Concepts

Chemicals naturally occur in our food. These chemicals can be used for testing household chemicals or making new chemicals.

Words to know

atom—a very, very small particle that makes up all matter

chemical reaction—when two substances combine to create a new substance; often characterized by fizzing, color change, change in temperature, or reation of light.

dissolve—when the molecules of a solid separate and become completely surrounded by the molecules of a liquid.

fluorescent—glows when light is shined on it

molecule—a group of at least two atoms held together in a definite arrangement.

phosphorescent—glows when light is shined on it and continues to glow after light is removed

photochemistry—chemical reactions that use light

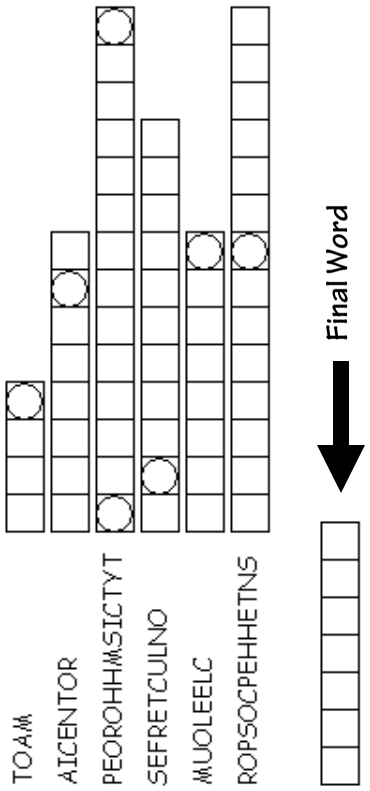
polymer—a large molecule that is made of many smaller molecules linked together

solution—a completely uniform mixture

Circled letters:

1. Unscramble each of the clue words.
2. Write down each of the letters that appear in a circle in the box above.
3. Unscramble these letters to discover the final word.

Unscramble words from the Words to Know list to solve the double puzzle.



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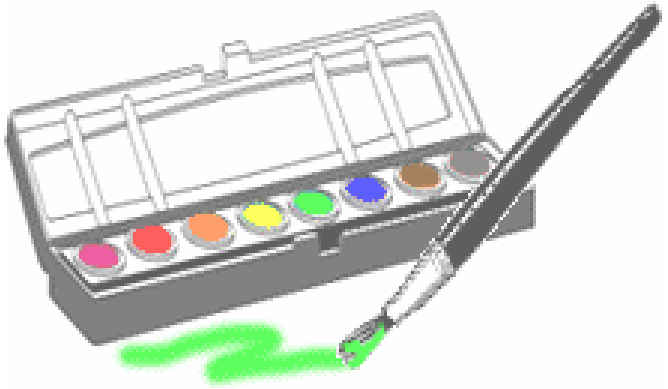
Take-Home Activities



Chemistry of Toys

Invisible Ink

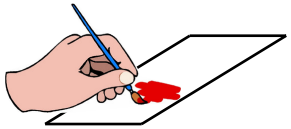
Create your own secret message!

Materials:

lemon juice
one piece of paper
one small brush or cotton swab
an oven (**CAUTION:** This experiment involves a hot oven; adult supervision is required.)

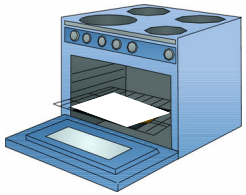
To do and notice:

1. Dip the brush or swab into the lemon juice, and use it to write on the piece of paper. Allow the paper to dry completely (about 15 minutes).
   - **Can you see the writing?**



CAUTION: The following steps involve a hot oven; adult supervision is required.

2. Warm the oven to 350°F



3. Carefully place the paper on a rack in the oven. Close the oven, and cook the paper for 10 minutes.
4. Carefully take the paper out of the oven. Turn off the oven.
   - **Can you see the writing now?**
   - **What does it look like?**

A closer look:

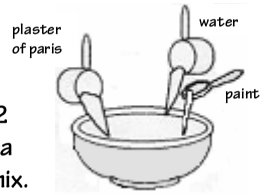
At 350°F, the oven is hot enough to burn the chemicals in the lemon juice, but it is not hot enough to burn the chemicals in the paper. At it burns, the lemon juice combines with oxygen in the air. This causes a brown, scorched appearance on the paper. If the oven were hotter, the paper would also combine with oxygen and burn.

Chalk it Up

Make your own sidewalk chalk!

Materials:

2 tablespoons powdered tempera paint
1 cup plaster of paris
plastic tub (yogurt or margarine container)
old spoon or stick
water
small paper cups
gloves (optional)



To do and notice:

1. Mix 1 cup plaster of paris with 2 tablespoons powdered tempera paint in the bowl. Stir well to mix.
2. Add about ½ cup of water, a little at a time, stirring well after each addition. The mixture should be smooth like thick cake batter.
3. Pour the mixture into the paper cups.
4. Let the cups dry for 1 day
   CAUTION: When cleaning up, do not pour extra plaster of paris into the sink. Throw it away into the trash.

5. When the mixture is completely dry and hard, peel off the paper cups. You have made chalk!
   - **How does your chalk look and feel?**
   - **Can you use your chalk to write on the sidewalk?**
6. Try the procedure again with different colors of paint.

A closer look:

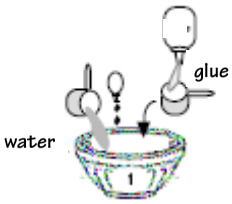
Plaster of paris is made of calcium sulfate ($CaSO_4$). When you add water to the dry plaster, the water molecules bind the calcium sulfate molecules together, forming a hard mass. The paint provides the color for your chalk. This colored solid is scraped off as you write with it.

Calcium sulfate is also used in the manufacture of artificial marble, wall plaster, gypsum sheetrock, and concrete.

Flubber

Make a polymer!

Materials:



Container 1
1/2 cup warm water
2/3 cup glue
food coloring (a few drops)

Container 2
1/3 cup warm water
1 teaspoon borax

To do and notice:

1. Mix the ingredients in each container completely.
   - **What do they look like?**
   - **How are they similar and different?**
2. Pour the contents of container 2 into container 1. Gently stir the mixture, lifting and turning until only about a tablespoon of liquid is left.
   - **What is happening to the two liquids?**
3. The Flubber will be sticky at first. Continue to work with the Flubber until it becomes more firm.
4. Try these experiments with the Flubber.
   - **How far can it be stretched?**
   - **Can it bounce?**
   - **What else can you do with Flubber?**

Helpful Hint
Vinegar dissolves Flubber from clothing, hair, carpet and furniture.

A closer look:

Glue is made from long molecules called polyvinylacetate. It is a **polymer** because it is made of repeating units of smaller molecules. When you add the borax solution, the borate ions from the borax connect to different places on each glue molecule. This forms a network of glue molecules called cross-linking. The cross-linked glue molecules are not as liquid as the regular glue, but they can still stretch apart and stick back together. This forms the thick, sticky substance called Flubber.