Bemidji Area Schools

Grades 11-12 College Chemistry Science Outcomes

Strand	Substrand	Standard "Understand that ...	Benchmark "The student will …	Materials, Activities, Assessments
1. The Nature of Science and Engineering	3. Interactions Among Science, Technology, Engineering, Mathematics, and Society	3. Developments in chemistry affect society and societal concerns affect the field of chemistry.	9C.1.3.3.1 Explain the political, societal, economic and environmental impact of chemical products and technologies. *For example:* Pollution effects, atmospheric changes, petroleum products, material use or waste disposal.	Activity: Each student plans and presents a project on a current topic in chemistry. Explaining the political, societal, economic and environmental impact of the product or technology is a required part of their project.
		4. Physical and mathematical models are used to describe physical systems.	9C.1.3.4.1 Use significant figures and an understanding of accuracy and precision in scientific measurements to determine and express the uncertainty of a result.	Text Chapter 1: Sections: 1.3 How do scientists report numbers? 1.4 How do we make measurements? Activities: Mathematics review. Measurements and Significant Figures lab. Use of Chemical Balances lab. Use of Volumetric Ware and the Determination of Density lab.
2. Physical Science	1. Matter	1. The periodic table illustrates how patterns in the physical and chemical properties of elements are related to atomic structure.	9C.2.1.1.1 Explain the relationship of an element's position on the periodic table to its atomic number and electron configuration.	Text: Chapter 2 Sections: 2.4 What are atoms made of? 2.5 What is the Periodic Table? 2.6 How are the electrons arranged? 2.7 How are electron configuration and position in the Periodic Table related? Activities: Chromatically Tinted Periodic Tables, electron configuration, orbital notation and Lewis structure practice
			9C.2.1.1.2 Identify and compare trends on the periodic table, including reactivity and relative sizes of atoms and ions; use the trends to explain the properties of subgroups, including metals, non-metals, alkali metals, alkaline earth metals, halogens and noble gases.	Text: Chapter 2 Sections: 2.2 How do we classify matter? 2.5 What is the Periodic Table? 2.6 How are the electrons arranged? 2.7 How are electron configuration and position in the Periodic Table related? 2.8 What is a periodic property? Activities: Periodic Table activity, Periodic Table video
		2. Chemical and physical properties of matter result from the ability of atoms to form bonds.	9C.2.1.2.1 Explain how elements combine to form compounds through ionic and covalent bonding.	Text: Chapter 3 Sections: 3.4 What are two major types of chemical bonds? 3.5 What is an ionic bond? 3.7 What is a covalent bond? Activity: Chemical Bonding video
			9C.2.1.2.2 Explain how elements combine to form compounds through ionic and covalent bonding.	Text: Chapter 3 Sections: 3.4 What are two major types of chemical bonds? 3.5 What is an ionic bond? 3.7 What is a covalent bond? Activity: Chemical Bonding video

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2. Physical Science	1. Matter	2. Chemical and physical properties of matter result from the ability of atoms to form bonds.	9C.2.1.2.3 Use IUPAC (International Union of Pure and Applied Chemistry) nomenclature to write chemical formulas and name molecular and ionic compounds, including those that contain polyatomic ions.	Text Chapter 3: Sections: 3.6 How do we name ionic compounds? 3.8 How do we name binary covalent compounds? Activity: Naming and formula writing I and II practice. Ions to Learn reference sheet.
			9C.2.1.2.4 Determine the molar mass of a compound from its chemical formula and a table of atomic masses; convert the mass of a molecular substance to moles, number of particles, or volume of gas at standard temperature and pressure.	Text Chapter 4: Sections: 4.5 What are formula weights, molecular weights, and molar masses? 4.6 What is a mole and how do we use it to calculate mass relationships? 4.7 How do we calculate mass relationships in chemical reactions? Text Chapter 5: Sections: 5.2 What is gas pressure and how do we measure it? 5.3 What are the laws that govern the behavior of gases? 5.4 What are Avogadro's Law and the Ideal Gas Law? 5.5 What is Dalton's Law of Partial Pressures? Materials: Formula, molecular and molar mass practice problems, Gas Laws practice problems, Molar volume of gas lab.
			9C.2.1.2.5 Determine percent composition, empirical formulas and molecular formulas of simple compounds.	Text: None Materials: Percent composition and determining empirical formulas practice, determining molecular formulas and hydrate formulas practice. Formula of a copper sulfide lab, formula of a hydrate lab.
			9C.2.1.2.6 Describe the dynamic process by which solutes dissolve in solvents, and calculate concentrations, including percent concentration, molarity and parts per million.	Text Chapter 6: Sections: 6.2 What are the most common types of solutions? 6.3 What are the distinguishing characteristics of solutions? 6.4 What factors affect solubility? 6.5 What are the most common units for concentration? Materials: Molarity practice problems and colligative properties labs
			9C.2.1.2.7 Explain the role of solubility of solids, liquids and gases in natural and designed systems. *For example:* The presence of heavy metals in water and the atmosphere. *Another example:* Development and use of alloys.	Text Chapter 5: Chemical Connections: Breathing and Boyle's Law, hyperbaric medicine, supercritical carbon dioxide. Text Chapter 6: Chemical Connections: Acid rain, the bends, electrolyte solution in body and intravenous fluids, hydrates and air pollution, hemodialysis.

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2. Physical Science	1. Matter	3. Chemical reactions describe a chemical change in which one or more reactants are transformed into one or more products.	9C.2.1.3.1 Classify chemical reactions as double replacement, single replacement, synthesis, decomposition or combustion.	Text: None Activities: Types of chemical reactions topic notes and practice. Classification of Chemical Reactions lab.
			9C.2.1.3.2 Use solubility and activity of ions to determine whether a double replacement or single replacement reaction will occur.	Text Chapter 4: Section: 4.3 How can we predict if ions in aqueous solution will react with each other? Activities: Use of solubility table and reactivity series to do: a. Types of reactions practice b. Qualitative Analysis labs
			9C.2.1.3.3 Relate the properties of acids and bases to the ions they contain and predict the products of an acid-base reaction.	Text Chapter 8: Sections: 8.1 What are acids and bases? 8.2 How do we define the strength of acids and bases? 8.3 What are conjugate acid-base pairs? 8.6 What are the properties of acids and bases? 8.8 What are pH and pOH? 8.9 How do we use titrations to calculate concentrations? Activities: Properties of Acids and Bases lab. Acid Base Titration lab. Analysis of Vinegar lab
			9C.2.1.3.4 Balance chemical equations by applying the laws of conservation of mass and constant composition.	Text Chapter 4: Sections: 4.1 What is a chemical reaction? 4.2 How do we balance chemical equations? Activities: Balancing equations practice and quiz, Moles to Coefficients lab, Formula of a Copper Sulfide lab. Types of reaction practice. Qualitative Analysis labs.

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2. Physical Science	1. Matter	3. Chemical reactions describe a chemical change in which one or more reactants are transformed into one or more products.	9C.2.1.3.5 Use the law of conservation of mass to describe and calculate relationships in a chemical reaction, including molarity, mole/mass relationships, mass/volume relations, limiting reactants and percent yield.	Text Chapter 4: Sections: 4.5 What are formula weights, and molecular weights? 4.6 What is a mole and how do we use it to calculate mass relationships? 4.7 How do we calculate mass relationships in chemical reactions? Text Chapter 5: Sections: 5.3 What are the laws that govern the behavior of gases? 5.4 What are Avogadro's Law and the Ideal Gas Law? 5.5 What is Dalton's Law of Partial Pressures? Text Chapter 6: Section: 6.5 What are the most common units for concentration? Activities: Formula and Molar mass practice. Determining empirical formulas from percent composition. Determining molecular formulas and hydrate formulas, limiting reactant practice. Moles to Coefficients lab, Formula of a Copper Sulfide lab, Formula of a Hydrate lab, Molar Volume of a Gas lab.
			9C.2.1.3.6 Describe the factors that affect the rate of a chemical reaction, including temperature, pressure, mixing, concentration, particle size, surface area and catalyst.	Text Chapter 6: Sections: 6.2 What are the most common types of solutions? 6.3 What are the distinguishing characteristics of solutions? 6.4 What factors affect solubility? Text Chapter 7: Sections: 7.? How do we measure reaction rates? 7.4 How can we change the rate of a chemical reaction? Activities: Rate of Solution lab. Reaction Rates and Equilibrium lab.

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2. Physical Science	1. Matter	3. Chemical reactions describe a chemical change in which one or more reactants are transformed into one or more products.	9C.2.1.3.7 Recognize that some chemical reactions are reversible and that not all chemical reactions go to completion.	Text Chapter 7: Section: 7.5 What does it mean to say that a reaction has reached equilibrium? 7.6 What is an equilibrium constant and how do we use it? 7.7 What is Le Chatelier's principle? Text Chapter 8: How can we tell the position of equilibrium in an Acid-Base Reaction? 8.10 What are buffers? 8.11 How do we calculate the pH of a buffer? Activities: Chapter 7 and 8 problem sets. Reaction Rates and Equilibrium lab
		4. States of matter can be described in terms of motion of molecules and that the properties and behavior of gases can be explained using the kinetic molecular theory.	9C.2.1.4.1 Use kinetic molecular theory to explain how changes in energy content affect the state of matter (solid, liquid and gaseous phases).	Text Chapter 5: Sections: 5.1 What are the states of matter? 5.6 What is the Kinetic Molecular theory? 5.7 What types of attractive forces exist between molecules? 5.8 How do we describe the behavior of liquids at the molecular level? 5.9 What are the characteristics of the various types of solids? 5.10 What is a phase change and what energies are involved? Activities: Phase Change lab and end of chapter activities.
			9C.2.1.4.2 Use the kinetic molecular theory to explain the behavior of gases and the relationship among temperature, pressure, volume and the number of particles.	Text Chapter 5: Sections: 5.2 What is gas pressure and how do we measure it? 5.3 What are the laws that govern the behavior of gases? 5.4 What are Avogadro's Law and the Ideal Gas Law? 5.5 What is Dalton's Law of Partial Pressures? Activities: Various gas laws practice problems and the Molar Volume of Gas lab.