

**FRESNO CITY COLLEGE
COURSE OUTLINE**

Course Department and Number _____ <u>Chemistry 1A</u> Course Title <u>General Chemistry</u>	Program <u>Chemistry</u> _____ _____ Date: <u>March 6, 1996</u>																				
<table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Catalog Description:</td> <td><input checked="" type="checkbox"/> existing</td> <td><input type="checkbox"/> clarified</td> <td><input type="checkbox"/> revised</td> <td><input type="checkbox"/> new (check one)</td> </tr> <tr> <td>Prerequisite:</td> <td><input type="checkbox"/> existing</td> <td><input type="checkbox"/> clarified</td> <td><input checked="" type="checkbox"/> revised</td> <td><input type="checkbox"/> new (check one)</td> </tr> <tr> <td>Corequisite:</td> <td><input checked="" type="checkbox"/> existing</td> <td><input type="checkbox"/> clarified</td> <td><input type="checkbox"/> revised</td> <td><input type="checkbox"/> new (check one)</td> </tr> <tr> <td>Advisory:</td> <td><input type="checkbox"/> existing</td> <td><input type="checkbox"/> clarified</td> <td><input checked="" type="checkbox"/> revised</td> <td><input type="checkbox"/> new (check one)</td> </tr> </table> <p><u>5</u> unit(s) <u>3</u> lecture hour(s) <u>6</u> laboratory hour(s) <u>0</u> number of repeats (maximum=3)</p> <p>_____ credit/no credit only</p> <p>Prerequisite: High school chemistry with laboratory component, or Chemistry 3A or equivalent, and Math 3 or equivalent.</p> <p>Corequisite: None.</p> <p>Advisory: Eligibility for English A, 53, or 54D recommended.</p> <p>Description: Basic concepts; atoms, molecules, and ions; formulas and equations; gas laws; electronic structure of atoms; bonding; atomic orbital and molecular orbital theories; solutions; redox reactions; introduction to acids and bases; survey of radioactivity. (CAN CHEM 2)</p>		Catalog Description:	<input checked="" type="checkbox"/> existing	<input type="checkbox"/> clarified	<input type="checkbox"/> revised	<input type="checkbox"/> new (check one)	Prerequisite:	<input type="checkbox"/> existing	<input type="checkbox"/> clarified	<input checked="" type="checkbox"/> revised	<input type="checkbox"/> new (check one)	Corequisite:	<input checked="" type="checkbox"/> existing	<input type="checkbox"/> clarified	<input type="checkbox"/> revised	<input type="checkbox"/> new (check one)	Advisory:	<input type="checkbox"/> existing	<input type="checkbox"/> clarified	<input checked="" type="checkbox"/> revised	<input type="checkbox"/> new (check one)
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<p>Entry Level Skills: Upon entering the course, the student should be able to:</p> <ol style="list-style-type: none"> 1. employ context clues and affix analysis to determine meanings of unfamiliar words; use dictionaries; determine main ideas and literal meaning; identify important details; paraphrase reading selections; use inference to determine implicit ideas; draw conclusions based on inferences; understand reading selections using literal and inferential comprehension skills; 2. read actively by previewing, questioning, paraphrasing, and tracing clues that lead to implied meaning embedded in reading selections; 3. comprehend academic reading materials associated with success in degree-applicable courses; 4. write short compositions which limit subjects, unify content by common purposes or main ideas, adequately develop ideas, specify and supply details, use appropriate diction, and avoid extensive errors in grammar, usage, and mechanics; 5. demonstrate laboratory skills which include operating an analytical balance; calibrating and/or using fundamental lab equipment such as a thermometer, barometer, buret, pipette; performing simple glassworking techniques, recognizing use and limitations of laboratory glassware; recording and reporting observations; and using error analysis techniques to evaluate certainty of lab data; 6. define names, correctly spell, and identify symbols for the first 36 elements, the balance of the representative elements from periods, 5, 6, and 7 plus certain elements of general interest such as palladium, platinum, silver, gold, cadmium, mercury, molybdenum, tungsten, cerium, and uranium; 7. write and balance chemical equations, and to use these equations along with stoichiometry and the mole concept to convert grams of a given substance into grams of an unknown substance; 8. calculate molar masses, empirical formulas, and percentage composition given appropriate data; 9. solve linear and quadratic equations and systems of equations; 10. analyze and solve word problems using algebraic methods. 11. apply principles of algebra to simplify algebraic, exponential, and radical expressions; and 12. graph linear and quadratic functions. 																					
Requested Credit Classification (Applicant)	<input checked="" type="checkbox"/> Course contains an international component.																				
<input checked="" type="checkbox"/> Degree Applicable <input type="checkbox"/> Noncredit <input type="checkbox"/> Non-Degree Applicable <input type="checkbox"/> Revised																					

Expected Outcomes/Objectives: Upon successful completion of the course, the student will be able to:

A. General

1. demonstrate skills in observation, making decisions, drawing conclusions, and recognizing the probability of errors in one's work;
2. show an understanding of the history of chemistry and its development from the time of Plato and Democritus until that of Pauling, Alyea, and Seaborg;
3. enumerate several of the things around us that were made possible through the development of chemistry;
4. list the contributions made by early scientists who defined the chemistry we know today; and
5. do further study in chemistry or one of the related sciences.

B. Specific

1. define names and symbols of and correctly spell the representative elements;
2. identify the first ten transition elements and selected others as they are introduced and used in this course;
3. name inorganic compounds and the rules for these names;
4. predict ionic and covalent bonding between species;
5. convert from the English to the metric system in weights, volume, and linear measurements;
6. calculate molecular weights, formula weights, gas volumes, temperatures, pressures, concentration of solutions, molality, molarity, empirical and molecular formulas, and percentage composition;
7. solve redox equations and assign oxidation numbers;
8. define the structural periodicity of elements;
9. interpret the gradual change from metal to non-metal as one goes across the periodic form left to right;
10. discuss the trends in all directions on the periodic chart and the terms for grouping elements, i.e., metalloids, transition elements, inner transition, etc.;
11. apply the Arrhenius definition of acid and base;
12. solve limiting reagent problems involving molecular and ionic compounds as pure substances and as solutions;
13. describe covalently bonded structures using Lewis theory, valence bond theory (including hybrid orbitals), and molecular orbital theory of diatomic molecules;
14. define the theoretical and mathematical description of ideal gases, including the concepts of temperature and kinetic energy distribution;
15. describe colligative properties of solutions of ionic and non-ionic substances and solve their numerical problems;
16. solve thermochemical problems, including using Hess' Law and calorimetry;
17. demonstrate skills in laboratory in the use of the analytical balance, thermometer calibration and usage, barometer reading, glass working, the care of one's equipment, and the recognition that if an experiment is not correct, there must have been a mistake and how to find this mistake.

Texts, Other Readings, and Materials:

Text(s): Ebbing, Darrell, General Chemistry, Current Edition, Houghton Mifflin Co., Boston, MA.

Lab Manual: Roberts, General Chemistry in the Lab, Current Edition, W. H. Freeman & Co., New York, NY.

Optional: Ebbing, Darrell, D., Study Guide to General Chemistry, Current Edition, Houghton Mifflin Co., Boston, MA.

Ebbing, Darrell, D., Student's Solutions Manual/General Chemistry, Current Edition, Houghton Mifflin Co., Boston, MA.

Materials: Calculator with scientific notation

Safety goggles as specified by lab instructor

Periodic chart, by Sargent-Welch, Buffalo Grove, IL.

Lab supplies: matches, sponge, dish soap, towel

Primary College Level

Adoptions at major colleges and universities and by

Primarily not College Level

Professional Judgment

(How Determined)

Assignments:

6 hours per week (or equivalent)

Permissible exceptions to the common interpretation as stated are as follows: (AR 7200) (1) (2) (3) (4) (circle one)

List types:

1. Daily reading assignments pertaining to scheduled lecture material.
2. Reading of the assigned lab experiments.
3. Reading supplementary books listed to aid in problem solving and further explanation of the text and lab assignments.
4. Daily problem assignments pertaining to presented lecture or lab material.

Class participation and assignments require and develop critical thinking (see Expected Outcomes/Objectives). Describe how:

In order to prepare successfully for class discussions, lectures and evaluations, the student will be required to apply principles learned in readings and previous class sessions. To solve elementary chemistry problems, students must extend familiar principles and adapt them to new circumstances. Often they will be required to synthesize new concepts by extrapolating or combining older ideas.

Primarily College Level

Not Primarily College Level

2 hours of independent work done out of class per each hour of lecture or class work, or 3 hours lab, practicum, or the equivalent, per unit.

Ratio of amount of work per unit of credit required by curriculum committee for a non-degree credit course is met.

Assessment:

Grades will be based upon: A combined average of points accumulated on all exams, tests, and other assigned work.

ESSAY*

Assignments and tests consist mainly of reading and solving problems which do not involve significant use of detailed written explanations.

COMPUTATION*

NON-COMPUTATIONAL PROBLEM-SOLVING*

Examples: Applying previously learned chemical principles to explain or predict trends encountered in new situations.

SKILL DEMONSTRATION

Kind: Mathematical and reasoning skills, laboratory apparatus manipulation skills.

MULTIPLE CHOICE

OTHER: Completion type questions, lab reports, tests, check of lab work turned in from experiments.

*For degree credit: At least one of the first three boxes above must be checked, and if "essay" is not checked, it must be explained why essays are an inappropriate basis for at least 25% of the grade in the course.

Expanded Description of Content and Methods:

Content:

Each topic lasts for approximately one week.

A. Matter and energy

1. The Laws of conservation of matter and energy
2. States of matter
3. Chemical and physical properties of matter
4. Chemical and physical changes of matter

B. Atoms, molecules, ions, compounds, elements and mixtures

C. Measurements in chemistry

1. Length, mass, volume
2. Significant figures
3. Dimensional analysis
4. Density and specific gravity

D. Stoichiometry, chemical formulas, and equations

1. Formulas of compounds, etc., and what they mean
2. Atomic mass units and isotopes
3. The mole, Avogadro's Number, and molar mass
4. Formula weight, molecular weights, and moles
5. Percent composition and formula of compound
 - a. Empirical formula
 - b. Molecular formula
 - c. Empirical formula from the weight of the elements in a compound
6. Chemical equations and calculations based on these equations (stoichiometry)
Stoichiometry
7. Percent purity, yield, and limiting reagent in equations

E. Concentration of solutions

1. Percent by mass and volume
2. Molarity (M) molar concentration
3. Dilution of solutions

F. Physical behavior of gases

1. The relationship of pressure and volume; Boyle's Law
2. The relationship of volume and temperature. Charles' Gay Lussac Law
3. Temperature (Kelvin absolute scale)
4. STP-standard temp. and pressure
5. Combined gas laws and molar volume
6. MW calculation and Dalton's Laws of partial pressures
7. Graham's Laws of effusion

G. Atomic Structure

1. Fundamental particles of atom
2. History of atomic structure and fundamental particles
3. Atomic number and mass number
4. Nuclear stability and binding energy
5. Atomic spectra and the Bohr atom
6. Quantum numbers, orbitals, main shells and subshells

H. Chemical periodicity and ionic bonding

1. The periodic table
2. Periodic properties and trends
Ionization energy, electron affinity, electronegativity, and size
3. Metals, non-metals and metalloids

I. Chemical Bonding

- 1. Kinds of chemical bonds**
- 2. Ionic bonding, ionic changes, oxidation numbers**
- 3. The covalent bond**
 - a. polar and nonpolar bonds**
 - b. Lewis dot formulas**
 - c. Octet rule and its limitations**
 - d. basic notions of bonding theory and resonance**

J. Covalent bonding and molecular structure

- 1. VSEPR Theory and V.B. theory**
- 2. Geometry of molecules from VSEPR or V.B. theory**
- 3. Geometry of polyatomic ions**
- 4. The shape of molecular orbitals**
- 5. Energy level diagram of orbitals**
- 6. Homonuclear diatomic molecules**
- 7. Heteronuclear diatomic molecules**

K. Naming inorganic compounds

L. A systematic study of chemical reactions

- 1. Aqueous solutions, electrolytes, nonelectrolytes and extent of ionization**
- 2. Solubility rules**
- 3. Classification of chemical reactions**
 - a. combinations and decomposition**
 - b. single and double replacement**
 - c. metathesis or double replacement**

M. Solutions

- 1. Solutions Terminology**
- 2. Concentration units (mole fraction, molality, molarity)**
- 3. Dilution of solutions**

N. Colloids

- 1. Tyndall Effect**
- 2. Hydrophilic and hydrophobic colloids**
- 3. Removal of colloid particles**

O. Acids, Bases, and Salts

- 1. Arrhenius acids and bases**
- 2. Bronsted-Lowry acids and bases**
- 3. Properties of acids and bases**
- 4. Preparation of acids and bases**
- 5. Concentrations and acid-base reactions in aqueous solutions**

P. Oxidation Reduction Reactions

- 1. Assigning oxidation numbers**
- 2. Recognizing redox equations by change in oxidation state**
- 3. Balancing simple redox equations**

Q. Liquids and Solids

- 1. Liquid state, adhesive and cohesive forces**
 - a. Viscosity**
 - b. Surface tension**
 - c. Vapor pressure**
 - d. Boiling points and freezing points**
 - e. Heat transfer**

- 2. The Solid State**
 - a. Melting point**
 - b. Heat transfer**
 - c. Sublimation and vapor pressure**
 - d. Crystal structure and amorphous**
 - e. Bonding in solids**
 - f. Metallic bonding and Band Theory**

Methods:

- A. Lecture periods are used to discuss principles and to provide specific examples designed to promote better understanding. Out of class assignments may be discussed if appropriate. Also the lecture time may include: 1) formal lectures, 2) lecture demonstrations, 3) quizzes, examinations, and other evaluations of student performance, 4) directed reading activities, 5) review of principles and concepts.**
- B. Lab periods may be devoted to study and review of lecture material as well as evaluations of student performance; however, this time is primarily for students to carry out specific assigned chemistry experiments in the laboratory. Instructor demonstrations of chemical concepts and procedures are also appropriate in the laboratory period.**