CHEM 112: GENERAL CHEMISTRY II

Citrus College Course Outline of Record

Heading	Value
Effective Term:	Fall 2021
Credits:	5
Total Contact Hours:	180
Lecture Hours :	54
Lab Hours:	126
Hours Arranged:	0
Outside of Class Hours:	108
Prerequisite:	CHEM 111.
District General Education:	B2. Natural Sciences - Physical Sciences, B3. Natural Sciences - Laboratory
Transferable to CSU:	Yes
Transferable to UC:	Yes - Approved
Grading Method:	Standard Letter, Pass/No Pass

Catalog Course Description

A general course in the fundamental principles of chemistry. CHEM 112 is a continuation of CHEM 111 and includes topics of equilibrium, kinetics, acid-base chemistry, electrochemistry, nuclear processes, coordination chemistry and thermodynamics. 54 lecture hours, 126 lab hours.

Course Objectives

- Demonstrate an understanding of the concept of equilibrium. Solve problems involving aqueous and gaseous equilibria.
- Be able to use thermodynamic tables to determine thermochemical values for physical and chemical processes.
- Be able to solve problems involving mass defect and nuclear binding energy.
- Determine ages of artifacts using half-life.
- Demonstrate how the 1st, 2nd, and 3rd Laws of Thermodynamics as applied to chemical processes.
- Be able to use the equilibrium constant expression in a variety of problems. Solve problems using approximation.
- Be able to solve problems involving rates of reaction. Determine the rate law using the method of initial rates. Use the integrated rate law for simple processes. Write the rate law of reactions given the appropriate reaction mechanisms.
- Be able to solve equilibrium problems involving acids and bases. Solve titration equilibrium problems.
- Demonstrate an understanding of electrochemical processes. Solve problems involving the Nernst equation.
- Compare and contrast the Valence Bond and Crystal Field Models of coordination compounds.
- Be able to describe nuclear processes including alpha and beta emission and be able to balance nuclear equations.
- Be able to perform a variety of laboratory experiments including equilibrium studies, kinetic studies, various acid-base titrations, electrochemical studies, thermodynamic studies, gravimetric and volumetric analyses, and qualitative analysis of several inorganic ions.
- Be able to use the Arrhenius equation to determine various kinetic parameters and thermal rate constants.

Major Course Content

1. Thermodynamics, Free Energy
2. Rates of Reactions
3. Equilibrium, Equilibrium Constant Expression, Solve By Approximation.
4. Acid-Base Equilibrium, Titration Calculations, Ka, Kb, Kw
5. Aqueous Equilibrium, Ksp, K_f
6. Electrochemistry, Nernst Equation, Galvanic Cells, Electrolytic Cells, Batteries
7. Nuclear Processes, Nuclear Equations, Calculations of Kinetics and Energetics of Nuclear Processes
8. Coordination Compounds, Isomerism, Valence Bond and Crystal Field Theories

Lab Content

1. Calorimetry
2. Kinetics: Determination of a Rate Law and Activation Energy
3. Equilibrium Constant Determination
4. Back Titration of Antacid
5. Determination of Titration Curve using Volumetric Analysis
6. Thermodynamics of Solubility Equilibrium
7. Electrolytic Cells
8. Qualitative Anion and Cation Analysis
9. Spectrophotometric Analysis

Suggested Reading Other Than Required Textbook

None

Examples of Required Writing Assignments

1.) Completion of laboratory reports which include data presentation, calculations, and qualitative analysis.

Examples of Outside Assignments

1.) Preparation of laboratory notebooks, including answering pre-laboratory questions, data tables, appropriate headings and organization.
Here is an example of a pre-laboratory question:
"Will the recorded temperature change for an exothermic reaction performed in a metal calorimeter be greater or less than that in a Styrofoam 'coffee cup' calorimeter? Explain. Assume metal to be a better conductor of heat than Styrofoam."
2.) Working on problem sets in preparation for quizzes administered during the lab periods.
Here is an example of a problem set question:
"The solubility of Ag2CrO4 is 0.0030 g per 100. mL of water. From this information determine:
(a) its Ksp value;
(b) its molar solubility in 0.020 M AgNO3;

(c) its molar solubility in 0.020 M K2CrO4."

Instruction Type(s)

Lecture, Lab, Online Education Lecture, Online Education Lab

IGETC Area 5: Physical and Biological Sciences

5A. Physical Science, 5C. Science Laboratory