FRESNO CITY COLLEGE
COURSE OUTLINE

Course Department and Number Chemistry 3A	Program Chemistry
Course Title Introductory General Chemistry (Formerly Chemistry 2A-2B)	Date: March 6, 1996

Catalog Description:	[ ] existing	[ ] clarified	[X] revised	[ ] new	(check one)
Prerequisite:	[ ] existing	[ ] clarified	[X] revised	[ ] new	(check one)
Corequisite:	[X] existing	[ ] clarified	[ ] revised	[ ] new	(check one)
Advisory:	[ ] existing	[ ] clarified	[ ] revised	[X] new	(check one)

4 unit(s) 3 lecture hour(s) 3 laboratory hour(s) 0 number of repeats (maximum = 3)

_____ credit/no credit only

Prerequisite: Math 1 or equivalent.

Corequisite: None.

Advisory: Math 3 and eligibility for English A, 53, or 54D recommended.

Description: Composition of matter and physical and chemical changes; fundamental laws and principles; atomic and molecular structure; acid-based theory, redox, and equilibria; qualitative and quantitative theory and techniques. For non-science majors. (CHEM 3A+3B = CAN CHEM SEQ B)

Entry Level Skills: Upon entering the course, the student should be able to:

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 inference; 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. do the order of operations and evaluate algebraic expression using signed numbers;
6. simplify expressions by using the rules of exponents;
7. solve systems of equations involving two variable by graphing, the addition method, and the substitution methods, and solve application problems by using at least one of these methods;
8. use algebraic methods to solve application problems of various types, including proportion, percent, variation and mixture problems;
9. graph points, lines, and simple polynomial curves, and solve inequalities of one variable;
10. solve linear and quadratic equations and systems of equations;
11. analyze and solve word problems using algebraic methods;
12. apply principles of algebra to simplify algebraic, exponential, and radical expressions; and
13. graph linear and quadratic functions.

Requested Credit Classification (Applicant) [X] Degree Applicable [ ] Noncredit [ ] Non-Degree Applicable [ ] Revised	[ ] Course contains an international component.

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

A. General
1. demonstrate an appreciation for the impact of chemistry on modern society with particular emphasis on the growth of chemical information by the scientific process;
2. define the interrelationships between chemistry, agriculture, medicine and the arts, and industry;
3. prepare for further studies in life sciences with regard to essential inorganic substances and basic physiological chemistry; and
4. demonstrate skills in making observations, drawing conclusions, using laboratory controls, and in recognizing error probability.

B. Specific
1. define names, correctly spell, and identify symbols for the first 36 elements, the balance of the representative elements from periods 5, 6, and 7, and certain elements of general interest such as palladium, platinum, silver, gold, cadmium, mercury, molybdenum, tungsten, cerium, and uranium;
2. use the periodic table to determine nuclear and atomic structures for elements;
3. demonstrate skills necessary to name inorganic compounds given their formulas, and write formulas given names;
4. predict the major bonding forces between atomic-sized particles;
5. write and balance chemical equations, and use these equations along with stoichiometry and the mole concept to convert grams of a given substance into grams of an unknown substance;
6. calculate molar masses, empirical formulas, and percentage composition given appropriate data;
7. classify types of matter (elements and compounds), to distinguish between mixtures and pure substances, and distinguish between physical and chemical properties or changes;
8. study the structural origin of chemical periodicity and distinguish and identify metals, non-metals, metalloids, alkali metals, alkaline earth metals, halogens, noble gases, transition metals, and elements of the lanthanide and actinide periods;
9. use the Arrhenius definition of an acid to identify acidic compounds and predict their behavior in aqueous solution;
10. calculate various parameters of solutions including molarity, dilution techniques, percentage concentration, and density;
11. interpret the energy of chemical reactions in terms of enthalpy and entropy changes and use thermodynamic concepts to calculate the enthalpy of reaction for a given process;
12. apply the principles of equilibrium in reversible reactions, saturated solutions, and solutions of weak electrolytes in solving related problems;
13. extend equilibrium concepts to interpret methods of evaluating the extent of reactions involving acids and bases;
14. determine the nature and applications for electron exchange reactions; and
15. demonstrate laboratory skills which include operating an analytical balance; calibrating and/or use 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

Texts, Other Readings, and Materials:

Text(s): Hardwick, E. Russell, and Bouillon, Joan, Introduction to Chemistry, Current Edition, Harcourt Brace Jovanovich College Department, Orlando, Florida.

Lab Manual: Rawate, Ph.D., Prabhu, Experiments for Chemistry 3A, Current Edition, Avante, Fresno, CA.
Jones & Bartlett, Laboratory Research Notebook, Current Edition, Jones & Bartlett Publishing, Boston, MA.

Optional: Hardwick, E. Russell, and Bouillon, Joan, Study Guide to Intro to Chemistry, Current Edition, H. B. Jovanovich College Department, Orlando, Florida.
Hardwick, E. Russell, and Bouillon, Joan, Student Solutions Manual/Intro Chem, Current Edition, Harcourt Brace Jovanovich College Department, Orlando, FL.

Materials: Calculator with scientific notation
Safety goggles as specified by lab instructor
Periodic chart, by Sargent-Welch
Lab supplies: matches, sponge, dish soap, towel

[X] Primarily College Level

[ ] Primarily not College Level

Adoptions at major colleges and universities and by 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. Periodic reading assignments (before lab class) pertaining to scheduled lab material.
3. Daily problem assignments pertaining to presented lecture or lab material.

[X] 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 in 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.

[X] Primarily College Level

[ ] Not Primarily College Level

[X] 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:

[ ] ESSAY*

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

[X] COMPUTATION*

[X] NON-COMPUTATIONAL PROBLEM-SOLVING*

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

[X] SKILL DEMONSTRATION

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

[X] MULTIPLE CHOICE

[X] OTHER: Describe
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:

A. Lecture

1. Introduction
2. States of Matter
3. Metric System
4. Atomic Structure
5. Chemical Periodicity
6. Ionic Bonding
7. Covalent Bonding
8. Nomenclature
9. Mole Concept
10. Formula Stoichiometry
11. Reactions and Equations
12. Equation Stoichiometry
13. Gas Laws and Kinetic Molecular Theory
14. Solids and Liquids
15. Solutes and Solutions
16. Heat of Reaction, Enthalpy, and Entropy
17. Reversible Reactions
18. Equilibrium Constants
19. Solubility Products
20. Acid-based Theory, Acidity Constants, and pH
21. Hydrolysis and Buffers
22. Oxidation-reduction Potentials
23. Electrochemistry

B. Laboratory: Each lab is approximately 3 hours.

1. Orientation, Safety, and Locker Check-in
2. Chemical Arithmetic
3. Chemical and Physical Properties and Changes
4. Properties of Gases
5. Properties of Liquids and Solids
6. Properties of Acids and Bases
7. Empirical Formulas
8. Ionic Reactions
9. Molar Volume of a Gas
10. Determining the Molar Mass of a Volatile Liquid
11. Stoichiometry: Preparation of a Salt
12. Hydrated Salts
13. Calorimetry: The Heat of combustion and the Heat of Fusion of Candle Wax
14. Standardization and Titration of Acids and Bases
15. Determining the Percentage of Sulfate in an Unknown Salt
16. Determining a Molar Mass by Freezing Point Depression
17. Oxidation-Reduction Studies: Determining Strengths of Reducing and Oxidizing Agents
18. Redox Titration

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.