Spanish Fork High School 2014-15
Unit Topics and I Can Statements
Honors Chemistry

Module 1 – I Can:

- Distinguish between elements, compounds, and mixtures
- Summarize the major experimental evidence that led to the development of various atomic models and give the limitations of these models
- Discriminate between the relative size, charge, and position of protons, neutrons, and electrons in the atom
- Generalize the relationship of proton number to the element's identity
- Give the number of protons, neutrons, and electrons in atoms of the same element
- Compare and contrast isotopes of the same element
- Identify the qualitative relationship between wavelength, frequency, color, and energy of a photon
- Calculate the energy, frequency, or wavelength of a photon of light
- Give evidence indicating that energy is absorbed or released in discrete units when electrons move from one energy level to another
- Use emission specta or flame test data to identify an unknown element
- Identify similarities in chemical behavior of elements within a group.
- Generalize trends in reactivity of elements within a group to trends in other groups.
- Compare the properties of elements (e.g., metal, nonmetallic, metalloid) based on their position in the periodic table.

Module 2 – I Can:

- Recognize that radioactive particles and wavelike radiations are products of the decay of an unstable nucleus.
- Interpret graphical data relating half-life and age of a radioactive substance.
- Compare the mass, energy, and penetrating power of alpha, beta, and gamma radiation.
- Write balanced nuclear reactions
- Distinguish between fission and fusion and give applications of each process
- Describe the process through which radiation is detected and measured
- Compare the strong nuclear force to the amount of energy released in a nuclear reaction and contrast it to the amount of energy released in a chemical reaction.
- After researching, evaluate and report the effects of nuclear radiation on humans or other organisms.
- Identify evidence supporting the assumption that matter in the universe has a common origin

- Recognize that all matter in the universe and on earth is composed of the same elements
- Identify the distribution of elements in the universe and compare the occurrence of heavier elements on earth and the universe

Module 3 – I Can:

- Give the correct SI units for measuring mass, temperature, volume, length, etc
- Identify the significant figures in a measurement
- Perform calculations (+-*/), round answer to the correct number of significant figures
- Express values in both scientific and standard notation
- Use the factor-label method to solve problems, including using density
- Construct and interpret appropriate graphs of data, indicating appropriate independent and dependent variables.

Module 4 – I Can:

- Compare covalent, ionic, and metallic bonds with respect to electron behavior and relative bond strengths.
- Generalize, from investigations, the physical properties (e.g., malleability, conductivity, solubility) of substances with different bond types.
- Compare the physical properties of a compound to the elements that form it.
- Compare the chemical properties of a compound to the elements that form it.
- Explain that combining elements in different proportions results in the formation of different compounds with different properties.
- Determine the number of valence electrons in atoms using the periodic table.
- Predict the charge an atom will acquire when it forms an ion by gaining or losing electrons.
- Predict bond types based on the behavior of valence (outermost) electrons.
- Use a chemical formula to represent the names of elements and numbers of atoms in a compound and recognize that the formula is unique to the specific compound.
- Relate the mass and number of atoms to the gram-sized quantities of matter in a mole
- Compare the ionization energy, electron affinity, electronegativity, and radius of atoms and ions accounting for the differences in terms of atomic/ionic structure

Module 5 – I Can:

- Write the name and formula of binary covalent compounds
- Use differences in electronegativities of elements to predict the bond type between two atoms (ionic, nonpolar covalent, polar covalent)
- Draw Lewis structures for molecular compounds
- Given a model, describe the 3d shape and resulting polarity of covalent molecules

- Identify how intermolecular forces of hydrogen bonds in water affect a variety of physical, chemical, and biological phenomena (e.g., surface tension, capillary action, boiling point)
- Identify the intermolecular forces exhibited in a compound (i.e.: London dispersion, dipole-dipole, hydrogen bonding)
- Compare the physical properties of covalent compounds based on the strength of their intermolecular forces

Module 6 – I Can:

- Distinguish between solids, liquids, and gases in terms of their structure, properties, and intermolecular forces
- Classify physical changes (e.g. melting, boiling, condensing, etc) as endothermic or exothermic
- Describe what is meant by the terms boiling point and vapor pressure
- Interpret a phase diagram.

Module 7 – I Can:

- Use the terms solute and solvent in describing a solution.
- Sketch a solution at the particle level.
- Describe the relative amount of solute particles in concentrated and dilute solutions and express concentration in terms of molarity and molality.
- Design and conduct an experiment to determine the factors (e.g., agitation, particle size, temperature) affecting the relative rate of dissolution.
- Relate the concept of parts per million (PPM) to relevant environmental issues found through research.
- Express concentration in terms of percent
- Calculate the concentration of a solution that has been diluted
- Predict the products of precipitate reactions based on solubility of ionic compounds
- Identify the colligative properties of a solution.
- Measure change in boiling and/or freezing point of a solvent when a solute is added.
- Describe how colligative properties affect the behavior of solutions in everyday applications (e.g., road salt, cold packs, antifreeze).

Module 8 – I Can:

- Generalize evidences of chemical reactions
- Compare the properties of reactants to the properties of products in a chemical reaction
- Use a chemical equation to describe a simple chemical reaction.
- Recognize that the number of atoms in a chemical reaction does not change and balance chemical reactions

- Determine the molar proportions of the reactants and products in a balanced chemical reaction.
- Investigate everyday chemical reactions that occur in a student's home (e.g., baking, rusting, bleaching, cleaning)
- Classify a reaction as synthesis, decomposition, single replacement, double replacement, or combustion
- Predict the products of synthesis, decomposition, single replacement, double replacement, or combustion reactions
- Using data from quantitative analysis identify evidence that supports the conservation of mass in a chemical reaction.
- Use molar relationships in a balanced chemical reaction to predict the mass of product produced in a simple chemical reaction that goes to completion.
- Report evidence of energy transformations in a chemical reaction. Using collected data, report the loss or gain of heat energy in a chemical reaction.
- After observing or measuring, classify evidence of temperature change in a chemical reaction as endothermic or exothermic.
- Using either a constructed or a diagrammed electrochemical cell, describe how electrical energy can be produced in a chemical reaction (e.g., half reaction, electron transfer).
- Identify which element was oxidized and which was reduced in an oxidation-reduction reaction
- Design and conduct an investigation of the factors affecting reaction rate and use the findings to generalize the results of other reactions.
- Use information from graphs to draw warranted conclusions about reaction rates.
- Correlate frequency and energy of collisions to reaction rate.
- Identify that catalysts are effective in increasing reaction rates.

Module 9 – I Can:

- Explain the concept of dynamic equilibrium
- Given an equation, identify the effect of adding either product or reactant to a shift in equilibrium
- Indicate the effect of a temperature change on the equilibrium, using an equation showing a heat term
- Relate the concentrations of H^+ and OH^- ions to the equilibrium constant for water, Kw
- Identify Bronsted-Lowry acids and bases and their conjugate pairs
- Identify acids and bases based on their properties
- Write neutralization reaction between acids and bases
- Describe the difference between how strong and weak acids behave in water and identify strong acids
- Relate hydrogen ion concentration to pH values and to the terms acidic, basic or neutral.

- Using an indicator, measure the pH of common household solutions and standard laboratory solutions, and identify them as acids or bases.
- Determine the concentration of an acid or a base using a simple acid-base titration.
- Research and report on the uses of acids and bases in industry, agriculture, medicine, mining, manufacturing, or construction.
- Evaluate mechanisms by which pollutants modify the pH of various environments (e.g., aquatic, atmospheric, soil).

Module 10 – I Can:

- Describe what meant by pressure and how it is measured
- Use Boyle's Law, Charles's Law, Gay-Lussac's Law, and Avogadro's Law to relate the pressure, volume, temperature, and quantity (moles) of a sample of gas, given a change to one of the other variables
- Use the ideal gas law to quantify a sample of gas
- Describe what is meant by the term partial pressure and calculate the partial pressure of a gas in a mixture
- Relate temperature to the kinetic energy and speed of particles in a sample of gas
- Calculate the quantities of gases involved in a chemical reaction based on volume ratios and the ideal gas law.