Course Title **ERHS**

Chemistry A (AP)

Description/ Target group

This is two-semester laboratory course of inorganic chemistry, designed for college bound students entering the fields of science and engineering, family health and human resources. This course is intended to be a second year chemistry course.

All students are expected to take the College Board Advanced Placement Exam for Chemistry in May.

Course Length

One Semester, 5 units

Course Adoption

UC/CSU "a-f" inclusion

Prerequisites

Chemistry B (P) and Algebra II B (P) with a B average or better. (Recommended)

Standards of Expected Student Achievement

Activity: It is expected that the student complete a preliminary summer assignment on the following topics:

A. Scientific Method
B. Significant digits and scientific calculations
C. Matter and energy
D. Properties of Matter
E. Elements, compounds and mixtures
F. The modern atomic theory
G. Compounds and inorganic nomenclature
H. The mole concept
I. Percentage composition and the empirical formula
J. Writing and balancing chemical equations
K. Stoichiometry
L. Limiting Reactant and percentage yield

Chemistry A (AP) (continued)

Students will demonstrate, through testing, problem solving and laboratory work, at least, a reasonable mastery of the following topics:

I. Structure of Matter
   A. Atomic theory and atomic structure
      1. Evidence of the atomic theory
      2. Atomic masses; determination by chemical and physical means
      3. Atomic number and mass number; isotopes
      4. Electron energy levels; atomic spectra, quantum numbers, atomic orbitals
      5. Periodic relationships including, for example, atomic radii, ionization energies, electron affinities, oxidation states

   B. Chemical bonding
      1. Binding forces
         a. Types: ionic, covalent, metallic, hydrogen bonding, van der Waals (including London dispersion forces)
         b. Relationships to states, structure, and properties of matter
         c. Polarity of bonds, electronegativities
      2. Molecular models
         a. Lewis structures
         b. Valence bond: hybridization of orbitals, resonance, sigma and pi bonds
         c. VSEPR
      3. Geometry of molecules and ions, structural isomerism of simple organic molecules and coordination complexes; dipole moments of molecules; relation of properties to structure
   C. Nuclear chemistry; nuclear equations, half-lives, and radioactivity; chemical applications
II. States of Matter
   A. Gases
      1. Laws of ideal gases
         a. Equation of state for an ideal gas
         b. Partial pressures
      2. Kinetic-molecular theory
         a. Interpretation of ideal gas laws on the basis of this theory
         b. Avogadro's hypothesis and the mole concept
         c. Dependence of kinetic energy of molecules of temperature
         d. Deviations from ideal gas laws
   B. Liquids and solids
      1. Liquids and solids from the kinetic-molecular viewpoint
      2. Phase diagrams of one-component systems
      3. Changes of state, including critical points and triple points
      4. Structure of solids; lattice energies
   C. Solutions
      1. Types of solutions and factors affecting solubility
      2. Methods of expressing concentration (The use of normalities is not tested.)

3. Raoult's law and colligative properties (nonvolatile solutes); osmosis
4. Non-ideal behavior (qualitative aspects)

III. Laboratory

A. Making observations of chemical reactions and substances
B. Recording data
C. Calculating and interpreting results based on the quantitative data obtained
D. Communicating effectively the results of experimental work

Methods of Assessment of Student Learning: Written examinations, laboratory reports, assigned homework problems, and College Board Advanced Placement Examination.

Textbook

Refer to: Secondary Adopted texts and Approved Supplementary Books used in the Santa Maria Joint Union High School District.

This course is not a graduation requirement for the Santa Maria Union High School District.

Department

RHS Science

Description/ Target group

This is two-semester laboratory course of inorganic chemistry, designed for college bound students entering the fields of science and engineering, family health and human resources.

All students are expected to take the College Board Advanced Placement Exam for Chemistry in May.

Course Length

One Semester, 5 units

Course Adoption

UC/CSU "a-f" inclusion

Prerequisites

Chemistry A (AP) with passing grade

Standards of Expected Student Achievement

Students will demonstrate, through testing, problem solving and laboratory work, at least, a reasonable mastery of the following topics:

I. Reactions
   A. Reaction types
      1. Acid-base reactions; concepts of Arrhenius, Brønsted-Lowry, and Lewis; coordination complexes; amphoterism
      2. Precipitation reactions
      3. Oxidation-reduction reactions
         a. Oxidation number
         b. The role of the electron in oxidation-reduction
         c. Electrochemistry: electrolytic and galvanic cells; Faraday's laws; standard half-cell potentials; Nernst equation; prediction of the direction of redox reactions

Chemistry B (AP) (continued)

   B. Stoichiometry

1. Ionic and molecular species present in chemical systems: net ionic equations
2. Balancing of equations including those for redox reactions
3. Mass and volume relations with emphasis on the mole concept, including empirical formulas and limiting empirical formulas and limiting reactants

C. Equilibrium
1. Concept of dynamic equilibrium, physical and chemical; Le Chatelier's principal; equilibrium constants
2. Quantitative treatment
a. Equilibrium constants for gaseous reactions: K_p, K_c
b. Equilibrium constants for reactions in solution
(1) Constants for acids and bases; pK; pH
(2) Solubility product constants and their and their application to precipitation and the dissolution of slightly soluble compounds
(3) Common ion effect; buffers; hydrolysis

D. Kinetics
1. Concept of rate of reaction
2. Use of experimental data and graphical analysis to determine reactant order, rate constants, and reaction rate laws.
3. Effect of temperature charge on rates
4. Energy of activation; the role of catalysts
5. The relationship between the rate-determining step and a mechanism

E. Thermodynamics
1. State functions
2. First law: change in enthalpy; heat of formation; heat of reaction; Hess's law; heats of vaporization and fusion; calorimetry
3. Second law: entropy; free energy of formation; free energy of reaction; dependence of change in free energy on enthalpy and entropy changes.
4. Relationship of change in free energy to equilibrium constants and electrode potentials

II. Descriptive Chemistry
A. Chemical reactivity and products of chemical reactions
B. Relationships in the periodic table; horizontal, vertical, and diagonal with examples from alkali metals, alkaline earth metals, halogens, and the first series of transition elements
C. Introduction to organic chemistry: hydrocarbons and functional groups

III. Laboratory

A. Making observations of chemical reactions and substances
B. Recording data
C. Calculating and interpreting results based on the quantitative data obtained
D. Communicating effectively the results of experimental work

Methods of Assessment of Student Learning: Written examinations, laboratory reports, assigned homework problems, and College Board Advanced Placement Examination

Textbook

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