SNC1D
UNIT 2: CHEMISTRY
CHAPTER 4: PROPERTIES OF ELEMENTS & COMPOUNDS

4.3: CHEMICAL PROPERTIES

A **chemical property** describes how a substance **reacts** with another substance in a chemical reaction to form new substances.

Sometimes the most important uses of a substance are from a reaction that it has with something else. For example, when wood burns in air we get fire, which can be beneficial to us if we use it for heat, light, or cooking.

Some examples of **chemical properties** include **how the substance reacts** with **water, air, pure oxygen,** and **acids**. Other chemical properties may include the **combustibility, stability,** and **toxicity.**

REACTIVITY WITH OTHER SUBSTANCES - See Table 4.4 on page 161

- **Reactivity with Water**: most elements and compounds do not react with water, however, some do. For example, calcium carbide reacts with water to produce acetylene gas. Potassium reacts violently with water to release hydrogen gas.

- **Reactivity with Oxygen**: most metals will react in the presence of oxygen to produce a metal oxide. Rusting is a result of the reaction between iron and oxygen to produce iron oxide.

- **Reactivity with Acids**: most metals will react with acids to produce a salt and hydrogen gas.

COMBUSTIBILITY - See page 163

Combustibility or flammability, is the ability of a substance to burn in air. Under ideal conditions and with pure fuels, the only products are carbon dioxide and water; however, in most instances, other products of combustion can include carbon monoxide, sulfur dioxide, nitrogen oxides, and particulate matter. All of these particles can affect human health and are a cause of acid rain.

STABILITY & TOXICITY **- See page 164**

Some examples of chemical properties are summarized in the table below. Fill in the missing information

Summary of Chemical Properties of Matter		
Property	**Definition**	**Example**
Combustibility	How easily a substance burns.	Propane gas is very combustible, water is not.
Reaction with acid	The ability of a substance to react with an acid.	Zinc bubbles when exposed to acid.
Reaction with oxygen		
Reaction with water		
Stability		
Toxicity		
pH	A measure of the acidity or basicity of a substance.	Orange juice is an acid; it has a pH of approximately 3.5. Toothpaste is a base; it has a pH between 8 and 9.

PHYSICAL OR CHEMICAL CHANGE?

There are two different ways that substances can change when they are mixed together:

Physical changes occur when the substance has been changed in some form, yet it remains the same substance chemically. These changes are usually easily reversed. For example, changes of state are physical changes because the substance remains the same, chemically. Water as a solid, liquid, or gas is still H_2O, and the change from one state to another is easily reversed. You could put water in a freezer to change it from a liquid to ice, and simply place the ice on the counter to allow it to melt and change back into a liquid.

Chemical changes result in the original substance being changed to an entirely new substance with different properties. These changes are not reversible. For example, when you burn a log in a fire the log turns to ash and heat, carbon dioxide, and water vapour are all released into the air. When frying an egg, once heat is added, you are not able to get the original egg white and yolk back.

There are **five** clues that indicate a chemical change has taken place:

- **Heat or light is given off.**
- **A colour change occurs.**
- **A precipitate (solid) forms in the mixture of two liquids.**
- **Gas is produced, usually seen as bubbles in a liquid or vapour given off.**
- **The change is difficult or impossible to reverse.**

COMPLETE:

① Activity 4-7: Reaction of calcium metal with water

② Video: http://www.youtube.com/watch?v=i-rFsFwdkTU

REVIEW 4.3

1. Circle the choice that describes a chemical property of hydrogen.
   A. Hydrogen is a gas.
   B. Hydrogen has no colour.
   C. Hydrogen can explode in the presence of air.

2. Complete each sentence.
   a. An example of a gas being produced by a chemical change is when

   b. An example of a gas being produced by a physical change is when

3. Complete the sentence: When an iron horseshoe is left outside it becomes rusty; this is a _____ property of iron.
   physical / chemical

4. Look around your home or school for a container with a chemical warning. Write the name of the chemical. Describe how it is harmful.

5. What is propane? Describe one chemical property of propane that makes it very useful.

6. Rubber tires are very stable. That is, the rubber stays the same for many years.
   Complete the sentence: This is a _____ property of rubber.
   physical / chemical

7. a. Enter the name of one substance that fits in each cell. One example is done for you.

	Toxic	Non-Toxic
Stable		salt
Unstable		

   b. Which of these substances is most dangerous in the environment?