Science
Chemistry: Honors
Unit 4: Solution Equilibrium

Essential Understandings	▪ Solutions can be combined to generate a variety of chemical reactions, the rates of which can be measured in a number of ways, depending on the nature of the reaction.
Essential Questions	▪ What are the factors that determine reaction rates? ▪ How can spontaneous reactions be predicted? ▪ How can a reversible chemical reaction be explained? ▪ How can the direction of a reversible chemical reaction be modified? ▪ How do we describe the role of acids and bases in aqueous solutions?
Essential Knowledge	▪ Various factors can influence rates of chemical reactions. ▪ The rate and/or direction of reversible chemical reactions can be modified.

Science
Chemistry: Honors
Unit 4: Solution Equilibrium

Vocabulary	▪ Terms: ○ Aqueous solution, Brownian motion, colloid, deliquescent, desiccant, effloresce, electrolyte, emulsion, hygroscopic, nonelectrolyte, solute, solvation, solvent, strong electrolyte, surface tension, surfactant, suspension, Tyndall effect, water of hydration, weak electrolyte, boiling point elevation, colligative property, concentrated solution, concentration, dilute solution, freezing point depression, Henry's law, immiscible, miscible, molal boiling point elevation constant, molal freezing point depression constant, molality, molarity, mole fraction, saturated solution, solubility, supersaturated solution, unsaturated, activated complex, activation energy, change in Gibbs free energy, chemical equilibrium, elementary reaction, endergonic, entropy, equilibrium constant, equilibrium position, exergonic, first-order reaction, free energy, heterogeneous reactions, inhibitor, intermediate, law of disorder, Le Chatelier's principle, nonspontaneous reaction, rate law, reaction mechanism, reaction rate, reversible reaction, specific rate constant, spontaneous reaction, standard entropy, transition state, acid dissociation constant, acidic solution, alkaline solution, amphoteric, base dissocation constant, base solution, conjugate base, conjugate acid-base pair, diprotic acid, hydrogen-ion acceptor, hydrogen-ion donor, hydronium ion, hydroxide ion, ion-product constant for water, Lewis acid, Lewis base, monoprotic acid, neutral solution, pH, self ionization, strong acid, strong base, triprotic acid, weak acid, weak base, buffer, buffer capacity, end point, equivalence point, equivalent, gram equivalent mass of and acid and a base, neutralization reaction, normality, salt hydrolysis, solubility product constant, standard solution, titration, half reaction, oxidation, oxidation number, oxidation-reduction reaction, oxidizing agent, reducing agent, reduction, spectator ion, anode, battery, cathode, cell potential, dry cell, electrical potential, electrochemical cell, electrode, electrolysis, electrolytic cell, fuel cell, half-cell, reduction potential, salt bridge, standard cell potential, standard hydrogen electrode, voltaic cell.

Science
Chemistry: Honors
Unit 4: Solution Equilibrium

Essential Skills	▪ Predict changes in the rates and direction of chemical reactions under specified environmental conditions. ▪ Explain how some chemical reactions can function as reversible reactions. ▪ Using laboratory data, qualitatively and quantitatively describe the effects of adding acids or bases to an existing solution. ▪ Describe solution equilibrium changes in terms of the gain and/or loss of electrons.

Science
Chemistry: Honors
Unit 4: Solution Equilibrium

Related Maine Learning Results	D. The Physical Setting D3.Matter and Energy Students describe the structure, behavior, and interactions of matter at the atomic level and the relationships between matter and energy. a. Describe the structure of atoms in terms of neutrons, protons, and electrons and the role of the atomic structure in determining chemical properties. b. Describe how the number and arrangement of atoms in a molecule determine a molecule's properties, including the types of bonds it makes with other molecules and its mass, and apply this to predictions about chemical reactions. c. Explain the essential roles of carbon and water in life processes. d. Describe how light is emitted and absorbed by atoms' changing energy levels, and how the results can be used to identify a substance. e. Describe factors that affect the rate of chemical reactions (including concentration, pressure, temperature, and the presence of molecules that encourage interaction with other molecules. f. Apply an understanding of the factors that affect the rate of chemical reaction to predictions about the rate of chemical reactions. g. Describe nuclear reactions, including fusion and fission, and the energy they release. h. Describe the radioactive decay and half-life. i. Explain the relationship between kinetic and potential energy and apply the knowledge to solve problems. j. Describe how in energy transformations the total amount of energy remains the same, but because of inefficiencies (heat, sound, and vibration) useful energy is often lost through radiation or conduction. k. Apply an understanding of energy transformations to solve problems. l. Describe the relationship among heat, temperature, and pressure in terms of the actions of atoms, molecules, and ions.
Sample Lessons And Activities	▪ Laboratory Exercises: ▪ Suminigashi ▪ Chromatography ▪ A Blue and Gold Reversible Reaction ▪ The Electrolysis of Potassium Iodide

Science
Chemistry: Honors
Unit 4: Solution Equilibrium

Sample Classroom Assessment Methods	▪ Quizzes ▪ Laboratory Reports ▪ Exams
Sample Resources	▪ Publications: o Chemistry, Wilbraham, Simpson and Matta o ChemMatters, a periodical for students, The American Chemical Society ▪ Videos: o Program selections from the World of Chemistry series o Program selections from the Chem Study series