YOSEMITE HIGH SCHOOL
50200 SCHOOL ROAD - OAKHURST, CA 93644
(559) 683-4667

COURSE TITLE: *CHEMISTRY*
DEPARTMENT: *SCIENCE*

REQUIREMENT SATISFIED:

High School:	*X*	*Model Curriculum Standards:*	*X*
State College:	*X*	*Frameworks:*	*X*
UC Approved:	*X*		

GRADE LEVEL: *10-12* *LENGTH OF COURSE: 1 year* *CREDITS: 10*

PREREQUISITE: *Successful completion of Algebra 1 and Biology or recommendation of previous Science instructor.*

TEXTBOOKS: *Chemistry Concepts and Applications, Glencoe McGraw-Hill*

COURSE DESCRIPTION:

Chemistry is a lecture/lab course in which the beginning student is provided with introductory types of Chemistry. There are five themes which unify the study of chemistry in this course: Energy, Submicroscopic, Conservation, Systems, and Equilibrium & Change. For each major topic covered there will be a lab to accompany it. Students are expected to be highly motivated, responsible, and disciplined in their work.

This course fulfills the Physical Science requirement for graduation and the UC requirement for Physical Science.

COURSE OUTLINE/ALIGNMENT TO CALIFORNIA STATE STANDARDS AND EXPECTED SCHOOLWIDE LEARNING RESULTS:

Assignment Course Content/Objectives:	*Standards Addressed:*	*ESLRS:*
Chapter 1 Chem the Science of Matter	*6a, 6c*	*1, 2, 3*
Chapter 2 Matter is Made of Atoms	*1a, 1d, 1e*	*1, 2, 3*
Chapter 3 Intro to the Periodic Table	*1b*	*1*
Chapter 4 Formation of Compounds	*2a, 2b, 2c, 2e*	*1, 2, 3*
Chapter 5 Types of Compounds	*2a, 2c*	*1, 2, 3*
Chapter 6 Chemical Reactions and Equations	*3a, 3e, 6d, 8a, 8b, 8c, 9a, 9b*	*1, 2, 3*
Chapter 8 Periodic Properties	*1c*	*1*
Chapter 9 Chemical Bonding	*1c, 2a*	*1, 2, 4*
Chapter 10 The Kinetic Theory	*2d, 4b, 4e, 4f, 6b, 7a, 7c*	*1, 2, 3, 6*
Chapter 11 Behavior of Gases	*4a, 4c, 4d*	*1, 2, 3, 4*
Chapter 12 Chemical Quantities	*3b, 3c, 3d*	*1, 2, 3*

COURSE OUTLINE/ALIGNMENT TO CALIFORNIA STATE STANDARDS AND EXPECTED SCHOOLWIDE LEARNING RESULTS: (Continued)

Assignment Course Content/Objectives:	*Standards Addressed:*	*ESLRS:*
Chapter 13 Water and its Solutions	*7d*	*1*
Chapter 14-15 Acids and Bases	*5a, 5b, 5c, 5d*	*1, 3, 4, 6*
Chapter 18 Organic Chemistry	*10b*	*6*
Chapter 19 The Chemistry of Life	*10a, 10c*	*1, 6*
Chapter 20 Chem Reactions and Energy	*7b*	*4*
Chapter 21 Nuclear Chemistry	*11a, 11b, 11c, 11d, 11e*	*1, 2, 3, 4*

DISTRICT/STATE CONTENT STANDARDS ADDRESSED:

Atomic and Molecular

1. *The Periodic Table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure. As a basis for understanding this concept, students know:*

    a. *How to relate the position of an element in the Periodic Table as its atomic number and atomic mass.*

    b. *How to use the Periodic Table to identify metals, semimetals, nonmetals, and halogens.*

    c. *How to use the Periodic Table to identify alkali metals, alkaline earth metals, and transition metals, and trends in ionization energy, electronegativity, and the relative sizes of ions and atoms.*

    d. *How to use the Periodic Table to determine the number of electrons available for bonding.*

    e. *The nucleus is much smaller in size than the atom yet contains most of its mass.*

    f. *How to use the Periodic Table to identify the lanthanides and actinides, and transactinide elements, and know that the transuranium elements were man made.*

    g. *how to relate the position of an element in the Periodic Table to its quantum electron configuration, and reactivity with other elements in the table.*

    h. *The experimental basis for Thomson's discovery of the electron, Rutherford's nuclear atom, Millikan's oil drop experiment, and Einstein's explanation of the photoelectric effect.*

i. The experimental basis for the development of the quantum theory of atomic structure and the historical importance of the Bohr model of the atom.

j. Spectral lines are a result of transitions of electrons between energy levels. Their frequency is related to the energy spacing between levels using Planck's relationship (E=hv).

Chemical Bonds

2. Biological, chemical, and physical properties of matter result from the ability of atoms to form bonds based on electrosatic forces between electrons and protons, and between atoms and molecules. As a basis for understanding this concept, students know:

a. Atoms combine to form molecules by sharing electrons to form covalent or metallic bonds, or by exchanging electrons to form ionic bonds.

b. Chemical bonds between atoms in molecules such as H2, CH4, NH3, H2CCH2, N2, C12, and many large biological molecules are covalent.

c. Salt crystals such as NaC1 are repeating patterns of positive and negative ions held together by electrostatic attraction.

d. In a liquid the intermolecular forces are weaker than in a solid so that the molecules can move in a random pattern relative to one another.

e. How to draw Lewis dot structure.

f. How electronegativity and ionization energy relate to bond formation.

g. How to identify solids and liquids held together by Van der Waals forces or hydrogen bonding and relate these forces to volatility and boiling/melting point temperatures.

Conservation of Matter and Stoichiometry

3. The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. AS a basis for understanding this concept, students know:

a. How to describe chemical reactions by writing balanced equations.

b. The quantity one mole is defined so that one mole of carbon 12 atoms has a mass of exactly 12 grams.

c. One mole equals 6.02x10 23 particles (atoms or molecules).

d. How to determine molar mass of a molecules from its chemical formula and a table of atomic masses, and how to convert the mass of a molecular substance to moles, number of particles or volume of gas at standard temperature and pressure.

e. How to calculate the masses of reactants and products in a chemical reaction from the mass of one of the reactants or products, and the relevant atomic masses.

f. How to calculate percent yield in a chemical reaction.

g. How to identify reactions that involve oxidation and reduction and how to balance oxidation-reduction reactions.

Gases and Their Properties

4. The Kinetic Molecular theory describes the motion of atoms and molecules and explains the properties of gases. As a basis for understanding this concept, students know:

a. The random motion of molecules and their collisions with a surface create the observable pressure on that surface.

b. The random motion of molecules explains the diffusion of gases.

c. How to apply the gas laws to relations between the pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases.

d. The values and meanings of standard temperature and pressure (STP).

e. How to convert between Celsius and Kelvin temperature scales.

f. There is no temperature lower that 0 Kelvin.

g. The kinetic theory of gases relates the absolute temperature of a gas to the average kinetic energy of its molecules or atoms.

h. How to solve problems using the ideal gas law in the form PV=nRT.

i. How to apply Dalton's Law of Partial Pressures to describe the composition gases, and Graham's Law to describe diffusion of gases.

Acids and Bases

5. Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept, students know:

a. The observable properties of acids, bases, and salt solutions.

b. Acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances.

c. Strong acids and bases fully dissociate and weak acids and bases partially dissociate.

d. How to use the pH scale to characterize acid and base solutions.

e. The Arrhenius, Bronsted-Lowry acid-base definitions.

f. How to calculate pH from hydrogen ion concentration.

g. Buffers stabilize pH in acid-base reactions.

Solutions

6. *Solutions are homogenous mixture of two or more substances. As a basis for understanding this concept, students know:*

   a. *Definitions of solute and solvent.*

   b. *How to describe the dissolving process as a result of random molecular motion.*

   c. *Temperature, pressure, and surface area affect the dissolving process.*

   d. *How to calculate the concentration of a solute in terms of grams per liter, molarity, parts per million and percent composition.*

   e. *The relationship between the molarity of solute in a solution, and the solution's depressed freezing point or elevated boiling point.*

   f. *How molecules in solution are separated or purified by the methods of chromatography and distillation.*

Chemical Thermodynamics

7. *Energy is exchanged or transformed in all chemical reactions and physical changes of matter. As a basis for understanding this concept, students know:*

   a. *How to describe temperature and heat flow in terms of the motion of molecules (or atoms).*

   b. *Chemical processes can either release (exothermic) or absorb (endothermic) thermal energy.*

   c. *Energy is released when a material condenses or freezes and absorbed when a material evaporates or melts.*

   d. *How to solve problems involving heat flow and temperature changes, using known values of specific heat, and latent heat of phase change.*

   e. *How to apply Hess' Law to calculate enthalpy change in a reaction.*

   f. *How to use the Gibbs free energy equation to determine whether a reaction would be spontaneous.*

Reaction Rates

8. *Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules. As a basis for understanding this concept, students know:*

   a. *The rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time.*

   b. *How reaction rates depend on such factors as concentration, temperature, and pressure.*

c. The role a catalyst plays in increasing the reaction rate.

d. The definition and role of activation energy in a chemical reaction.

Chemical Equilibrium

9. Chemical equilibrium is a dynamic process at the molecular level. As a basis for understanding this concept, students know:

a. How to use LeChatelier's Principle to predict the effect of changes in concentration, temperature, and pressure.

b. Equilibrium is established when forward and reverse reaction rates are equal.

c. How to write and calculate an equilibrium constant expression for a reaction.

Organic and Biochemistry

10. The bonding characteristics of carbon lead to many different molecules with varied sizes, shapes, and chemical properties, providing the biochemical basis of life. As a basis for understanding this concept, students know:

a. Large molecules (polymers) such as proteins, nucleic acids, and starch are formed by repetitive combinations of simple sub-units.

b. The bonding characteristics of carbon lead to a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.

c. Amino acids are the building blocks of proteins.

d. The system for naming the ten simplest linear hydrocarbons and isomers containing single bonds, simple hydrocarbons with double and triple bonds, and simple molecules containing a benzene ring.

e. How to identify the functional groups which form the basis of alcohols, ketones, ethers, amines, esters, aldehydes, and organic acids.

f. The R-group structure of amino acids and how they combine to form the polypeptide backbone structure of proteins.

Nuclear Processes

11. Nuclear processes are those in which an atomic nucleus changes, including radioactive decay of naturally occurring and man-made isotopes, nuclear fission, and nuclear fusion. As a basis for understanding this concept, students know:

a. Protons and neutrons in the nucleus are held together by strong nuclear forces which are stronger than the electromagnetic repulsion between the protons.

b. The energy release per gram of material is much larger in nuclear fusion or fission reactions than in chemical reactions: change in mass (calculated by E=mc_) is small but significant in nuclear reactions.

c. *Many naturally occurring isotopes of elements are radioactive, as are isotopes formed in nuclear reactions.*

d. *The three most common forms of radioactive decay (alpha, beta, gamma) and how the nucleus changes in each type of decay.*

e. *Alpha, beta, and gamma radiation produce different amounts and kinds of damage in matter and have different penetrations.*

f. *How to calculate the amount of a radioactive substance remaining after an integral number of half lives have passed.*

g. *Protons and neutrons have substructure and consist of particles called quarks.*

OUTCOMES:

Students will demonstrate:

1. *Thorough understanding of the periodic table.*
2. *The ability to differentiate what types of bonds are in a compound.*
3. *The law of conservation of matter through calculations.*
4. *The effect the Kinetic theory has on the motion of atoms.*
5. *Acids, Bases, and salts have observable properties.*
6. *Solutions are affected by a variety of conditions.*
7. *Energy is gained or lost in almost all chemical reactions.*
8. *Reaction rates depend on a variety of factors.*
9. *Carbon molecules provide the basis for life.*
10. *Nuclear processes involve the decay of the atom.*

INSTRUCTIONAL STRATEGIES:
(i.e., Lectures, discussions, class projects, etc.)

The class will be a combination of: lectures, discussions, demonstrations, labs, power point presentations by teacher and students, virtual labs, videos, CD ROM's, etc.

ASSESSMENT:
(i.e., Exams, Standards Master, Portfolios, etc.)

Students will be assessed using traditional Exams, Homework assignments, Classwork assignments, Labs, Quizzes.