



Advanced Placement Chemistry Standard

The *CareerTech* AP Chemistry course is designed to serve as an equivalent course to a general chemistry course taken in the first year of college. Class size, cost, and more personalized instruction are just a few advantages of taking this course during the high school years. Completion of this course will enable the student to be successful, and in some cases, advanced in college chemistry or other courses in which general college chemistry is a prerequisite. Students will attain a depth of understanding of fundamentals and a competence in dealing with chemical problems. A committee of Highly Qualified Science instructors that have taught the course for many years developed the objectives. It was correlated with Oklahoma Chemistry PASS (Priority Academic Student Skills) Content and Process Standards as well as NSES (National Science Education Standards). This document provides an outline for administrators, teachers, parents, and students. At the end of this course students will be able to score at a level on the AP exam that will earn credit and/or waive requirements at most higher level institutions in the country. Institutions that offer College Board® courses are required to submit annual audits through that organization.

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Innovative Initiatives Division
For the
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**Course Description:**

Chemistry is the study of the properties of materials and the changes that materials undergo. A student will see how chemical principles operate in all aspects of our lives, from everyday activities to far-reaching matters like the development of drugs to cure cancer. Students will learn through laboratory and lecture methods using group and individual activities, cooperative learning, presentations, and technology to enhance the learning environment. Students will learn how to design and conduct experiments using a variety of laboratory techniques and technology to investigate a chemical concept. They will apply stoichiometric concepts to chemical reactions and analyze how atomic structure relates to periodicity. The student will analyze how atomic structures relate to chemical bonding and apply chemical concepts to reactions in aqueous solutions. They will learn about gas laws as well as study electrochemistry. Prerequisites are: Algebra I, Geometry, Biology.

Requirements for College Admission Status (Title 70 O.S. § 11-103.6)

These courses are to be taught by a highly qualified teacher with an Oklahoma Chemistry teaching certification. The students should be in the eleventh or twelfth grade or if a sophomore, they should be in a Focused Field of Career Study program. The prerequisites for this course are Biology I and Algebra I with Chemistry being highly recommended. The course should consist of 40% laboratory or fieldwork in order to be considered a lab science. The course will have at a minimum, but may exceed, a duration of 120 hours within a school year (72 hours theory/48 lab hours).



AP Chemistry

Objective	National Science Education Standards 9-12 Content Standards	Oklahoma Chemistry Content and Process PASS Standards
Atomic theory and atomic structure		
<ul style="list-style-type: none"> Investigate evidence for the atomic theory 	B, G	Content 1.1, 1.2, 1.3, 1.4
<ul style="list-style-type: none"> Discuss atomic masses; determination by chemical and physical means 	B	Content 1.1, 1.2, 1.3, 1.4
<ul style="list-style-type: none"> Discuss atomic number and mass number; isotopes 	B	Content 1.1, 1.2, 1.3, 1.4
<ul style="list-style-type: none"> Discuss electron energy levels: atomic spectra, quantum numbers, atomic orbitals 	B	Content 1.1, 1.2, 1.3, 1.4
<ul style="list-style-type: none"> Interpret periodic relationships including, for example, atomic radii, ionization energies, electron affinities, oxidation states 	A, B	Content 1.1, 1.2, 1.3, 1.4, 1.5
Chemical Bonding		
<ul style="list-style-type: none"> Investigate and discuss binding forces <ul style="list-style-type: none"> types: ionic, covalent, metallic, hydrogen bonding, van der Waals (including London dispersion forces) relationships to states, structure, and properties of matter polarity of bonds, electronegativities 	A, B	Content 1.2, 1.4, 2.1, 2.2, 2.3, 2.4
<ul style="list-style-type: none"> Build molecular models <ul style="list-style-type: none"> lewis structures valence bond: hybridization of orbitals, resonance, sigma and 	A, B	Content 1.2, 1.4, 2.1, 2.2, 2.3, 2.4

<ul style="list-style-type: none"> pi bonds VSEPR 		
<ul style="list-style-type: none"> Discuss and model geometry of molecules and ions, structural isomerism of simple organic molecules and coordination complexes; dipole moments of molecules; relation of properties to structure 	A, B	Content 1.2, 1.4, 2.1, 2.2, 2.3, 2.4
<ul style="list-style-type: none"> Discuss and build geometry of molecules and ions, structural isomerism of simple organic molecules and coordination complexes; dipole moments of molecules; relation of properties to structure Understand nuclear chemistry: nuclear equations, half-lives, and radioactivity; chemical applications 	A, B	Content 1.2, 1.4, 2.1, 2.2, 2.3, 2.4
Gases		
<ul style="list-style-type: none"> Interpret the laws of ideal gases <ul style="list-style-type: none"> Equation of state for an ideal gas Partial pressures 	B	Content 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
<ul style="list-style-type: none"> Kinetic-molecular theory <ul style="list-style-type: none"> Interpretation of ideal gas laws on the basis of this theory Avogadro's hypothesis and the mole concept Dependence of kinetic energy of molecules on temperature Deviations from ideal gas laws 	B	Content 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
Liquids and solids		
<ul style="list-style-type: none"> Understand liquids and solids from the kinetic-molecular viewpoint 	B	Content 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
<ul style="list-style-type: none"> Create phase diagrams of one-component systems 	A, B	Content 1.2, 1.3, 1.4, 1.5
<ul style="list-style-type: none"> Interpret changes of state, including critical points and triple points 	B	Content 1.2, 1.3, 1.4, 1.5
<ul style="list-style-type: none"> Discuss structure of solids; lattice energies 	B	Content 1.4, 1.5, 2.1, 2.2, 2.3, 2.4

Solutions		
<ul style="list-style-type: none"> • Create types of solutions and understand factors affecting solubility 	A, B	Content 1.2, 1.3,1.4, 1.5, 2.1, 2.2, 2.3, 2.4
<ul style="list-style-type: none"> • Discuss methods of expressing concentration (The use of normalities is not tested.) 	B	Content 1.2, 1.3,1.4, 1.5, 2.1, 2.2, 2.3, 2.4
<ul style="list-style-type: none"> • Model Raoult's law and colligative properties (nonvolatile solutes); osmosis 	A, B	Content 1.2, 1.3,1.4, 1.5, 2.1, 2.2, 2.3, 2.4
<ul style="list-style-type: none"> • Discuss non-ideal behavior (qualitative aspects) 	B	Content 1.2, 1.3,1.4, 1.5, 2.1, 2.2, 2.3, 2.4
Reactions		
<ul style="list-style-type: none"> • Model acid-base reactions; concepts of Arrhenius, Brønsted-Lowry, and Lewis; coordination complexes; amphoterism 	A, B	Content 1.5, 2.1, 2.2, 2.3
<ul style="list-style-type: none"> • Create precipitation reactions 	A, B	Content 1.5, 2.1, 2.2, 2.3
<ul style="list-style-type: none"> • Create oxidation-reduction reactions <ul style="list-style-type: none"> • An Oxidation number • The role of the electron in oxidation-reduction • Electrochemistry: electrolytic and galvanic cells; Faraday's Laws; standard half-cell potentials; Nernst equation; prediction of the direction redox reactions 	A, B	Content 1.1, 1.2, 1.3, 1.4,1.5, 2.1, 2.2, 2.3
Stoichiometry		
<ul style="list-style-type: none"> • Understand and model ionic and molecular species present in chemical systems: net ionic equations 	B	Content 1.1, 1.2, 1.3, 1.4,1.5, 2.1, 2.2, 2.3, 2.4
<ul style="list-style-type: none"> • Balance equations including those for redox reactions 	B	Content 1.1, 1.2, 1.3, 1.4,1.5, 2.1, 2.2, 2.3, 2.4
<ul style="list-style-type: none"> • Apply mass and volume relations with emphasis on the mole concept, including empirical formulas and limiting reactants 	B	Content 1.1, 1.2, 1.3, 1.4,1.5, 2.1, 2.2, 2.3, 2.4

Equilibrium		
<ul style="list-style-type: none"> Apply concept of dynamic equilibrium, physical and chemical; Le Chatelier's principle; equilibrium constants 	B	Content 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4
<ul style="list-style-type: none"> Interpret quantitative treatment 	A, B	Content 2.3, 2.4
<ul style="list-style-type: none"> Apply equilibrium constants for gaseous reactions: K_p, K_c <ul style="list-style-type: none"> Equilibrium constants for reactions in solution Constants for acids and bases; pK; pH Solubility product constants and their application to precipitation and the dissolution of slightly soluble compounds Common ion effect; buffers; hydrolysis 	A, B	Content 2.3, 2.4
Kinetics		
<ul style="list-style-type: none"> Understand concept of rate of reaction 	B	Content 2.2
<ul style="list-style-type: none"> Apply differential rate laws to determine order of reaction and rate constant from experimental data 	A, B	Content 2.2, 2.3
<ul style="list-style-type: none"> Discuss effect of temperature change on rates 	B	Content 1.4, 2.2
<ul style="list-style-type: none"> Discuss energy of activation; the role of catalysts 	B	Content 1.2, 1.3, 2.1, 2.2
<ul style="list-style-type: none"> Discuss the relationship between the rate-determining step and a mechanism 	B	Content 2.2
Thermodynamics		
<ul style="list-style-type: none"> Apply functions Apply first law: change in enthalpy; heat of formation; heat of reaction; Hess's law; heats of vaporization and fusion; calorimetry Apply second law: entropy; free energy of formation; free energy of reaction; dependence of change in free energy on enthalpy 	A, B	Content 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.4

<p>and entropy changes</p> <ul style="list-style-type: none"> • Compare and contrast relationship of change in free energy to equilibrium constants and electrode potentials 		
<p>Labs/Activities: These labs follow Collegeboard® recommendations.</p>		
<p>Determination of the Formula of a Compound Students will:</p> <ul style="list-style-type: none"> • Determine the water of hydration in a copper chloride hydrate sample. • Conduct a reaction between a solution of copper chloride and solid aluminum. • Use the results of the reaction to determine the mass and moles of Cu and Cl in the reaction. • Calculate the empirical formula of the copper chloride compound. • Write a detailed lab report citing all steps in the scientific method 	<p>A, B</p>	<p>Content 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4 Process 1.1, 1.2, 1.3, 3.3, 4.1, 4.2, 4.7, 5.1, 5.2, 6.1, 6.2, 6.3, 6.4</p>
<p>Separation by Chromatography Students will:</p> <ul style="list-style-type: none"> • Conduct a liquid chromatographic separation. • Conduct a step gradient chromatographic separation. • Complete the necessary measurements and calculations to evaluate the components of a mixture that have been separated by liquid chromatography. • Write a detailed lab report citing all steps in the scientific method 	<p>A, B, E</p>	<p>Content 1.5 Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.3, 4.1, 4.2, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p>Determination of the Rate of a Reaction and Its Order Students will:</p> <ul style="list-style-type: none"> • Conduct the catalyzed decomposition of hydrogen peroxide under various conditions. • Calculate the rate constant for the reaction. • Determine the rate law for the reaction. • Calculate the activation energy for the reaction. • Write a detailed lab report citing all steps in the scientific method 	<p>A, B</p>	<p>Content 1.4, 2.1, 2.2, 2.3, 2.4</p> <p>Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p>Determination of Enthalpy Change Associated With a Reaction Students will:</p> <ul style="list-style-type: none"> • Use Hess's Law to determine the enthalpy change of the reaction between aqueous ammonia and aqueous hydrochloric acid. • Compare your calculated enthalpy change with the experimental results. • Write a detailed lab report citing all steps in the scientific method 	<p>A, B, D</p>	<p>Content 1.4, 2.1, 2.2, 2.3, 2.4</p> <p>Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p>Synthesis of a Coordination Compound and Its Chemical Analysis Students will:</p> <ul style="list-style-type: none"> • Synthesize a sample of potassium aluminum sulfate dodecahydrate (alum). • Observe and record the process of synthesizing a compound. • Calculate the percent yield of your synthesis. • Determine the melting temperature of a sample of alum. 	<p>A, B, E</p>	<p>Content 1.4, 2.1, 2.2, 2.3, 2.4</p> <p>Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<ul style="list-style-type: none"> • Determine the water of hydration of a sample of alum. • Determine the percent sulfate of a sample of alum. • Verify the chemical formula of a sample of alum. • Write a detailed lab report citing all steps in the scientific method 		
<p>Analytical Gravimetric Determination Students will:</p> <ul style="list-style-type: none"> • Measure the conductivity of the reaction between sulfuric acid and barium hydroxide. • Use conductivity values as a means of determining the equivalence point of the reaction. • Measure the mass of a product of the reaction as a means of determining the equivalence point of the reaction gravimetrically. • Calculate the molar concentration of a barium hydroxide solution. • Write a detailed lab report citing all steps in the scientific method 	A, B	<p>Content 1.4, 2.1, 2.2, 2.3, 2.4</p> <p>Process 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>
<p>Determination of the Percentage of Water in a Hydrate Students will:</p> <ul style="list-style-type: none"> • Carefully heat a measured sample of a hygroscopic ionic compound. • Determine the water of hydration of the compound. • Complete the chemical formula of the compound. • Write a detailed lab report citing all steps in the scientific method 	A, B	<p>Content 1.4, 2.1, 2.2, 2.4</p> <p>Process 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>

<p>Determination of the Equilibrium Constant for a Chemical Reaction</p> <p>Students will:</p> <ul style="list-style-type: none"> • Prepare and test standard solutions of FeSCN^{2+} in equilibrium. • Test solutions of SCN^- of unknown molar concentration. • Determine the molar concentrations of the ions present in an equilibrium system. • Determine the value of the equilibrium constant, K_{eq}. • Write a detailed lab report citing all steps in the scientific method 	<p>A, B</p>	<p>Content 2.1, 2.2, 2.4</p> <p>Process 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>
<p>Standardization of a Solution Using a Primary Standard</p> <p>Students will:</p> <ul style="list-style-type: none"> • Prepare an aqueous solution of sodium hydroxide to a target molar concentration. • Determine the concentration of your NaOH solution by titrating it with a solution of potassium hydrogen phthalate, abbreviated KHP, of precise molar concentration. • Write a detailed lab report citing all steps in the scientific method 	<p>A, B</p>	<p>Content 2.1, 2.4</p> <p>Process 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>
<p>Determination of Electrochemical Series</p> <p>Students will:</p> <ul style="list-style-type: none"> • Prepare a Cu-Pb voltaic cell and measure its potential. • Test two voltaic cells that use unknown metal electrodes to identify the metals. • Prepare copper and lead concentration cells, observe, and measure their respective cell 	<p>A, B, E</p>	<p>Content 1.3, 1.4, 1.5, 2.1, 2.2, 2.3</p> <p>Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p>potentials.</p> <ul style="list-style-type: none"> • Use the Nernst equation to calculate the K_{sp} of PbI_2. • Write a detailed lab report citing all steps in the scientific method 		
<p>Synthesis, Purification, and Analysis of an Organic Compound</p> <p>Students will:</p> <ul style="list-style-type: none"> • Synthesize a sample of acetylsalicylic acid (aspirin). • Calculate the percent yield of your synthesis. • Measure the melting temperature of your aspirin sample. • Conduct a colorimetric analysis of your aspirin sample. • Write a detailed lab report citing all steps in the scientific method 	A, B, F	<p>Content</p> <p>1.3, 1.4, 1.5, 2.1, 2.2, 2.3</p> <p>Process</p> <p>1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p>Determination of Mass and Mole Relationship in a Chemical Reaction</p> <p>Students will:</p> <ul style="list-style-type: none"> • Measure the enthalpy change of a series of reactions. • Determine the stoichiometry of an oxidation-reduction reaction in which the reactants are known but the products are unknown • Write a detailed lab report citing all steps in the scientific method 	A, B	<p>Content</p> <p>1.3, 1.4, 1.5, 2.1, 2.2, 2.3</p> <p>Process</p> <p>1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p>Determination of Molar Mass by Vapor Density</p> <p>Students will:</p> <ul style="list-style-type: none"> • Measure the gas production of a chemical reaction by a pressure change. • Determine the molar volume of the 	A, B	<p>Content</p> <p>1.3, 1.4, 1.5, 2.3</p> <p>Process</p> <p>1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3,</p>

<p>gas produced in the reaction.</p> <ul style="list-style-type: none"> • Calculate the molar volume of a gas at STP. • Write a detailed lab report citing all steps in the scientific method 		6.1, 6.2, 6.3, 6.4
<p>Determination of Molar Mass by Freezing-Point Depression Students will:</p> <ul style="list-style-type: none"> • Determine the freezing temperature of the pure solvent, lauric acid. • Determine the freezing temperature of a mixture of lauric acid and benzoic acid. • Calculate the freezing point depression of the mixture. • Calculate the molecular weight of benzoic acid. • Write a detailed lab report citing all steps in the scientific method 	A, B	<p>Content 1.3, 1.4, 1.5, 2.3</p> <p>Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p>Determination of the Molar Volume of a Gas Students will:</p> <ul style="list-style-type: none"> • Measure the gas production of a chemical reaction by a pressure change. • Determine the molar volume of the gas produced in the reaction. • Calculate the molar volume of a gas at STP. • Write a detailed lab report citing all steps in the scientific method 	A, B	<p>Content 1.3, 1.4, 1.5, 2.3</p> <p>Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p>Determination of Appropriate Indicators for Various Acid-Base Titrations, pH Determination</p> <p>Students will:</p> <ul style="list-style-type: none"> • Conduct strong acid-strong base titrations using solutions of hydrochloric acid and sodium hydroxide, and three different indicator solutions. • Select the proper indicator to use with a titration involving a weak acid or a weak base, based on your observations and measurements. • Write a detailed lab report citing all steps in the scientific method 	<p>A, B, E</p>	<p>Content 2.1</p> <p>Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p>Determination of Concentration by Acid-Base Titration, Weak Acid & Weak Base</p> <p>Students will:</p> <ul style="list-style-type: none"> • Accurately conduct acid-base titrations. • Determine the equivalence point of a strong acid - strong base titration. • Determine the equivalence point of a weak acid - strong base titration. • Calculate the molar concentrations of two acid solutions. • Write a detailed lab report citing all steps in the scientific method 	<p>A, B, E</p>	<p>Content 2.1, 2.3, 2.4</p> <p>Process 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p>Preparation and Properties of Buffer Solutions</p> <p>Students will:</p> <ul style="list-style-type: none"> • Evaluate a standard buffer solution. • Prepare and test an acid buffer solution. • Determine the buffer capacity of the standard buffer and the prepared buffer. • Write a detailed lab report citing all 	<p>A, B</p>	<p>Content 2.1</p> <p>Process 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>

steps in the scientific method		
<p>Determination of Concentration by Oxidation-Reduction Titration</p> <p>Students will:</p> <ul style="list-style-type: none"> Conduct the potentiometric titration of the reaction between ferrous ammonium sulfate hexahydrate and ammonium cerium (IV) nitrate. Measure the potential change of the reaction. Determine the molar concentration of iron (II) ions in a sample of ferrous ammonium sulfate hexahydrate Write a detailed lab report citing all steps in the scientific method 	A, B	<p>Content 2.1</p> <p>Process 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>
<p>Separation and Qualitative Analysis of Cations and Anions</p> <p>Students will:</p> <ul style="list-style-type: none"> Prepare and analyze a solution that contains ten selected cations. Analyze an unknown solution that contains a selection of cations. Prepare and analyze a solution that contains six selected anions. Analyze an unknown solution that contains a selection of anions. Write a detailed lab report citing all steps in the scientific method 	A, B	<p>Content 2.1, 2.2, 2.3, 2.4</p> <p>Process 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4</p>
<p>Colorimetric or Spectrophotometric Analysis</p> <p>Students will:</p> <ul style="list-style-type: none"> Prepare and test the absorbance of five standard copper (II) sulfate 	A, B, E	<p>Content 2.2, 2.2, 2.3</p> <p>Process 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5,</p>

<p>solutions.</p> <ul style="list-style-type: none"> • Calculate a standard curve from the test results of the standard solutions. • Test the absorbance of a copper (II) sulfate solution of unknown molar concentration. • Calculate the molar concentration of the unknown CuSO_4 solution. • Write a detailed lab report citing all steps in the scientific method 		<p>4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>
<p>Measurements Using Electrochemical Cells and Electroplating Students will:</p> <ul style="list-style-type: none"> • Prepare and operate an electrochemical cell to plate copper onto a brass surface. • Measure the amount of copper that was deposited in the electroplating process. • Calculate the amount of energy used to complete the electroplating process. • Write a detailed lab report citing all steps in the scientific method 	<p>A, B, E</p>	<p>Content 2.1, 2.2, 2.3 Process 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 6.1, 6.2, 6.3, 6.4</p>

Resources

Standards

National Science Standards (5th ed). (1998). National Research Council, Washington, D.C., National Academy of Sciences

Oklahoma Priority Academic Student Skills (2003). Oklahoma State Department of Education-PASS-www.sde.state.ok.us

Textbooks

Kotz, John C., Treichel, Paul M., Weaver, Gabriela C. (2006). *Chemistry and Chemical Reactivity* (6th ed.) Belmont, CA: Brooks/Cole Publishing.

Zumdahl, Steven S., (2003). *Chemistry* (6th ed.). Boston: Houghton Mifflin.

Brown, Theodore L., LeMay, Eugene H. Jr., & Bursten, Bruce E. (2006). *Chemistry: The Central Science* (10th ed.). Upper Saddle River, New Jersey: Pearson Prentice Hall.

Slowinski, Emil, Wolsey, Wayne C., Masterton, William L. (2005). *Chemical Principles in the Laboratory* (8th ed.). Belmont, CA: Brooks/Cole Publishing.

Ehrenkranz, David, Mauch, John J. (1993). *Chemistry in Microscale* (2nd ed.). Dubuque, IA: Kendall Hunt Publishing.

Chang, Raymond (2007). *Chemistry* (9th ed.). New York, NY: McGraw-Hill Publishing.

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Supplemental Materials

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