SRPSD Chemistry 30 Rubrics

Student-Directed Study

CH30-SDS1 Create and carry out a plan to explore one or more topics of personal interest relevant to Chemistry 30 in depth.

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can identify a personally relevant or interesting topic and develop a proposal for a scientific investigation, or a plan for an experiment, using the scientific method.	I can assemble a product demonstrating an understanding of a Chemistry 30 related topic of interest.	I can demonstrate a deep understanding of my topic.	I can use my deep understanding to show how my topic impacts myself, society, and/or the scientific community.

Materials Science

CH30-MS1 Examine the role of valence electrons in the formation of chemical bonds.

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can identify how experimentation informs and revises theories in chemistry. Specifically the historical development of the model of the atom.	I can draw Lewis (electron-dot) structures for group 1 and 2 elements. I can use valence electrons to describe the formation of ions and the octet rule.	I can explain the role of valence electrons in the formation of covalent and ionic bonds, including a connection to metals and non-metals. I can draw Lewis (electron-dot) structures for ionic compounds.	I can predict the arrangement of atoms in covalent and ionic compounds based on their Lewis (electron-dot) diagrams.

CH30-MS2 Investigate how the properties of materials are dependent on their underlying intermolecular and intramolecular forces.

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can use chemical and physical properties to describe materials. I can identify the difference between intermolecular and intramolecular forces.	I can describe and classify the properties of different types of substances based on their bond type (i.e. ionic, molecular, metal, and network covalent.). I recognize that a substance's physical properties are a result of the types of bonds and forces within the molecule.	I can describe the different types of intermolecular [i.e. van der Waals (London dispersion, dipole-dipole, hydrogen bonding, ion-dipole), ionic crystal, and network-covalent] and intramolecular (i.e. non-polar covalent, polar-covalent, ionic and metallic).	I can design and/or carry out experiments to compare several physical and chemical properties of various materials with different bond types. I can construct a classification system to categorize various materials of different bond types based on their properties.

CH30-MS3 Explore the nature and classification of organic compounds, and their uses in modern materials.

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can describe how carbon's valence shell results in the diversity of organic compounds.	I can use the appropriate models to represent molecular and structural formulas. I can provide the IUPAC name for straight-chain alkanes, alkenes, and alkynes up to ten carbon atoms. I can identify examples of organic consumer products.	I can identify different classes of organic compounds based on their functional groups (i.e. alcohols, aldehydes, ketones, etc.) I can describe the importance of isomerization in various applications. I can describe applications of various classes of organic compounds.	I can provide IUPAC names and/or illustrate structural formulas of branched and straight-chain isomers.

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CH30-MS4 Determine the suitability of materials for use in specific applications.

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can identify criteria used to guide the choice of materials for a specific application.	I can suggest a range of suitable applications for a material based on its chemical and physical properties.	I can justify the use of the material chosen for a specific application based on student selected criteria.	I can investigate the potential of modern materials to change the way we live. I can analyze how a product has evolved in response to the development of new products. I can evaluate the risks and benefits to society and the environment of a product throughout its life cycle, from raw materials to production, use and disposal.

Chemical Equilibria

CH30-EQ1 Consider, qualitatively and quantitatively, the characteristics and applications of equilibrium systems in chemical reactions

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can identify characteristics of a system at equilibrium.	I can write the equilibrium constant (Keq) expression for a variety of chemical reactions. I can recognize that equilibrium constant (Keq) values are dependent upon pressure and temperature but are independent of concentration and the presence of a catalyst.	I can solve problems quantitatively related chemical equilibrium using ICE charts. I can predict the shifts in equilibrium caused by changes in temperature, pressure, volume, concentration or the addition of a catalyst using Le Chatelier's principle. I can interpret Keq values to determine whether the concentration of products reactants or neither is favoured once equilibrium has been reached.	I can explain why solid and liquid phases have no effect on the values of an equilibrium constant. I can use the Keq to determine the change in upper level ICE chart questions. I can explain how industry uses equilibrium to optimize yield.

CH30-EQ2 Analyze aqueous solution equilibria including solubility-product constants

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can discuss conditions necessary for the establishment of equilibrium in aqueous solution.	I can interpret solubility curves of selected substances. I can calculate the solubility product constant (Ksp) for saturated solutions, given solute concentrations.	I can analyze how temperature and the common ion effect influence the solubility of substance in aqueous solution. I can use data to create a solubility graph.	I can predict whether a precipitate will occur in a double replacement reaction when given the initial concentration of reactants and solubility product constants (Ksp) values of the products.

CH30-EQ3 Observe and analyze phenomena related to acid-base reactions and equilibrium.

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can identify examples of acid-base reactions in household and industrial products.	I can discuss the relationship between $[H^+]/[H_3O^+]$ and $[OH^-]$ in the dissociation of water, to explain K_w and perform relevant calculations.	I can solve problems involving pH, pOH, $[H^+]/[H_3O^+]$, $[OH^-]$, K_w, K_a, and K_b. I can identify conjugate acids and bases formed in acid-base reactions. I can also differentiate between strong vs. weak and concentrated vs. dilute.	I can perform acid-base titrations and relevant calculations for multiple ratios of $[H^+]/[H_30^+]$ to $[OH^-]$, including those for reactions that either reach the endpoint/equivalence point or represent over-titration. I can interpret pH titration curves for various combinations of acids and bases identifying endpoints and choosing appropriate indicators.

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Electrochemistry

CH30-EC1 Investigate the chemistry of oxidation and reduction (redox) reactions

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can define oxidation and reduction in terms of electron transfer and the role of oxidizing and reducing agents.	I can compare the characteristics of redox reactions with other types of chemical reactions. I can assign oxidation numbers.	I can write and balance net redox equations using the half reaction and oxidation number method. I can illustrate and label the parts of electrochemical and electrolytic cells and explain how they work, including half-reactions, flow of ions and flow of electrons. I can predict the electric potential and spontaneity of various cells using reduction potentials.	I can compare electrochemical and electrolytic cells in terms of electron flow/transfer, and chemical change. Design or construct or evaluate a prototype of a working battery that meets specific student identified criteria such as powering a small electric device.

CH30-EC2 Examine applications of electrochemistry and their impact on society and the environment.

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can provide examples of redox reactions that occur in nature and in technological processes.	I can predict how applications of electrochemistry may impact society and the environment.	I can investigate the process of corrosion and its prevention.	I can design or carry out experiments which illustrate the process of electrolysis and electroplating. I can research and discuss the issue of storage of electrical energy as a barrier to large scale adoption of renewable energy resources.