

## Radical Reactions (3<sup>rd</sup>-5<sup>th</sup> Grades) Pre-Visit Activities

### Vocabulary List and Student Definitions (elementary level):

- **Atom:** particle of matter; building block of the universe
- **Matter:** the material substance of the universe that has mass and occupies space
- **Chemistry:** area of science that studies matter and the reactions of matter
- **Physical Reaction:** when the appearance of matter changes but the arrangement of atoms remains the same
- **Chemical Reaction:** when the atoms of one or more substances are rearranged, creating a new substance
- **Molecule:** atoms that combine to form small units of matter

### Teacher Background and Supporting Information

#### I. What is Chemistry?

##### a. What is Chemistry?

- i. **Chemistry** is the study of what makes up matter, how matter acts, and what happens when matter changes.
- ii. **Matter** is anything that takes up space and has mass.
- iii. All matter is composed of **atoms**, the building blocks of the universe.
- iv. The states of matter include: *solids, liquids, gases, plasmas, and Bose-Einstein Condensates (BEC)*.

##### b. What are Physical and Chemical Reactions?

- i. A **physical reaction** occurs when the appearance of a substance (matter) is changed (melting ice, boiling water, crumpled piece of paper) but the makeup of the substance, or arrangement of the atoms, remains the same.
- ii. A **chemical reaction** occurs when one or more substances change into a new substance. That is, the bonds between atoms change formation and the atoms are rearranged to create new substances. When chemical reactions occur there is always a change in energy. Sometimes energy is given off and sometimes energy is absorbed (burning a piece of paper).

##### c. Predicting Reactions Analogy

- i. What would your reaction be if I came up to you on a day like today and said boo (in a normal tone of voice)? Would you be scared?
- ii. What if you were lost alone in the woods at night without a flashlight and I came up to you and said boo (in a louder voice)? Would you be scared?
- iii. You just predicted how you would react in different situations. **Chemists** predict how materials or substances react in different situations.

## II. Student Activities:

### a. Recommended Readings:

- i. Chemical Reactions by Louise Spilbury
- ii. Chemistry: Matter and Change by Thandi Buthelezi
- iii. Physics: Why Matter Matters by Dan Green
- iv. Energy Makes Things Happen by Kimberly Bradley

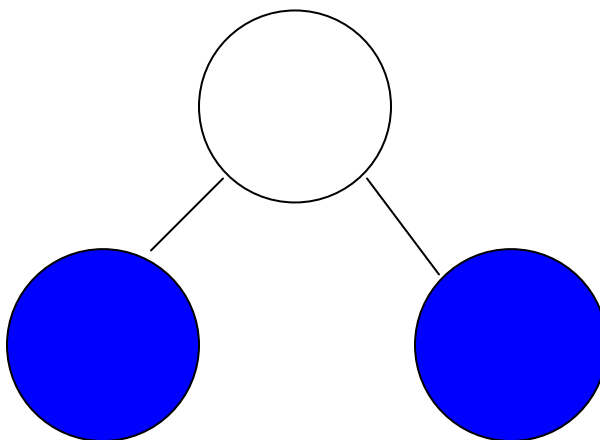
### b. Visit the following website to learn more about each state of matter, physical and chemical reactions, and more.

- i. [http://www.chem4kids.com/files/matter\\_states.html](http://www.chem4kids.com/files/matter_states.html)

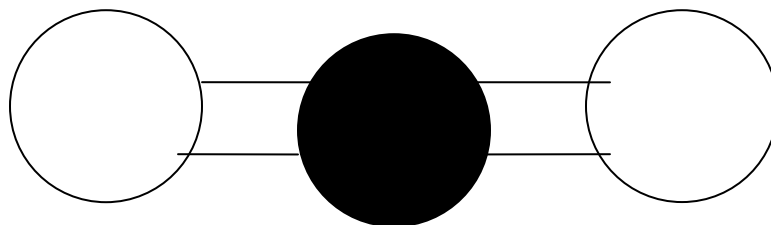
### c. Making Molecules

- i. Provide students with a variety of colored clay or soft candy, such as jelly beans. Each color will represent a specific atom from the Periodic Table of Elements.
- ii. You will want a different color to represent the following:  
Hydrogen = white  
Oxygen = blue  
Carbon = black  
Nitrogen = red
- iii. Provide toothpicks and explain that they represent the bonds that join atoms together. **Atoms** join together to make **molecules**. **Molecules** join together to make **solids, liquids, and gases**.

Example: A **water molecule** will consist of two hydrogen and one oxygen atoms, joined together by two single bonds. The chemical formula is  $H_2O$ .



A **carbon dioxide molecule** will consist of one carbon and two oxygen atoms, joined together by two double bonds. The chemical formula is  $\text{CO}_2$ .



A **caffeine molecule** will consist of eight carbon, ten hydrogen, four nitrogen, and two oxygen atoms, joined by single and double bonds. The chemical formula is  $C_8H_{10}N_4O$ .

