Chemistry (4200) Course Overview Curriculum Document

Course Description

Chemistry is the study of matter and its interactions. The analytical laboratory is used extensively as a starting point for topics including but not limited to: atomic theory, periodicity, bonding theory, chemical equations, and measuring and calculating changes in matter. A solid understanding of algebra, including graphing and solving for a variety of variables is needed and will be used daily in the laboratory and coursework. Chemistry provides the student with a knowledge and understanding of chemistry for students who may be pursuing a post high school education in mathematics and/or science-related careers. It is strongly recommended that students who plan to take AP Chemistry take Chemistry 4200. Students who complete Chemistry (4200) cannot take General Chemistry (4190) for credit.

Credits	Prerequisites
1.0	Concurrent with Algebra II (9260) or successful completion (Grade of A or B) of Algebra 1 (9100) **AND** current science teacher recommendation
Board Approved	**Revised**
April 1998	June 2008, June 2019, May 2020, June 2023

Required Assessments

District-wide, standards-based common summative assessments

Textbooks/Resources

Pearson Education (2021). *Experience Chemistry* [Vol. 1 and 2]. Glenview, IL: Pearson, Prentice Hall, and Pearson Prentice Hall Education, Inc.
ISBN: 978-1-4183-2946-4

Course Essential Understandings	Course Relevance Questions
As a result of successfully completing this course, students will understand that: • Matter is neither created nor destroyed in a chemical reaction, the atoms simply re-arrange. • The periodic table is a working arrangement of elements; known and unknown. The position of an element determines its properties. • The structure of a particle affects its properties and interactions with other particles. • Molar quantities can be used to determine amounts of reactants and products in a chemical reaction.	• Why does matter behave the way that it does? • How can we predict and measure the outcome of a chemical reaction?

Unit Overviews

Unit Name	Unit Description	Unit Relevance Question	Instructional Standards	Assessed Standards
Unit 1: Atomic Structure and Periodicity	Students use the periodic table to predict the patterns of behavior of the elements based on the attraction and repulsion between electrically charged particles and the patterns of outermost electrons that determine the typical reactivity of an atom. Students predict the following patterns of properties: 1. Electron configurations of different elements. 2. The arrangement of the main groups of the periodic table reflects the patterns of outermost electrons. 3. Elements in the periodic table are arranged by the numbers of protons in atoms. 4. The trend in reactivity and ionization energy of atoms down a group, and across a row in the periodic table, based on attractions of outermost (valence) electrons to the nucleus; and 5. The relative sizes of atoms both across a period and down a group in the periodic table.	How does the structure of an atom affect its properties?	HS-PS-1-1 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-PS-1-1 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.
Unit 2: Intramolecular versus Intermolecular Forces and Properties of Matter	Students describe the phenomenon under investigation using the relationship between measurable properties of a substance and the strength of the electrical forces between the particles of the substances. Students will describe how the forces between particles affect their physical properties.	How does the structure and arrangement of particles affect the properties of a substance?	PS1-3 Create a model and use evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.	PS1-3 Create a model and use evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles
Unit 3: Chemical Bonding & Chemical Reactions	Students construct an explanation of the outcome of the given reaction, including: 1. The numbers and types of bonds (i.e., ionic, covalent) that each atom forms, as determined by the outermost (valence) electron states and the electronegativity; 2. The outermost (valence) electron state of the atoms that make up both the reactants and the products of the reaction is based on their position in the periodic table; 3. A discussion of how the patterns of attraction allow the prediction of the type of reaction that occurs (e.g., formation of ionic compounds, combustion of hydrocarbons). Students identify and describe the evidence to construct the explanation, including:	What determines how atoms react and bond together?	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-PS1-2 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

	1. Identification of the products and reactants, including their chemical formulas and the arrangement of their outermost (valence) electrons; 2. Identification that the number and types of atoms are the same both before and after a reaction; 3. Identification of the numbers and types of bonds (i.e., ionic, covalent) in both the reactants and the products; 4. The patterns of reactivity (e.g., the high reactivity of alkali metals) at the level as determined by using the periodic table; and 5. The outermost (valence) electron configuration and the relative electronegativity of the atoms that make up both the reactants and the products of the reaction based on their position in the periodic table.			
Unit 4: Moles and Stoichiometry	Students identify and describe the relevant components in the mathematical representations such as 1. Quantities of reactants and products of a chemical reaction in terms of atoms, moles, and mass; 2. Molar mass of all components of the reaction; 3. Use of balanced chemical equation(s); and Identification of the claim that atoms, and therefore mass, are conserved during a chemical reaction. Students will mathematically prove that there is a relationship between the amount of atoms in a substance and the mass. Students will mathematically prove that mass is conserved in a chemical change. Students will determine 1. How much product can be made based on given amounts of reactants 2. Why chemical reactions stop.	How can a chemist determine the amount of product formed in a chemical reaction?	HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction	HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction