## Unit 2 Learning Outcomes Chem 1010

2A: States of Matter

You should be able to:

- Describe what is happening when dry ice is added to water.
- Describe the physical characteristics of solids, liquids, and gases.
- Explain the difference between what the molecules are doing in a solid, liquid, and gas, including movement, spacing, and organization, and how this explains the physical characteristics of these states.
- Explain how the speed of mixing in solids, liquids and gases gives evidence of the movement of the molecules in these states.
- Draw what the atoms or molecules in solid, liquid, and gas would look like.
- Describe what is happening in each of the changes of state with regard to how the movement, spacing, and organization changes.
- Describe what change of state is occurring in different weather situations.
- Explain what a melting point and and a boiling point are.
- Give the state of matter of a substance if at a certain temperature when given the melting and boiling points.
- Explain why some melting and boiling points are higher than others.

## 2B: Physical, Chemical, and Nuclear Changes

You should be able to:

- Describe the characteristics of a physical change, chemical reaction, and nuclear reaction, and how they are different from each other.
- Judge whether a physical, chemical, or nuclear change is happening by looking at an equation.
- Predict whether energy is absorbed or released in everyday changes, and explain how the amount of energy compares between the three types of changes.
- Interpret what is going on in a change by looking at the equation for it.
- Explain what types of changes are most common.
- List the two most common kinds of physical changes.
- Give the three most common kinds of nuclear changes, and where they occur; identify equations of all three types.
- Give clues that a chemical change is occurring, with examples of each.
- Use clues to determine whether a chemical change is occurring with new examples.
- Explain what it means to balance a chemical reaction, and why they need to be balanced.
- Add coefficients to balance an equation, and recognize equations which have not been correctly balanced.

## 2C: Small Molecules

You should be able to:

- Match the name and formula of small molecules discussed in class with where they are found; for example, ammonia (NH<sub>3</sub>) is found in floor and window cleaning solutions.
- Explain why space filling models are useful, and what information they are missing.
- Explain how electrons are organized in an atom.
- Explain which electrons are involved in chemical bonding
- Determine the number of valence electrons in main group metals and nonmetals.

- Draw correct Lewis structures for main group metals and nonmetals.
- Explain what the octet rule is, and what it is used for.
- Draw correct Lewis structures for small molecules which follow the octet rule and are made of nonmetals.
- Recognize incorrectly drawn Lewis structures.
- Recognize structures which look different but are actually the same molecule.
- Predict the number of H's that would be needed to form a compound with any nonmetal.
- Predict the number of bonds that any nonmetal will form.
- Give the number of electrons involved in single, double, and triple bonds, and which atoms can have these.
- Explain what isomers are, and recognize molecules which are and which are not isomers.
- Recognize molecules which are alcohols, and which are carboxylic acids.
- Identify how many carbon atoms (1-4) are in a molecule based on the parts which are found in their names.
- Categorize molecules as elements or compounds, organic or inorganic, and hydrocarbons or molecules with functional groups, and explain the relative sizes of these categories.

## 2D: The Chemistry of Smell

You should be able to:

- Give the number of smells that humans can detect, and explain why some animals are better at detecting smells than we are.
- Match bananas, wintergreen, cinnamon, vanilla, and lemons with facts about where they come from.
- Explain the process by which we smell things, and why some things don't have a smell.
- Explain how taste and smell are connected, how you can test this, and the two ways that molecules can reach your nose.
- Match names of the 5 molecules we focused on with where they come from.
- Give a definition for hydrocarbons, and recognize Lewis structures or line structures of hydrocarbons.
- Recognize alcohols, carboxylic acid, aldehydes, and esters when given a Lewis or line structure.
- Identify aromatic compounds, and understand the difference between the chemical and everyday meaning of the word.
- Interpret line structures by giving the number of carbon atoms and recognizing functional groups.
- Explain the difference between natural and artificial flavors.