viewing box, students can see the shape of the field produced by the hidden magnets and discover their orientation.

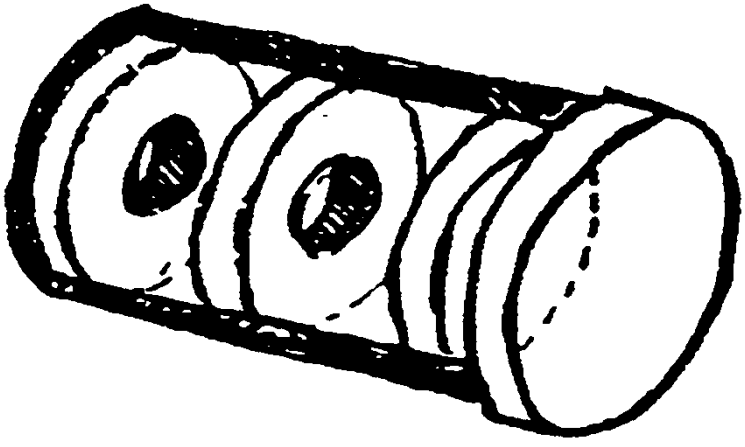
Materials

3 ring magnets per group
unsharpened pencil
black plastic film canister, with lid
large magnetic field viewer
masking tape

Procedure

1. Pass out all materials.
2. Half of each group should secretly orient two magnets along the pencil about 1 cm. apart, either attracting or repelling.
3. Roll a piece of tape around the outside of the magnets, securing their position.
4. Orient a third magnet along the pencil 1 cm. from the second magnet and tape to secure.
5. Slide magnets off the pencil and into the film canister.
6. Put the lid on the film canister.
7. Ask the rest of the group to determine the orientation of the magnets using the large magnetic field viewer.



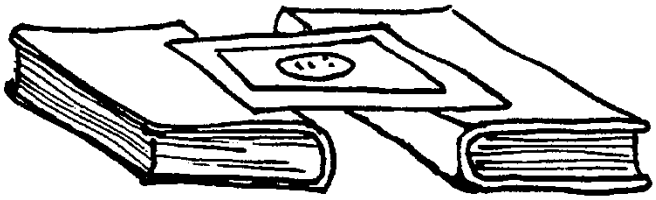


Funny Faces Activity

This activity allows students to understand the different shapes a magnetic field can produce as the students create arrangements of “hair” (iron filings) on a paper face.

Materials

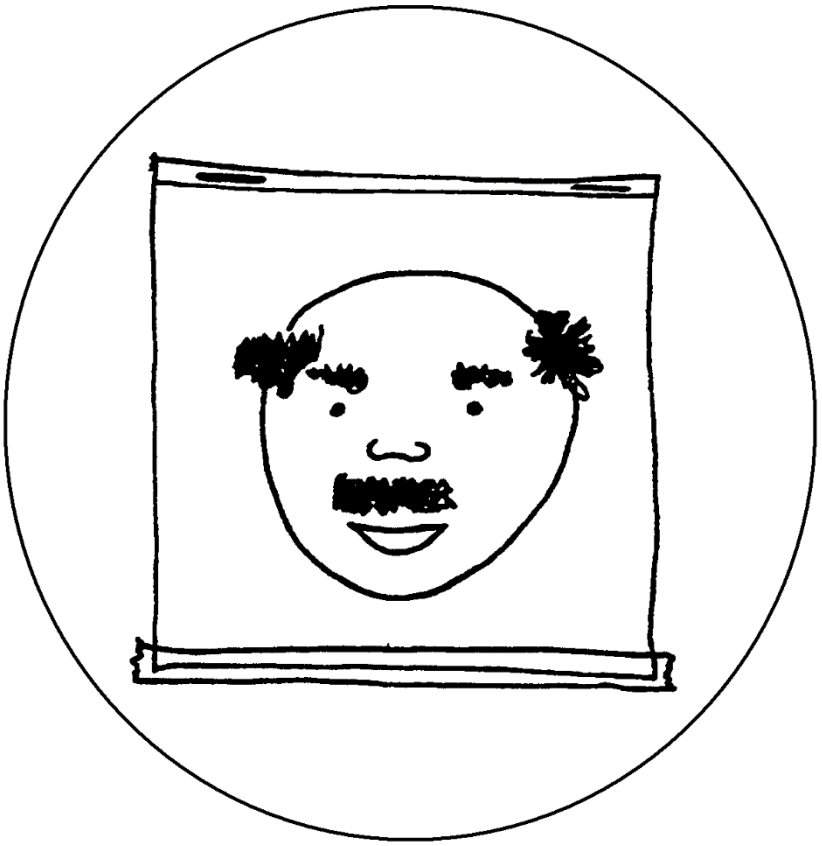
white paper plates
pencil, pen, or marker
iron filings
¼ tsp. measuring spoon
zipper sandwich bag
stapler
tape
magnets



Procedure

1. Draw a face, without hair or eyebrows, on a paper plate.
1. Put ¼ teaspoon of iron filings into a zipper sandwich bag.
2. Seal the bag and center it on the plate.
3. Staple top corners of the bag, above the zipper, to the plate.
4. Tape bottom corners of the bag to the plate.
5. Shake the plate side to side to distribute the filings.
6. Keep the plate horizontal or suspend it between two books.
7. Move a magnet along the back of the plate to draw hair, eyebrows, beards, bangs, braids, and mustaches with the iron filings.

For further exploration, use an assortment of magnets (bar, ring, button, horseshoe) as a shape stamp for the iron filings.



Magnetic Field Viewing Jar

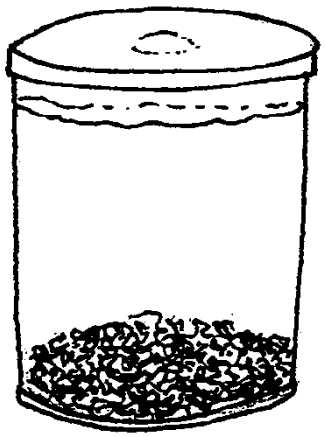
With magnetic field viewing jars, students can visualize the force around and between magnets. Have students answer the following questions using their viewing jars: Is the force from several magnets put together stronger than the force from one magnet? Do the edges of magnets produce the same field (the shape of the force) as the poles? Do different shaped magnets produce different fields?

Materials

1 clear plastic jar with screw-on cap per person or group
iron filings
¼ tsp. measuring spoon
mineral oil
2 or more ring magnets per person or group

Procedure

1. Pass out clear plastic jars.
2. Put ¼ teaspoon of iron filings into each jar.
3. Fill each jar almost full with mineral oil.
4. Screw cap on tightly and advise students not to open.
5. Shake the container to distribute the iron filings evenly.
6. Hold one or more magnets near the jar to see how they attract the filings.
7. Try different magnet arrangements and hold near various locations on the jar to see how the field is affected.



Large Magnetic Field Viewer

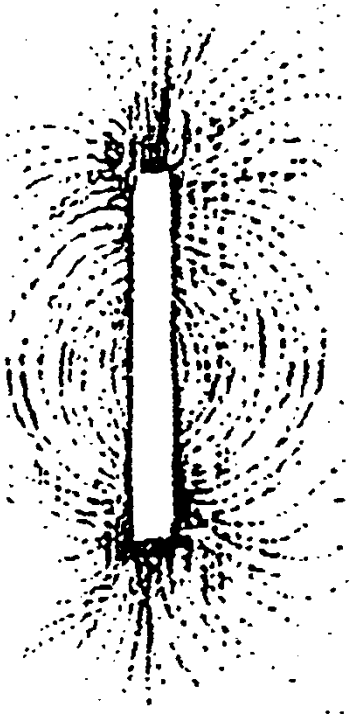
The large magnetic field viewer allows students to see magnetic fields clearly.

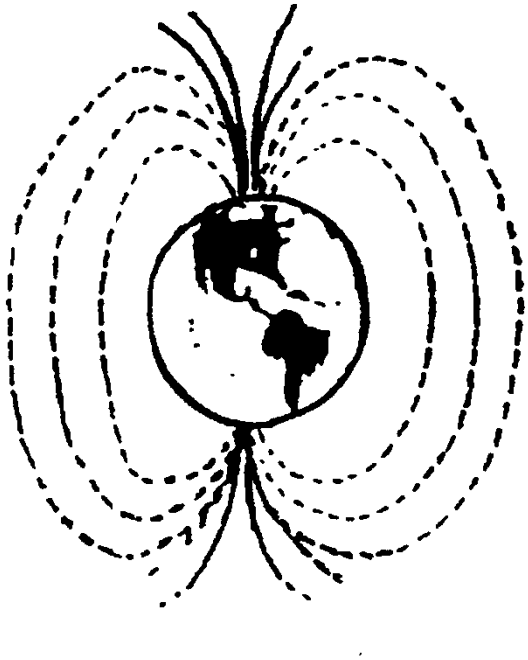
Materials

flat, clear plastic bottle with cap (Neutrogena or CVS brand shampoo bottles work well)
iron filings
mineral oil
2 or more ring magnets per group
optional, but advised: superglue to permanently seal the bottle

Procedure

1. Put ¼-½ teaspoon of iron filings into a bottle.
2. Fill the bottle almost full with mineral oil.
3. Put the cap on firmly (you may want to put superglue on the threads of the bottle before closing it).
4. Shake to distribute the iron filings evenly.
5. Hold one or more magnets near the bottle to see the shape of the magnetic field.
6. Put several ring magnets together to make a "bar" magnet and view the field. (Bar magnets have field lines similar to the magnetic field around the earth.)
7. Put one or more magnets on either side of the bottle. Compare the difference in the shape of the force between attracting magnets and repelling magnets.





Sources of Materials:

Magnets: Amazon
Iron Filings: Amazon

Resources:

Lower Elementary (K-3) Print Resources:

- *Push and Pull*, Patricia J. Murphy, 2002, Children's Press
- *Everyone Shouted Pull!* Claire Llewellyn, 2004 Picture Window Books
- *Roll, Slope, and Slide*, Michael Dahl, 2006 Picture Window Books
- *Pushing and Pulling*, Sue Barraclough, 2006 Raintree
- *Forces Make Things Move*, Kimberly Bradley, 2005 Harper Collins
- *What Makes a Magnet?,* Franklyn Branley, HarperCollins, 2016
- *Magnets: Pulling Together, Pushing Apart,* Natalie Rosinsky, Picture Window Books, 2002
- *Magnets Push, Magnets Pull,* David Adler, Holiday House, 2018
- *Magnet Max,* Monica Hughes, Brown Books Kids, 2015

Upper Elementary (4-6) Print Resources:

- *Isaac Newton and the Laws of Motion* by Andrea Gianopoulos Graphic Novel, 2007 Capstone Press
- *A Crash Course in Forces and Motion with Max Axion, Super Scientist*, by Emily Sohn, 2007 Capstone Press
- *Forces and Motion: From High Speed Jets and Wind-up Toys,* Tom DeRosa and Carolyn Reeves, Master Books 2009
- *Driving Force*, James D. Livingston, 1996, Harvard University Press
- *Investigating Science: What Does a Magnet Do?* Jacqui Bailey, Franklin Watts, London, 2007

Online Resources

- NASA STI Program, Toys in Space, 2
  - https://www.youtube.com/watch?v=E9RDlIjgftI
- Top 6 kinetic art objects by MIT scientist and artist, Arthur Ganson
  - https://www.youtube.com/watch?v=R-d7I48-95A
- http://www.coolmagnetman.com/magindex.htm
  - Listing of magnet information and experiments.
- http://www.exploratorium.edu/snacks/iconmagnetism.html
  - Many engaging experiments with magnetism.
- Magnetism on Raz Kids
  - https://www.raz-kids.com/main/BookDetail/id/82