North Polk Community Schools Pacing & Course Description Guide

Grade Level: 10-11	Content: Chemistry	Year: 2022-2023

Course Description/Rationale

This is an introductory high school chemistry course that incorporates more of the computational understanding associated with chemical knowledge. Topics covered include atomic structure, electron probability, the periodic table and periodic properties, bonding, formulas and names, equations, chemical reactions, the mole and stoichiometry, gasses, solutions, and acids/bases. Many of these topics require strong algebra skills. Laboratory study is designed to enhance understanding of the concepts. Students are encouraged to take this class if they are interested in taking AP Biology, AP Chemistry, Organic Chemistry, and/or DMACC science courses prior to graduation. This course will satisfy North Polk's science requirement and 4-year university admission.

Name of Unit	Time Frame	Essential Learning Target	Standard(s)
Lab Safety	3 Weeks	Students will learn the essentials of lab safety, lab technique, and the correct use of lab equipment prior to conducting lab work.	**Appendix F: Science and Engineering Process**
Search for Life	6 weeks	(1-1) Use periodic trends to predict the relative properties of elements based on patterns of valence electrons. (1-1) Identify patterns in the structure of the periodic table (1-1) Determine the amount of valence electrons of an element (1-1) Identify diatomic elements on the periodic table (1-1) Identify the difference between an element and a compound (1-2) Explain the outcome of a simple chemical reaction based on valence electrons of an atom. (1-2) Explain the outcome of a simple chemical reaction based on trends of the periodic table. (1-2) Explain the outcome of a simple chemical reaction based on patterns of chemical properties. (1-3) Plan an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (1-3) Describe the electrostatic forces between particles (1-3) Observe substances in bulk to make hypotheses concerning the electrostatic forces (2-4) Use mathematical representations of Coulomb's Law to describe the electrostatic forces between	**HS-PS1-1:** 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. **HS-PS1-2:** 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. **HS-PS1-3:** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. **HS-PS2-4.** Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and

		objects. (2-4) Determine the charges of different ions	predict the gravitational and electrostatic forces between objects.
Fuels	8 weeks	(1-4) Develop a model to illustrate that the release of energy from a chemical reaction system depends on changes in total energy. (1-4) Develop a model to illustrate that the absorption of energy from a chemical reaction system depends on changes in total energy. (1-4) Compare the energy released and absorbed in a chemical reaction (1-4) Determine if a reaction is endothermic or exothermic based on total energy (3-5) Develop a model of two objects interacting through electric fields to illustrate the forces between objects. (3-5) Develop a model of two objects interacting through electric fields to illustrate the changes in energy of the objects due to the interaction. (3-5) Represent the protons, neutrons, and electrons of an atom (3-1) Observe patterns of a bond energy table (3-1) Calculate the energy of a reaction when bonds broken and formed are known (3-1) Hypothesize the energy of an unknown component when all other components are known (3-2) Use a model to represent energy at the macroscopic scale can be accounted for as energy associated with the motions of particles. (3-2) Use a model to illustrate that energy at the macroscopic scale can be accounted for as energy associated with the relative position of particles. (3-2) Create representations of solids, liquids, and gasses in order to explain particle speed and positions	**HS-PS1-4:** 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. **HS-PS3-5:** 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. **HS-PS3-1:** 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. **HS-PS3-2.** 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).
Oysters	6 weeks	(1-5) Explain how changing temperature affects the rate at which a reaction occurs. (1-5) Explain how changing concentration of particles affects the rate at which a reaction occurs. (1-6) Model a chemical system approaching equilibrium conditions (1-6) Design a system by changing conditions that would produce an increase in amount of product at equilibrium (1-7) Use a mathematical model to support that atoms are conserved in a chemical reaction	**HS-PS1-5.** Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. **HS-PS1-6.** Refine the design of a chemical system by specifying a change in

		(1-7) Create a balanced chemical equation (1-7) Design an explanation to represent how mass was transferred if a loss is measured	conditions that would produce increased amounts of products at equilibrium.* **HS-PS1-7.** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
Chemistry Skills	2 weeks	(1-2) Explain the outcome of a simple chemical reaction based on valence electrons of an atom. (1-2) Explain the outcome of a simple chemical reaction based on trends of the periodic table. (1-2) Explain the outcome of a simple chemical reaction based on patterns of chemical properties. (1-7) Use a mathematical model to support that atoms are conserved in a chemical reaction (1-7) Create a balanced chemical equation (1-7) Design an explanation to represent how mass was transferred if a loss is measured	(Repeat) **HS-PS1-7.** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. (Repeat) **HS-PS1-2.** 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.
Nuclear	4 weeks	(1-8) Identify different isotopes of an element by representing neutrons, protons, and electrons (1-8) Calculate average atomic mass of a given element and make connections to the periodic table (1-8) Illustrate the energy released in the process of fission (1-8) Illustrate the energy released in the process of fusion (1-8) Illustrate the energy released in the process of radioactive decay (1-8) Explain how atoms can change from one element to another	**HS-PS1-8.** Develop models 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.