

Bemidji Area Schools

Grades 10-12 General Chemistry Science Outcomes

Strand	Substrand	Standard "Understand that ...	Benchmark "The student will ...	Activity
1. The Nature of Science and Engineering	3. Interactions Among Science, Technology, Engineering, Mathematics, and Society	4. Science, technology, engineering, and mathematics rely on each other to enhance knowledge and understanding.	9.1.3.4.5 Demonstrate how unit consistency and dimensional analysis can guide the calculation of quantitative solutions and verification of results.	Unit O: Metric to English conversions Supplement unit: Stoichiometry and Types of Reactions Lab: PIAT, recycling of copper Gas Law problem packet: <u>Avogadro's Law</u>
		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. <i>For example:</i> Pollution effects, atmospheric changes, petroleum products, material use or waste disposal.	Unit 1: Materials PIAT: Brochure project about the use of coins vs. bills Unit 3: Petroleum PIAT: Creating a commercial for an alternative fuel car Unit 4: Role play a town council meeting: <u>Riverwood Fish Kill</u>
		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.	Unit O: Metric conversions Lab: Accuracy and Precision of Beakers Ongoing during any type of quantitative lab measurements or problem worksheets.
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.	Unit 1 Materials part B: Medeleev activity (grouping elements) Tour of the Periodic Table Periodic Table quiz Making Atomic Models
		1. The periodic table illustrates how patterns in the physical and chemical properties of elements are related to atomic structure.	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.	Unit 1 Materials part B: Graphing trends in properties Lab: Metal Reactivities Lab: Metal/Non-Metal Lab: Halogens
		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.	Unit 1: Materials part B: Naming and formulas for ionic compounds Activity: Naming ionic compounds Unit 3: Petroleum part A: Covalent Bonding Activity: Electron dot structures

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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.2.1.2.2 Compare and contrast the structure, properties and uses of organic compounds, such as hydrocarbons, alcohols, sugars, fats and proteins.	Unit 3: Petroleum part A and B: Labs: Modeling Alkanes, Polymer Structures, Other Builder molecules
		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.	Unit 1: Materials part B: Naming and formulas for ionic compounds Activity: Naming ionic compounds Unit 3: Petroleum part A: Covalent Bonding and naming organic molecules
		2. Chemical and physical properties of matter result from the ability of atoms to form bonds.	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.	Unit 1: Materials part C: Finding Molar Mass Unit 2: Air part B: Avagadro's Law and Ideal Gas Law (done as a mini unit: Gas Laws)
		2. Chemical and physical properties of matter result from the ability of atoms to form bonds.	9C.2.1.2.5 Determine percent composition, empirical formulas and molecular formulas of simple compounds.	Unit 1: Materials part C: Percent composition of metals in ore Lab: Percent cu in a penny (extracting zinc) Unit 3: Petroleum B: Naming molecules and finding empirical formulas
		2. Chemical and physical properties of matter result from the ability of atoms to form bonds.	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.	Unit 4: Water part B: Describing Solution Concentration Lab: Solution Concentration
		2. Chemical and physical properties of matter result from the ability of atoms to form bonds.	9C.2.1.2.7 Explain the role of solubility of solids, liquids and gases in natural and designed systems. <i>For example:</i> The presence of heavy metals in water and the atmosphere. <i>Another example:</i> Development and use of alloys.	Unit 1: Materials part D: Lab: Striking it Rich (making an alloy) Unit 4: Water part B: Lab: Solvents Lab: How much CO ₂ in soda
		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.	Supplement Unit: Stoichiometry and Types of Reactions Lab: Types of Reactions Activity: Balance and give type of reaction worksheet

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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.2.1.3.2 Use solubility and activity of ions to determine whether a double replacement or single replacement reaction will occur.	Supplement Unit: Stoichiometry and Types of Reactions Lab: Types of Reactions Unit 4: Water part C: Reactions in solutions Lab: Water testing Lab: Combining Solutions
			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.	Unit 4: Water part C: Reactions in solutions Lab: Antacids Lab: Titration for HCl
			9C.2.1.3.4 Balance chemical equations by applying the laws of conservation of mass and constant composition.	Unit 1: Materials: Lab: Reactivity of Metals Supplement Unit: Stoichiometry and Types of Reactions Lab: Types of Reactions Activity: Balance and give type of reaction worksheet
			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.	Supplement Unit: Stoichiometry and Types of Reactions Lab: PIAT: Recycling of copper
			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.	Unit 4: Water part B Lab: How much CO ₂ in soda Lab: Speed of Alka Seltzer
			9C.2.1.3.7 Recognize that some chemical reactions are reversible and that not all chemical reactions go to completion.	Unit 2: Air part C: Le Chatalier's Principle Lab: p. 532-4 Unit 3: Petroleum part C: Combustion reactions in vehicles

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2. Physical Science	1. Matter	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).	Unit 2: Air part B: Activity: Modeling the kinetic theory of molecular motion Lab: Phase Changes Demo: Distillation of a Mixture
			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.	Unit 2: Air part B: Pressure of School Books demo; Can Crusher demo