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 spectra 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.