ORLANDO SCIENCE CENTER

Discovery Lab Pre-Visit Activities

Advanced ChemLab

Grades 9-12

Thank you for booking your field trip to the Orlando Science Center! As a means of preparing your students for their Discovery Lab and enhancing their experience, we are providing you with these pre-visit materials to share with your class.

Discovery Lab Objective:

Explore and experiment in this hands-on chemistry lab utilizing the SPARK Science Learning System and PASCO probeware technology. Students will separate substances from mixtures, investigate the identity of unknown chemical compounds, and combine chemicals to cause colors to change, temperatures to rise and fall, and solutions to foam and fizz.

Next Generation Sunshine State Standards:

SC.6.N.1.1, SC.6.N.1.4, SC.6.N.1.5, SC.7.N.1.1, SC.8.N.1.1, SC.8.P.8.4, SC.8.P.8.8, SC.8.P.8.9, SC.8.P.9.2, SC.8.P.9.3

Key Vocabulary:

- **Mixture:** the product of a thorough blending of two or more substances, not chemically combined.
- **Solution:** a mixture of two or more substances uniformly dispersed throughout a single phase.
- **Rate of Reaction:** the speed at which reactants are consumed and products are produced in a given reaction.
- **Physical Change:** a reaction; a change in matter from one form to another, without forming new substances.
- **Chemical Change:** a reaction or change in a substance produced by chemical means that results in producing a different chemical.

Key Concepts:

- Mixtures can be separated by various physical properties such as size, magnetism, and static electricity.
- Chemical substances can be classified and compared based on their physical properties, which can be demonstrated or measured.
- Physical changes do not form new substances, while chemical changes produce a different chemical.
- Temperature influences chemical changes.
- Science involves creativity to construct experiments to solve problems.

Discussion Topics:

- The discovery of gold led to interest in chemical processes. Alchemists discovered new chemical processes to create fireworks, medicine, and other useful mixtures and solutions of the time. *What products do chemists create that you use everyday?*
- Mixtures are the product of two substances combined, for instance Chex Mix or salt and pepper in one shaker. A solution is a type of mixture where the substances are uniformly dispersed, like sugar in tea. W*hat are some more examples of mixtures and solutions?*
- When a match burns, it creates smoke and makes a new substance, ash. This is called a chemical change. Ice melting doesn't make a new substance, so it's a physical change. *When do you see chemical or physical changes?*

In Class Activities:

- Signs of a chemical change are change in color, gas production or rust. Rust usually happens from oxidation over a period of time. You can create rust in a short period of time using an acid, vinegar and a metal, steel wool. Pour about half a cup of vinegar into a glass beaker. Tear some pieces off of the steel wool and drop them into the vinegar. Let them soak for about 10 minutes. Use tweezers to remove the wool from the vinegar and place on a paper towel. Observe the rust on the wool. You can also do the same activity with time as your variable and see how time affects the chemical change.
- Mixtures are the product of when two or more substances are combined. A solution is a type of mixture where the substances are evenly distributed. To demonstrate this, get two beakers and fill with 200 mL of water. Have the students hypothesize what will happen if you add salt to one beaker and sand to another. In one beaker, put one teaspoon of sand and stir for 30 seconds, then observe. In the other beaker, put one teaspoon of salt and stir for 30 seconds, then observe. The sand doesn't dissolve in water, and the salt did. The sand/water beaker contains a mixture. The salt is evenly dispersed in the water, so it is a solution. You can set the beakers near the window for about a week and the water will evaporate from both mixtures.
- The pH scale measures the amount of hydrogen ions in a substance. The more hydrogen ions it has, the more acidic the substance is; the more hydroxide ions it has, the more basic the substance is. Determine the pH of common substances by creating an indicator out of cabbage juice. Indicators work by turning a distinctive color in the presence of hydrogen or hydroxide ions. Finely chop one head of red cabbage and add to a boiling pint of water on a saucepan. Take saucepan off the heat and let sit for 30 minutes, then strain the liquid into a jar (discard used cabbage). For every 5 parts of water, add 1 part rubbing alcohol, then refrigerate. The color of the liquid will change as you add acidic substances. To test, pour substance of choice (lemon juice, ammonia, cream of tartar, baking soda, vinegar, milk, etc.) into a small jar, then add one or two drops of cabbage juice indicator. Acids will turn pink, bases will turn green, neutrals will stay the same reddish-purple color.

Additional Resources:

http://www.infoplease.com/chemistry/simlab/#axzz0xWyEEF4g
http://www.chem.ox.ac.uk/vrchemistry/LiveChem/transitionmetals_content.html
http://www.pasco.com/chemistry/experiments/online/index.cfm