CHEM A185: GENERAL CHEMISTRY B

Item	Value
Curriculum Committee Approval Date	12/04/2024
Top Code	190500 - Chemistry, General
Units	5 Total Units
Hours	162 Total Hours (Lecture Hours 54; Lab Hours 108)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)
Associate Arts Local General Education (GE)	• Area 5 Physical and Biological Sciences, Scientific Inquiry, Life Science (OB)
Associate Science Local General Education (GE)	• Area 5 Physical and Biological Sciences, Scientific Inquiry, Life (OSB)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5A Physical Science (5A) • Cal-GETC 5C Laboratory Activity (5C)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5A Physical Science (5A) • IGETC 5C Laboratory Activity (5C)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B1 Physical Science (B1) • CSU B3 Laboratory Activity (B3)

Course Description

Study of non-ideal solutions, chemical equilibria, thermodynamics, kinetics and nuclear chemistry. PREREQUISITE: CHEM A180. Transfer Credit: CSU; UC. C-ID: CHEM 120S as CHEM A180 and CHEM A185.**C-ID:** CHEM 120S as CHEM A180 and CHEM A185.

Course Level Student Learning Outcome(s)

1. Use unit equations and algebraic methods to solve computational problems in the areas of unit conversion, chemical equilibria, thermodynamics, electrochemistry, and kinetics.
2. Use equilibrium expressions and the principle of Le Chatelier to calculate the concentrations of species in chemical systems at equilibrium and to predict the changes that occur in response to perturbations to chemical systems at equilibrium.
3. Use the atomic theory and kinetic molecular theory to explain the properties of solids, liquids, gases, and solutions, and to describe the changes that occur on a molecular level as matter changes phases.
4. Apply thermodynamic properties such as enthalpy, entropy, and free-energy to describe the behavior, energy changes, and spontaneity of chemical reactions.
5. Apply safe and proper laboratory techniques to make accurate, reproducible measurements of masses and volumes, and accurate, reproducible experimental observations.

Course Objectives

- 1. Describe the meaning and common usage of terms important in general chemistry.
- 2. Explain observations which are new to them in terms of the principles of chemistry.
- 3. Use the important systems of chemical nomenclature to name compounds new to them; or given the name, write the formula.
- 4. Predict and write correct balanced chemical equations and properly interpret chemical equations.
- 5. Describe the nature of aqueous solutions and pertinent equilibria.
- 6. Analyze and solve unfamiliar chemistry problems in an organized and logical manner.
- 7. Correctly use laboratory equipment in a safe manner with good results.
- 8. Quantitatively evaluate precision and accuracy of experimental results.

Lecture Content

Lecture Topics : Relationships of freezing point, boiling point, osmotic pressure and vapor pressure of solutions to concentration; Raoult's Law and Henry's Law The symbolic expression of the equilibrium constant; combination of equilibrium constants, and the relationship of Kp to Kc Le Chatelier's Principle Calculations involving equilibrium constants; the distribution constant The material balance equation and the electrical neutrality balance equation Activity and activity coefficient; the equilibrium constant in terms of activities Equilibrium constants for acids and bases; definition and calculation of pH and pOH Calculations involving solubility products Calculations involving instability constants Definition and development of elementary thermodynamic concepts such as E, H, S, G, q, and w Thermodynamic calculations including the calculation of equilibrium constants Electrical cells, standard electrode potentials, and calculation of Qt and Kt using the Nernst Equation Introduction to chemical kinetics, the rate law and its determination Calculation of the rate law constant Enthalpy of activation Mechanism of reactions; postulation of mechanisms using the rate law Introduction to bonding theories for complexes including Ligand Field Theory Nuclear Chemistry Organic Chemistry

Lab Content

Laboratory Schedule for Chemistry A185 1. Preparation of potassium triiodide solution, sodium thiosulfate solution and starch indicator; titration of the sodium thiosulfate soln with the potassium triiodide soln; standardization of the two solutions using potassium dichromate 2. Determination of the percentage antimony by an iodimetric method 3. Determination of the percentage copper by an iodometric method 4. Determination of the equilibrium constant for: I2 + I- -> I3- 5. Use of the pH meter; determination of the thermodynamic acid constant of monoprotic acid, of the extent of ionization of a monoprotic acid, and variation of alpha with dilution; comparison of the buffering capacities of a buffer,

of a sodium hydroxide solution, and of water 6. Determination with a pH meter of the acid constants of a diprotic acid

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- Lab (04)
- DE Live Online Lab (04S)

Instructional Techniques

Lecture, demonstration, problem assignments, discussion, and laboratory experiments

Reading Assignments

Assigned reading from the course textbook and other appropriate sources - approximately 2-3 hours per week.

Writing Assignments

Experiments and exams will include some questions requiring the writing of sentence explanations and/or descriptions. Students will be expected to analyze questions and generate answers to them. Some answers will be in the language of mathematics and others will, as stated above, be in English. Some questions will require the use of principles to synthesize an answer which was not taught. Approximately 2-3 hours per week.

Out-of-class Assignments

Homework problem sets - approximatey 2-3 hours per week.

Demonstration of Critical Thinking

Skill demonstrations of laboratory procedures; exams including problem solving exercises; final exam

Required Writing, Problem Solving, Skills Demonstration

Experiments and exams will include some questions requiring the writing of sentence explanations and/or descriptions. Students will be expected to analyze questions and generate answers to them. Some answers will be in the language of mathematics and others will, as stated above, be in English. Some questions will require the use of principles to synthesize an answer which was not taught.

Eligible Disciplines

Chemistry: Master's degree in chemistry OR bachelor's degree in chemistry or biochemistry AND master's degree in biochemistry, chemical engineering, chemical physics, physics, molecular biology, or geochemistry OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Petrucci, R.H., Herring, F.G., Madura, J.D., Bissonnette, C. General Chemistry: Principles and Modern Applications, 11th ed. Pearson , 2017 2. Required Ashbaugh S., Bazell, A., Ezell, M., Gonzales, S., Johnson, S., Roundy, W., and Wylie, J.. General Chemistry Notes, 9th ed. Pearson, 2009 Rationale: .