

South Hadley Public Schools

Subject: Standard Chemistry

School: High School

Big Idea/Essential Question: What is this stuff?				
Standards	South Hadley Learning Expectations	Skills	Assessments	Content
<p>1.1 Identify and explain some of the physical properties that are used to classify matter, e.g., density, melting point, and boiling point.</p> <p>1.2 Explain the difference between mixtures and pure substances.</p> <p>1.3 Describe the four states of matter (solid, liquid, gas, plasma) in terms of energy, particle motion, and phase transitions.</p> <p>1.4 Distinguish between chemical and physical changes.</p>	<p>LE 1: Read, write, and communicate effectively.</p> <p>LE 2: Define, analyze, and solve complex problems and communicate results.</p> <p>LE 3: Study and work productively both independently and in groups.</p> <p>LE 4: Demonstrate personal, social, and civic responsibility.</p> <p>LE 5: Acquire, apply, integrate, analyze, and synthesize knowledge.</p> <p>LE 8: Identify and apply appropriate technologies.</p>	<p>1. Measure the density of given objects.</p> <p>2. Identify substances by their characteristic density, melting point, and boiling point.</p> <p>3. Identify a pure substance and mixture by their properties.</p> <p>4. Employ appropriate separatory techniques to a mixture.</p> <p>5. Distinguish between physical and chemical changes by observation and description.</p>	<p>1. lab - Measure the density of 10 substances.</p> <p>2. lab - Identify the metal inside a “new “ penny.</p> <p>3. lab - make a cooling curve for a pure substance and a mixture.</p> <p>4. lab - separate a mixture into pure substances</p> <p>5. lab - physical or chemical change.</p> <p>6. Unit 1 test</p>	<p>text section 7-1</p> <p>demo - density layers</p> <p>demo - density of Coke</p> <p>demo - filter OJ</p> <p>demo - distill Coke</p> <p>demo - electrolysis of water</p> <p>demo - melting metals</p> <p>demo - can crush</p> <p>demo - vacuum chamber fun</p> <p>text section 2-3, 2-4, 2-5</p>

Big Idea/Essential Question: What is this stuff made of?

Standards	South Hadley Learning Expectations	Skills	Assessments	Content
<p>2.2 Interpret Dalton's atomic theory terms of the Law of Conservation of Mass, Constant Composition, and Multiple Proportions.</p> <p>2.3 Identify the major components of the nuclear atom (protons, neutrons, and electrons) and explain how they interact.</p> <p>2.9 Compare nuclear fission and nuclear fusion and mass defect.</p> <p>2.10 Describe the process of radioactive decay as the spontaneous breakdown of certain unstable elements (radioactive) into new elements (radioactive or not) through the spontaneous emission by the nucleus of alpha or beta particles. Explain the difference between stable and unstable isotopes.</p>	<p>LE 1: Read, write, and communicate effectively.</p> <p>LE 2: Define, analyze, and solve complex problems and communicate results.</p> <p>LE 3: Study and work productively both independently and in groups.</p> <p>LE 4: Demonstrate personal, social, and civic responsibility.</p> <p>LE 5: Acquire, apply, integrate, analyze, and synthesize knowledge.</p> <p>LE 8: Identify and apply appropriate technologies.</p>	<ol style="list-style-type: none"> 1. Apply conservation of mass to chemical reactions.. 2. Determine the percent composition of compounds. 3. Determine the number of protons, neutron, and electrons in any isotope or any ion. 4. Describe and diagram the arrangement of particles in the atom. 5. Describe the reactions of nuclear fission and fusion. 6. Describe the dangers and benefits of nuclear radiation. 	<ol style="list-style-type: none"> 1. lab - constant composition of magnesium oxide. 2. lab - percent composition of magnesium chloride. 3. Your name in atoms. 4. Your name in ions. 5. research - uses of radiation. 6. lab - conservation of mass in a chemical reaction. 7. lab - determine the mass of each product of a chemical reaction. 8. unit 2 test 	<p>demo - reactions of the balance.</p> <p>text section 3-3, 3-4</p> <p>text section 24-2, 24-3</p> <p>video - Back to Chernobyl</p>

Big Idea/Essential Question: Is there any pattern to the stuff of this world?

Standards	South Hadley Learning Expectations	Skills	Assessments	Content
<p>3.1 Explain the relationship of an elements position on the periodic table to its atomic number and mass.</p> <p>3.2 Use the periodic table to identify metals, nonmetals, metalloids, families (groups), periods, valence electrons, and reactivity with other elements in the table.</p> <p>3.3 Relate the position of an element on the periodic table to its electron configuration.</p> <p>3.4 Identify trends on the periodic table (ionization energy, electronegativity, electron affinity, and relative size of atoms and ions).</p>	<p>LE 1: Read, write, and communicate effectively.</p> <p>LE 2: Define, analyze, and solve complex problems and communicate results.</p> <p>LE 3: Study and work productively both independently and in groups.</p> <p>LE 4: Demonstrate personal, social, and civic responsibility.</p> <p>LE 5: Acquire, apply, integrate, analyze, and synthesize knowledge.</p> <p>LE 8: Identify and apply appropriate technologies.</p>	<p>1. Be able to read the periodic table in terms of groups, periods, metals, nonmetals, metalloids, group names, atom composition, mass, valence electrons, and general reactivity.</p> <p>2. Describe trends in the periodic table such as atom size, ion size, ionization energy, and electron affinity.</p>	<p>1. your name with the periodic table.</p> <p>2. lab - order of metallic character by properties.</p> <p>3. lab - measure the electrical conductivity of metals.</p> <p>4. lab - measure the thermal conductivity of metals.</p> <p>5. unit 3 test</p>	<p>Text sections 5-2, 5-3</p>

Big Idea/Essential Question: What would this stuff look like if my eyes could see the atoms?

Standards	South Hadley Learning Expectations	Skills	Assessments	Content
<p>4.1 Explain how atoms combine to form compounds through both ionic and covalent bonding.</p> <p>4.2 Draw Lewis dot structures for simple molecules.</p> <p>4.6 Predict chemical formulas based on the number of valence electrons.</p> <p>4.7 Name and write the chemical formulas for simple ionic and molecular compounds, including those that contain common polyatomic ions.</p>	<p>LE 1: Read, write, and communicate effectively.</p> <p>LE 2: Define, analyze, and solve complex problems and communicate results.</p> <p>LE 3: Study and work productively both independently and in groups.</p> <p>LE 4: Demonstrate personal, social, and civic responsibility.</p> <p>LE 5: Acquire, apply, integrate, analyze, and synthesize knowledge.</p>	<ol style="list-style-type: none"> 1. Draw the Lewis dot diagram for elements. 2. Determine if a compound has ionic or covalent bonding by formula and properties. 3. Draw the Lewis structures that describe ionic bonding between monatomic ions. 4. Write the name and formula for ionic compounds involving monatomic and polyatomic ions. 5. Draw the Lewis structure for small covalently bonded molecules. 6. Write the name and formula for small covalently bonded molecules. 	<ol style="list-style-type: none"> 1. Lewis structures drawn on a blank periodic table. 2. lab - Determine if these substance have ionic or covalent bonding. 3. lab - empirical formula for zinc chloride. 4. unit 4 test 	<p>text section 7-1, 7-2, 7-3</p>

Big Idea/Essential Question: What can I make from this stuff, and how much?

Standard(s)	South Hadley Learning Expectations	Skills	Assessment	Content
<p>5.1 Balance chemical equations by applying the Law of Conservation of Mass.</p> <p>5.2 Recognize synthesis, decomposition, single displacement, double displacement, and neutralization reactions.</p> <p>5.3 Understand the mole concept in terms of number of particles, mass, and gas volume.</p> <p>5.4 Determine molar mass, percent composition, empirical formulas, and molecular formulas.</p> <p>5.5 Calculate mass-mass, mass-volume, volume-volume, and limiting reagent problems for chemical reactions.</p>	<p>LE 1: Read, write, and communicate effectively.</p> <p>LE 2: Define, analyze, and solve complex problems and communicate results.</p> <p>LE 3: Study and work productively both independently and in groups.</p> <p>LE 4: Demonstrate personal, social, and civic responsibility.</p> <p>LE 5: Acquire, apply, integrate, analyze, and synthesize knowledge.</p>	<ol style="list-style-type: none"> Write word equations for a chemical change using correct nomenclature. Translate word equations into unbalanced formula equations. Use coefficients to balance chemical equations. Identify the type of a chemical reaction based on the formulas for reactants and products. Determine the molar mass of elements and compounds. Convert between mass and moles for elements and compounds. Convert between moles and mass for gases at standard temperature and pressure. Solve stoichiometry problems to predict the amount of product made, or the amount of reactant used. 	<ol style="list-style-type: none"> lab - balanced chemical equations for six reactions. lab - decomposition of a carbonate. unit 5 - test I lab - counting rice by mass. lab - moles and mass of elements. lab - moles and mass of compounds. lab - mole ratio between iron and copper in a chemical reaction. lab - predict the amount of salt that will be made in a chemical reaction. lab - predict the volume of hydrogen gas that will be made in a chemical reaction. lab - determine the amount of hydrogen peroxide in a store bought solution. unit 5 - test II 	<p>text section 9-2, 9-3</p> <p>text section 10-1, 10-2</p> <p>text sections 11-1, 11-2</p>

Big Idea/Essential Question: I am a bottom dweller in a ocean of gas. What is this stuff that I am living in?

Standards	South Hadley Learning Expectations	Skills	Assessments	Content
<p>6.1 Using the kinetic molecular theory, explain the relationship between pressure and volume (Boyle's Law), volume and temperature (Charles' Law), and the number of particles in a gas sample (Avogadro's hypothesis).</p> <p>6.2 Explain the relationship between temperature and average kinetic energy.</p> <p>6.3 Perform calculations using the ideal gas law</p> <p>6.6 Use the combined gas law to determine changes in pressure, volume, and temperature.</p>	<p>LE 1: Read, write, and communicate effectively.</p> <p>LE 2: Define, analyze, and solve complex problems and communicate results.</p> <p>LE 3: Study and work productively both independently and in groups.</p> <p>LE 4: Demonstrate personal, social, and civic responsibility.</p> <p>LE 5: Acquire, apply, integrate, analyze, and synthesize knowledge.</p> <p>LE 8: Identify and apply appropriate technologies.</p>	<p>1. Draw a representation of the particles in a gas and explain the difference in their arrangement and motion from solids and liquids.</p> <p>2. Identify volume, temperature, and pressure as the key gas variables to determining the amount of a gas sample.</p> <p>3. Qualitatively and quantitatively describe the effect on a gas sample when the volume, temperature, or pressure is changed.</p> <p>4. Apply the ideal gas law in appropriate situations and solve for any variable.</p>	<p>1. lab - predict the value of absolute zero.</p> <p>2. lab - predict the amount of reactants necessary to make a bagful of gas.</p> <p>3. lab - measure the effect of changing temperature on gas pressure.</p> <p>4. lab - determine the molar mass of butane.</p> <p>5. unit 6 test</p>	<p>text section 13-1, 13-2, 13-3, 13-4</p> <p>demo - cold and hot balloons</p> <p>demo - exploding zip-locks</p> <p>demo - heat and pressure</p> <p>demo - heavy and light bubbles</p> <p>demo - barometer and manometer</p>

Big Idea/Essential Question: How do I know that a solution is a mixture if I can no longer see the stuff that is dissolved?

Standards	South Hadley Learning Expectations	Skills	Assessments	Content
<p>7.1 Describe the process by which solutes dissolve in solvents.</p> <p>7.2 Identify and explain the factors that affect the rate of dissolving (i.e., temperature, concentration, and mixing).</p> <p>7.4 Calculate concentration in terms of molarity, molality, and percent by mass.</p> <p>7.5 Use a solubility curve to determine saturation values at different temperatures.</p>	<p>LE 1: Read, write, and communicate effectively.</p> <p>LE 2: Define, analyze, and solve complex problems and communicate results.</p> <p>LE 3: Study and work productively both independently and in groups.</p> <p>LE 4: Demonstrate personal, social, and civic responsibility.</p> <p>LE 5: Acquire, apply, integrate, analyze, and synthesize knowledge.</p> <p>LE 8: Identify and apply appropriate technologies.</p>	<ol style="list-style-type: none"> 1. Identify a solution by its characteristic properties. 2. Identify the solvent and solutes in a solution. 3. Determine the concentration of a solution in terms of percent by mass and molarity. 4. Identify and describe the factors that affect the rate of dissolving a solute into a solvent. 5. Make and read solubility curves in terms of unsaturated, saturated, and super saturated solutions at various temperatures. 	<ol style="list-style-type: none"> 1. lab - Make solutions to desired molarities and percent concentrations. 2. lab - Determine the molarity and percent concentration of a given solution. 3. lab - make a solubility curve for a mystery compound. 4. lab - evaluate the factors that affect the rate of dissolving of copper(II) sulfate. 5. lab - evaluate the performance, cost, and toxicity of compounds for use in a commercial cold pack 6. unit 7 test 	<p>text section 15-1, 15-2, 15-3</p> <p>demo - solubility and electrolytes</p> <p>demo - super saturated solution</p> <p>solubility curve worksheet</p>

Big Idea/Essential Question: Are bases really the opposite of acids?

Standards	South Hadley Learning Expectations	Skills	Assessments	Content
<p>8.1 Define Arrhenius' theory of acids and bases in terms of the presence of hydronium and hydroxide ions, and Bronsted's theory of acids and bases in terms of proton donor and acceptor, and relate their concentrations to the pH scale.</p> <p>8.4 Explain how indicators are used in titrations and how they are selected.</p> <p>8.5 Describe an acid-base titration. Identify when the equivalence point is reached and its significance.</p>	<p>LE 1: Read, write, and communicate effectively.</p> <p>LE 2: Define, analyze, and solve complex problems and communicate results.</p> <p>LE 3: Study and work productively both independently and in groups.</p> <p>LE 4: Demonstrate personal, social, and civic responsibility.</p> <p>LE 5: Acquire, apply, integrate, analyze, and synthesize knowledge.</p>	<p>1. Identify acids and bases by their ability to produce the hydronium and hydroxide ions respectively when in aqueous solution.</p> <p>2. Apply the pH scale to acidic and basic solutions.</p> <p>3. Perform acid-base titrations to the equivalence point to determine the acidity or basicity of a solution.</p> <p>4. Understand the role of indicators in acid-base titrations.</p>	<p>1. demo - common solutions and their pH</p> <p>2. lab - which is the best antacid</p> <p>3. lab - which aspirin tablet has the most active ingredient</p>	<p>Text sections: 18-1, 19-1, 19-3</p>

Big Idea/Essential Question: If this stuff is supposed to react, why is it taking so long?

Standards	South Hadley Learning Expectations	Skills	Assessments	Content
9.3 Identify the factors that affect the rate of a chemical reaction (temperature, concentration) and the factors that can cause a shift in equilibrium (concentration, pressure, volume, temperature).	LE 1: Read, write, and communicate effectively. LE 2: Define, analyze, and solve complex problems and communicate results. LE 3: Study and work productively both independently and in groups. LE 4: Demonstrate personal, social, and civic responsibility. LE 5: Acquire, apply, integrate, analyze, and synthesize knowledge. LE 8: Identify and apply appropriate technologies.	1. Identify and apply the factors that can make a reaction proceed at a faster or slower rate as desired.	1. lab - changing the rate of a reaction.	text section 22-3