# LETTER TO FAMILY

Cut and paste onto school letterhead before making copies.

## *Science News*

Dear Family,

Our class is beginning a new science unit, **Mixtures and Solutions**. We will be studying basic concepts in chemistry, and finding out how materials interact with each other. Students will learn what happens when simple materials, such as gravel, salt, and water, are put together. They will also learn techniques for separating the resulting mixtures and solutions. As our studies continue, we will investigate combinations of materials, such as baking soda and calcium chloride (the salt used to melt ice on roads), that react when mixed to produce new products—chalk, carbon dioxide gas, and table salt. We will engage in an engineering challenge dealing with desalination.

One of the most demanding intellectual activities in the enterprise of science is developing descriptive, explanatory models to advance the understanding of complex natural phenomena. Models provide intellectual structures to important ideas that are inaccessible to direct observation. But bringing understanding to the inaccessible is a critically important dimension of science. We expect students to develop their first, primitive models of the particulate nature of matter. Their models at this level will be incomplete and limited, but expect them to have some interesting intellectual experiences as they grapple with explanations for the commonplace phenomena they observe.

You can bring chemistry to life at home by exploring familiar household materials in a scientific way. Some of the interesting chemicals you may have on hand include baking soda, baking powder, alum, table salt, Epsom salts, flour, sugar, cornstarch, and vinegar. Add to these a few pieces of "laboratory equipment," such as jars, margarine tubs, plastic cups, and spoons, and you are ready to extend the classroom experiences into your home. Reminder: Just as we do at school, you and your student should review and follow important safety procedures, even when working with familiar materials.

- Have a plan before starting an investigation.
- Avoid skin contact with experimental materials. Clean up spills immediately. Rinse with water if materials contact skin, eyes, or clothes. Wash hands after completing experiments.
- Never taste the experiments.

The US Consumer Product Safety Commission (CPSC) requires the following label to be on student sheets associated with the use of these chemicals in the FOSS investigations: calcium chloride, citric acid, diatomaceous earth, Epsom salts, and kosher salt. It is a reminder to students to exercise particular safety precautions when working with materials in the classroom.

**WARNING —** This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

Watch for the Home/School Connection sheets I will be sending home with your student. These suggest ways for the whole family to investigate interesting aspects of chemistry. We are looking forward to many weeks of exciting investigations with mixtures and solutions. You can get more information on this module by going to www.FOSSweb.com.

Sincerely,

# HOME/SCHOOL CONNECTION

## Investigation 1: Separating Mixtures

Make a mixture known as oobleck.

### Materials

1 Mixing bowl

1 Spoon

1 Measuring cup

- Cornstarch
- Water

### Directions

1. Put about 1 cup of cornstarch in a mixing bowl.
2. Slowly add water to make a mixture, stirring as you go.
3. When the cornstarch is all wet, it will turn into oobleck.

### Things to find out

Explore the properties of oobleck.

- Is it a solid or a liquid?
- What happens when you place solids, such as coins or spoons, on the surface?
- What happens when you try to push your hand gently into the oobleck? When you try to push your hand hard and fast into the oobleck?
- Pick up a handful of oobleck. Can you hold it?
- Can you cut a ribbon of oobleck with scissors?
- What happens to the properties of oobleck when you change the amounts of the two ingredients in the mixture? More water? More cornstarch?

NOTE: If you want to keep oobleck so that you can work with it another day, store it in a covered container in the refrigerator.

# HOME/SCHOOL CONNECTION

## Investigation 2: Developing Models

*Black box* is a general term scientists and engineers use to describe a system that works in mysterious or unknown ways. For most people, a television is a black box. Electricity goes in, and a picture miraculously appears on the screen. Even the cell phone is a black box. We dial a number to speak with a person across the continent, never questioning how this is possible.

What black boxes do you have in or around your home, in your neighborhood, in your car? What black boxes have you read about, seen on TV, or seen in a movie? Make a list with the help of other family members. Be prepared to share your list. Do you think you can come up with any black boxes that no one else will think of?

**Black boxes**

# HOME/SCHOOL CONNECTION

## Investigation 3: Concentration

You can make your own play putty right at home. Here's what you will need.

### Materials

| | |
|---|---|
| 20 mL | White household glue (Colored glue won't work.) |
| 15 mL | Borax |
| • | Water |
| 1 | Measuring cup |
| 1 | Plastic bag |
| 1 | Set of measuring spoons |
| 1 | Spoon |
| • | Food coloring |
| 2 | Plastic cups or small jars (Baby-food jars work great.) |

### Directions

1. Mix 15 mL (1 tablespoon) of borax in a cup or jar with enough water to dissolve it (about 40–50 mL). This will make a very concentrated solution.
2. In a separate plastic cup, mix 20 mL (4 teaspoons) of white glue with 5 mL (1 teaspoon) of water and a few drops of food coloring.
3. Add 5 mL of the concentrated borax solution to the cup of glue.
4. Mix the mixture for a few minutes, and watch what happens.
5. Now test your play putty for stretching, bouncing, newsprint transfers, and so on. How long will it stretch? How high will it bounce? Record your observations and bring them to class.
6. Store the putty in a plastic zip bag.

**WARNING —** This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

# HOME/SCHOOL CONNECTION

## Investigation 4: Reaching Saturation

You can grow crystals in your home laboratory. Choose one of the approaches described below. Use safe laboratory procedures when working with chemicals.

### Alum or Epsom Salts Crystals

1. Evaporate an alum (or Epsom salts) solution and save the crystals.
2. With an adult, make a supersaturated alum solution by dissolving alum in very hot water (close to boiling) until nothing more will dissolve. Cool the solution. Pour it into a jar.
3. Tie one alum crystal to the end of a thread. This is the seed crystal.
4. Hang the seed crystal in the jar of supersaturated alum solution, and wait several days for the crystal to grow.
5. Remove the crystal, make another supersaturated alum solution, cool it, pour it into the jar, and put the crystal back into the solution. Repeat this process for bigger and bigger crystals.

### Bluing Crystals

| | | | |
|---|---|---|---|
| 1/4 cup | Water | 1 | Plastic cup or jar |
| 2 Tbsp. | Liquid bluing | 4 | Pipe cleaners |
| 2 Tbsp. | Salt | 1 | Small lump of clay |
| 2 Tbsp. | Ammonia (no detergent) | • | Food coloring |

1. With an adult, make a solution with the water, liquid bluing, salt, and ammonia.
2. Place a lump of clay on the bottom of a clear plastic cup or jar. Push four pipe cleaners into the clay. Put food coloring on the tips of the pipe cleaners.
3. Pour the solution into the cup so that it covers the clay and all but 1 cm of the pipe cleaners.
4. Set the cup where it will not be bumped or disturbed. Crystals will start to form in a few hours.

NOTE: The solution may be poured over broken charcoal, sponges, or sections of cardboard tubes instead of clay and pipe cleaners. Whichever material you use, part of it must extend above the surface of the liquid.

# HOME/SCHOOL CONNECTION

## Investigation 5: Fizz Quiz

Baking soda (sodium bicarbonate, $NaHCO_3$) reacts with acid. One of the products is carbon dioxide ($CO_2$). You can use a baking soda solution to test liquids to see if they are acids. If $CO_2$ bubbles form when you mix the two solutions, the liquid probably contains an acid.

### Materials

Baking soda

Tablespoon

Measuring cup

Water

Assorted liquids

Small glass

Spoon

### Directions

1. Put 1 heaping tablespoon of baking soda into a measuring cup.
2. Add water to the 1-cup level. Stir to dissolve the baking soda.
3. Measure a small amount of the baking soda solution into a glass.
4. Add an equal amount of liquid to test. Record your observations.

### Things to try

Fruit juices (particularly citrus)

Vinegar

Vitamin C dissolved in water

Coffee

Soft drinks

NOTE: Students should be supervised by an adult while doing this activity.

| Liquid | Observations |
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