



Study guides are available to complement each one of our shows. Every study guide reviews the basic concepts that underline the skills presented, gives a list of relevant vocabulary with definitions, includes a bibliography for further reading, and gives instructions for scientific experiments and educational activities for you to try that demonstrate the principles covered in the show. Here's an activity that demonstrates principles introduced in *The Magic of Chemistry*:

Activity: Color changing glasses TEACHER SUPERVISION ADVISED

Demonstrates: Solutions, Catalyst and Oxidation Reaction

You will need: 3 long stem wineglasses, tap water, a bottle of seltzer water, food coloring and bleach.

Purpose: Make colors magically appear and disappear in the glasses.

Activity:

1. Place 3 wine glasses on a table. Carefully put 1 drop of red food coloring in one glass and a drop of blue in another, before your audience gets there.
2. When your audience arrives, pick up the glass with no food coloring and pour some seltzer water in it. It will be clear.
3. Then pick up glass with food coloring **BY THE STEM**. (This will help hide the food coloring.) Then pour in some seltzer and it will be magically red.
4. Repeat with the blue.
5. Then tell your audience you will now make the colors disappear on the count of 5.
6. Pick up the small bottle that contains bleach, and as you count to 5, slowly pour a little in each glass.
7. The color will disappear.
8. Try the same thing with tap water. You will notice it takes about twice as long for the color to go away.

The color disappears because the oxygen molecules in the bleach bond to those in the colored water. When using seltzer water, the oxygen molecules are more easily accessible from the carbon dioxide (the catalyst) so the oxidation reaction happens faster.

DANGER - REMEMBER. Bleach is dangerous chemical. DO NOT TRY THIS UNLESS AN ADULT IS WITH YOU!!!!!!

Activity: The balloon that blows itself up

Demonstrates: Chemical reaction

You will need: A small vinegar bottle, vinegar, a large balloon, baking soda

Purpose: To blow up a balloon using a chemical reaction

Activity:

1. Fill the little vinegar bottle half -way full of vinegar
2. Put 2 tablespoons of baking soda in a large balloon. (Use a funnel)
3. CAREFULLY stretch the mouth of the balloon over the mouth of the vinegar bottle.
4. DO NOT LET ANY BAKING SODA GET IN THE BOTTLE WHILE YOU DO THIS.
5. Make sure the balloon is securely around the bottle. Hold the balloon on the bottle with your thumb and index finger. DO NOT LET GO.
6. With your other hand, slowly pick up the rest of the balloon that has the baking soda in it and carefully and evenly pour it into the vinegar.
7. The balloon will begin to inflate quickly.

This happens because the molecules in the baking soda and vinegar do not bond evenly. There are leftover molecules, which create a third substance, a gas... CARBON DIOXIDE.

Activity:

Liquid- Solid- Gas

Put an ice cube on a dish. On its own, how fast does it change form to become water? If you add heat (a light bulb, or you can put the ice in a pot on the stove with adult supervision) At what temperature does ice become liquid? Gas? Heat is the **catalyst** (element that speeds up change). At what temperature do other solids become liquid? Try melting butter, chocolate or a candle! The point at which a liquid becomes a gas is called the **boiling point**. What is the boiling point of water? (Ans.: 212 degrees F, 100 degrees C)

Solutions

See how much sugar you can stir into a glass of water before it just won't take any more. The solution becomes much denser. Here's a hint: if you heat the water, it will dissolve much more sugar. This is a **solution**. When no more sugar will dissolve the solution has become **saturated**.

What other powders can dissolve in water? Does the water take more or less than it did sugar?

Drop a bit of food coloring into several glasses of water. Start with only red yellow and blue. See if you can use these 3 to make every color in the rainbow. When you mix all the colors together, they make black. To make the color disappear, add bleach. This is called an **oxidation reaction** Remember to have an adult help you with the bleach. If you get any on your hands, wash them immediately with soap and water and NEVER touch your eyes.

Chemical Reactions

Baking soda is a base. It is the main component of over the counter antacids! Vinegar is an acid. When you combine the two they have create a third thing called Carbon Dioxide. This is called an **Acid-base reaction**. Try it!

Put some baking soda into a balloon. Put vinegar in a bottle with a narrow enough neck so that the balloon can fit over it. Secure the balloon over the top of the bottle then empty the soda into the vinegar. Hold on-- it may fly! Make sure you have an adult help you and clean up after yourself because it makes a BIG mess!

Elements:

Read the back of a vitamin bottle and see how many of the 107 elements you can find. Have your teacher show you the "Periodic table" which will tell you what all the 107 elements are.

VOCABULARY LIST

Chemistry: The study of all substances that make up our world

Atom: The smallest particle of an element

Molecule: The smallest particle of a compound

Nucleus: The center of an atom

Electrons: Tiny particles orbiting around the nucleus of an atom

Protons: Tiny particle inside the nucleus of an atom along with the neutron

Liquid: A state of matter where the bonds between molecules are only medium strong.**Solid:** The state of matter where the bonds of the molecules are the densest and strongest. They move the slowest of the three states.

Gas: The molecules are freely moving around very quickly.

Solution: A mixture of a liquid with something else, like another liquid or a solid

Chemical Reaction: When two elements combine, the molecules do not match up evenly and the left over molecules and produce a third thing.

Static Electricity: an atom's search for its missing electron. The atom without that electron is called an **ION**

Current Electricity: Current is electrons in motion There are 2 kinds of Current electricity; Alternating Current and Direct Current. Alternating current or AC electricity is the type of electricity commonly used in homes and businesses throughout the world. While the flow of electrons through a wire in direct current (DC) electricity is continuous in one direction, the current in AC electricity alternates in direction.

Magnetism: a naturally occurring force of attraction. The magnetic field is composed of electrons in motion. The force both attracts and repels with equal strength.

Compound: a combination of two or more substances where each retains molecular integrity.

Catalyst: Something that makes the molecules move faster and change form faster. Any substance that speeds a chemical reaction without affecting its outcome.

Elements: The simplest possible chemicals, each made up of its own particular kind of atom. There are 118 elements on earth. (As of the time of this study guide. Scientists are constantly working on this and revising the number)

Books to check out

Palder, Edward. Chemistry Magic, Woodbine House inc. Kensington, MD 1987.

Hann, Judith. How Science Works, Reader's digest books, London, 1991.

VanCleave, Janice. 201 Awesome, Magical, Bizarre & Incredible Experiments. John Wiley and Sons, USA. 1994.