



# Electric and Magnetic Forces in Action

## **Part 1. Electric Force**

You will see how electric forces push and pull. This is what you will need:

- a roll of clear plastic tape
- a balloon
- something made of wool or a cat

This is what you do:

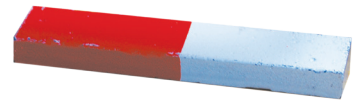
- 1.** Tear off two pieces of tape about as long as your hand. Stick them to a desk or tabletop. Smooth them down. Leave one end free so you can peel them off.
- 2.** Peel one strip of tape off with your right hand. Peel the other strip off with your left hand.
- 3.** Let the strips hang down. Bring them slowly toward each other. Watch what happens.
- 4.** Blow up the balloon and tie it shut.
- 5.** Rub the balloon on the wool or the cat.
- 6.** Try to stick the balloon to the wall or the ceiling.

Which things had the same charge (both positive or both negative)? Which things had different charges (one positive, the other negative)?

## **Part 2. Magnetic Force**

You will see how the same poles on a magnet push each other away. You will also see how different poles pull each other together. This is what you will need:

- three bar magnets—bar magnets look like this:
- a glass or plastic tube that the magnets will just fit into.



This is what you do:

- 1.** Hold the tube up on end. Drop the magnets in one at a time.
- 2.** What do you see? Are any of the magnets “floating”?
- 3.** Try putting the magnets in different ways. Try to find a way that makes the top two magnets float above the others.

What does it mean when the top magnets float? What does it tell you about the magnet poles of the different magnets?



# Chemical Changes and Conservation of Mass

**CONSERVATION OF MASS** is one of the laws of science. “Conserved” means something stays the same. So this law says that no mass is lost or gained during a chemical change. This is also true of physical changes. You can do experiments to show that this is true.

## Experiment 1

For the first experiment you will need a piece of fresh bread, a tablespoon of water and a container. You must be able to see through the container and be able to seal it very tightly. You will also need a scale or balance that can tell very small differences in weight. Ask your teacher if there is an “analytical balance” in your school. Ask if someone could weigh some things for you.

### Steps:

1. Put the bread and water in the container and seal it tightly.
2. Weigh the container with the bread and water in it.
3. Put the container in a sunny window or other warm place.
4. Wait until the bread is covered with mold. (Getting moldy is a chemical reaction.)
5. Weigh the container again.

## Experiment 2

For the second experiment you will need a few small iron nails or some iron filings. The nails should be plain iron and not coated with anything. Iron filings will work better.

### Steps:

1. Weigh the iron nails or filings carefully.
2. Put the nails or filings outside in a place where they will get sunlight and where dew and rain can get on them.
3. Wait until the iron is covered with rust. (Remember rusting is a chemical reaction.)
4. Bring the nails or filings inside. When you are sure they are dry, weigh them again.

- A. Did the weight change in the first experiment?
- B. Did the weight change in the second experiment?
- C. If the results were different in the two experiments, explain the difference.
- D. Do you think mass was conserved in both experiments? Explain your answer.



# Convection Currents and Density of Air

**For this activity, you will learn about convection currents in air and water.**

**Remember that:**

- **Hot gases and liquids are less dense than cold ones.**
- **This makes the warm material rise and cold material fall.**
- **This is what causes most convection currents.**

**Try this!** Here are some ways you can feel CONVECTION CURRENTS IN AIR...

- A. If you hold your hand above a light bulb you will feel warm air rising.
- B. If you stand on a chair or ladder so that your head is almost touching the ceiling, you will feel that the air is warmer up there.
- C. Have you ever felt cold air dropping? Follow the four steps described below.
  1. Put an empty, sealed jar in the refrigerator freezer for about 15 minutes. (Of course, it is not empty; it has air in it.)
  2. Take the jar out and take off the lid.
  3. Now slowly tip it over as if you were pouring water out of it.
  4. Hold one hand under it and you will feel the cold air falling onto your hand!

**Try this, too!** Follow the steps below to see a CONVECTION CURRENT IN WATER.

1. Put a drop of food coloring in a jar of water. Put the jar in the refrigerator for 30 minutes.
2. Fill a glass with warm water, with no coloring in it.
3. Very gently pour the cold, colored water *into* the warm uncolored water.
4. What happens? Did you see a convection current?