

## Properties of Magnets

### The Pull of Magnets

1. Magnet: an object that attracts, or pulls on, certain materials, like iron and steel
  - a. Steel is made from iron
  - b. A magnet's property of attracting certain materials is called magnetism
  - c. Why can a magnet pick up paper clips and not rubber bands: rubber bands contain no iron or other materials a magnet attracts
2. What are some uses of magnets? can opener, screwdriver, holding spelling tests on the fridge

### Two Kinds of Magnets

1. Permanent Magnets: hold magnetism for a long time; made in factories
  - a. Examples: refrigerator magnets
2. Temporary Magnets: can only hold their magnetism for a short time

### North and South Poles

1. When a magnet hangs so that it can swing freely, one end always points north
  - a. This is the magnet's north pole
  - b. The end opposite the north pole is the south pole
2. What happens...
  - a. If you move the north pole of one magnet near the south pole of another magnet? The north and south poles stick together: attract
  - b. If you move the north pole of one magnet near the north pole of another magnet? The north and north poles push away: repel
3. Opposites attract, like sides repel
  - a. Repel: to push away from

## Maglev Trains

### It Flies and It's Fast

1. Maglev means magnetic levitation
  - a. Levitation: floating or rising into the air
2. The maglev train uses magnetism to rise into the air.
3. Regular trains are slowed by friction
  - a. Because the maglev doesn't touch the track, there is no friction
    - i. It can go as fast as 310 mph
4. Maglev trains also make very little pollution

### It's Clean

1. Maglev trains create very little pollution because it doesn't burn fuel

## Force Fields

### Lines of Force

1. When iron filings are sprinkled over a magnet, the iron filings form a pattern
  - a. This pattern...
  - b. The filings are thickest and closest together where the force of the magnet is strongest
2. The lines formed by the iron filings are called lines of force

### A Magnet's Force Field

1. The space in which the force of a magnet can act is called a magnetic field
  - a. You can't see the magnetic field, but how do you know it exists? Things that a magnet attracts (iron or steel) will attract to the magnet if they are in the magnetic field.
2. The magnetic field spreads out in all directions around the magnet

#### Comparing Force Fields

1. Four properties of magnets:
  - a. Magnets attract objects made from iron or steel
  - b. The force of a magnet is greatest at the north and south poles
  - c. Like poles of two magnets repel each other
  - d. Unlike poles of two magnets attract each other

#### Earth as a Magnet

1. Today, Scientists know Earth is a giant magnet
2. Lodestone: a naturally magnetic rock found in Earth's crust
  - a. Turkey (country): A shepherd found that lodestone attracted iron nails in his shoes
  - b. Greece: Greeks discover that when lodestone is hung from a string, one side always points north
3. A Stone Leads the Way
  - a. China: sailors used lodestone as a compass by floating a small piece of it on straw in a body of water.
    - i. How did they use the compass? Because the lodestone always pointed north, they knew their direction
4. Earth's Magnetism
  - a. Earth's center is made mostly of iron
    - i. The spinning of Earth caused the iron to be magnetized, which has turned Earth into a giant magnet
  - b. The "Earth" magnet has poles
    - i. It is surrounded by a magnetic field
    - ii. It has lines of force
  - c. Magnets are affected by Earth's magnetism
    - i. The north-seeking pole of a magnet is attracted to Earth's magnetic north pole. This is what makes a compass work.
5. Why Two Sets of Poles
  - a. Earth has two sets of poles
    - i. Geographic Poles mark the end points of the imaginary line (axis) that Earth spins on
    - ii. Magnetic Poles show where magnetic north and south are (about 1,000 miles from Geographic poles
6. Magnetism Lights Up the Sky
  - a. Northern and Southern Lights: auroras
    - i. Auroras are created when very small pieces of matter from space are caught in Earth's magnetic field.

b. Why are the Northern and Southern Lights brightest near Earth's magnetic poles? Magnets are strongest at their poles.