RAFT IDEAS

Topics: Magnetism, Gravity, Micrograv

Materials List

- ✓ Ring magnets, 3 cm (1⅛") diameter or equal, 2
- ✓ Pencil or dowel having a diameter smaller than the hole in the ring magnet
- ✓ String
- ✓ Rubber bands, small diameter
- ✓ Cardstock, file folder, or thin cardboard
- ✓ Hole punch
- ✓ Tape or glue

This activity can be used to teach:
Next Generation Science Standards:

- Properties of materials (Grade 5, Physical Science 1-3)
- Electric or magnetic interactions between objects not in contact (Grade 3, Physical Science 2-3; Middle School, Physical Science 2-5)
- Magnets (Grade 3, Physical Science 2-4; Middle School, Physical Science 2-3)
- Forces & Motion (Grade 3, Physical Science 2-1)

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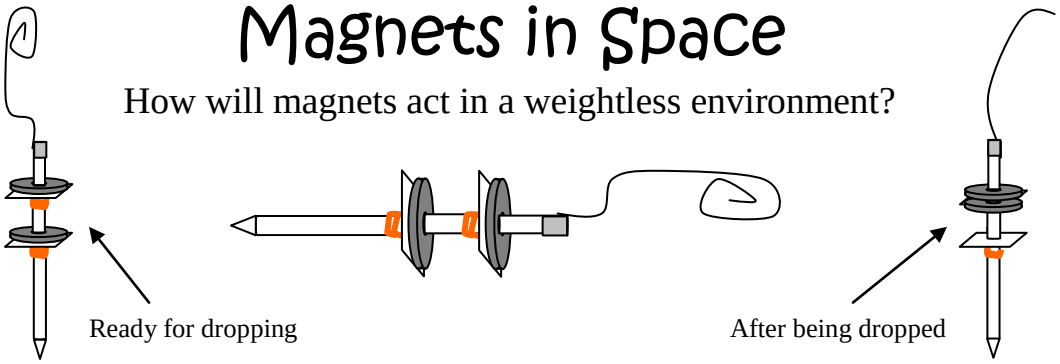
Magnets in Space

How will magnets act in a weightless environment?



Create a weightless "environment" and see how magnets would react in outer space.

Assembly

1. Cut 2 squares from a file folder or thin cardboard (other shapes also work) with sides equal to the magnets' diameter. Punch a hole slightly smaller than the diameter of the pencil in the center of both squares.
2. Loop a small diameter rubber band several times around the end of a pencil until the loops are snug. Slide the rubber band to about the middle of the pencil.
3. Insert a cut shape over the pencil's end and place on top of the rubber band loops.
4. Slide a ring magnet over the pencil and place on top of the file folder square.
5. Wrap a second small diameter rubber band snugly around the pencil, above the magnet. Position the rubber band between the magnet and the end of the pencil.
6. Repeat steps 3 and 4 with the 2nd file folder square and a second magnet.
7. Move the lower magnet toward the top magnet. If the top magnet is repelled, remove the top magnet, turn it over, and put it back on the pencil.
8. Attach a 60 cm (24") long string to the end of the pencil above the top magnet.

To Do and Notice

1. Hold the pencil upright, the string end at the top. Both magnets must be resting on their file folder squares. Hold the free end of the string in the other hand.
2. The magnets' opposite poles are facing and attracting each other. The magnets remain in place on the file folder squares due to the force of gravity.
3. Drop the pencil while still holding the other end of the string.
4. What happens? How can the behavior of the magnets be explained?

The Science Behind the Activity

Space is generally considered to begin at about 100 km (~60 miles) above the Earth. At that altitude gravity is only about 3% weaker than at the surface of the Earth! The weightlessness or microgravity experienced by astronauts is due to the falling of the spacecraft around the Earth. We experience weight due to the surface beneath us pushing back as gravity pulls us down. Falling objects, such as a spacecraft and the dropped magnets, are in freefall and have nothing pushing back (on Earth there is some air resistance). The dropped, attracting, magnets will move toward each other resulting in a click when the magnets meet, making a file folder "sandwich".

Taking it Further

Create a repelling magnet demonstration. Use a pencil with a **steel** ferrule (holds the eraser). Follow the **Assembly** steps but position rubber bands at points 1/5 and 2/5's of the pencil's length from the eraser. Position the magnets so they repel each other. Attach a rubber band, tied to a string, to the eraser. Repeat the **To Do and Notice**.

Web Resources (Visit www.raft.net/raft-idea?isid=206 for more resources!)
Micrograv - http://quest.arc.nasa.gov/space/teachers/microgravity/index.html

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