Course: Chemistry A/B
Curriculum: Time4Learning
Date Reviewed: March 2020

This document addresses the full yearlong course. The following concepts will need to be added to this curriculum. Please work with your HST to identify resources that you will use to address these concepts.

- Complete all labs in the Chemistry Lab Kit/ICS Outline
- Complete Time4Learning Authentic Tasks
- Research and evaluate the advantages of using a digital transmission and storage of information. Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.
- Research and describe how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.

Time4Learning Lessons	Supplements
Chapter 2: Organizing Matter: Patterns Chapter 3: Language of Chemistry Chapter 7: Organic Chemistry	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.
Chapter 2: Organizing Matter: Patterns	● Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. Focus of research is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors. ● Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects, in terms of different types of chemical bonds.

	• Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.
Chapter 2: Organizing Matter: Patterns Chapter 3: Language of Chemistry Chapter 5: Solutions and Their Behavior Chapter 6: Chemical Reactions Chapter 8: Nuclear Chemistry	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.
Chapter 5: Solutions and Their Behavior Chapter 6: Chemical Reactions	• Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. Focus is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved. • Explain using scientific principles and evidence how the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
Chapter 3: Language of Chemistry Chapter 5: Solutions and Their Behavior Chapter 6: Chemical Reactions	• Design a chemical system that illustrates Le Chatlier's Principle, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products. • Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. Emphasis is on the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. • Demonstrate their understanding of the Law of Conservation of Matter by developing their own stoichiometry model, as they balance a chemical equation. This model may be completed by

	using candy, legos, blocks, molly mods or other equivalent item, which will be used to build and represent atoms in the chemical equation. Different colors will represent different atoms. Conservation of atoms in the chemical equation will be shown by having the same number and kinds of atoms on each side of the equation. ● Use mathematical representations and gas laws to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. ● Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include the use of renewable energy forms and efficiency.
Chapter 3: Language of Chemistry Chapter 4: Phases of Matter Chapter 6: Chemical Reactions	● Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. Model is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields. ● Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects). Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations. ● Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.

Chapter 8: Nuclear Chemistry	● Develop a model(s) to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. Model(s) maybe pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations. ● Compare and contrast the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. ● Research and evaluate the validity of how photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.