CEM 142 – General and Inorganic Chemistry

Description:
Kinetics; gaseous equilibria; acids and bases; pH; aqueous equilibria involving buffers, hydrolysis, and titrations; heterogeneous equilibria of weakly soluable salts; electrochemistry; coordination chemistry, stereochemistry, and bonding within the transition elements.
Credit:
3 credits (3 hours of lecture, 1 hour of recitation per week).
Prerequisite: CEM 141 or LBS 171. Not open to students with credit in CEM ~~151~~ 152 or
LBS 172.
Lecture Topics:
1.
Chemical Kinetics
Introduction; rates of reactions; rate equations
Integrated rate equations; half lives
Collision theory; effect of temperature; Arrhenius equation; catalysis
Reaction mechanisms; rate-determining step; steady-state approximation
2.
Chemical Equilibria
The equilibrium state; Q and K; LeChatelier's principle
Calculations involving equilibria; review of aqueous solutions; pH
Review of acids and bases and various definitions
Brønsted-Lowry equilibria for weak electrolytes
Hydrolysis of salts; polyprotic acids and bases
Common ion effect and buffer solutions; Henderson-Hasselbalch equation
Acid-base neutralization reactions
3.
Heterogeneous Equilibria
Solubility and solubility product; precipitation
Common ion effect; simultaneous equilibria; complex formation; effect of pH
4.
Thermodynamics and Equilibria
Review of the first law; heat capacity and specific heat
Second law of thermodynamics; entropy; third law of thermodynamics

Gibbs free energy; thermodynamics & equilibria; temperature dependence
5.
Electrochemistry
Oxidation and reduction; oxidation numbers; cells
Redox equations; half cells and half cell reactions
Half cell potentials; Nernst equation; cells, batteries, and fuel cells
Electrolysis; Faraday's laws
6.
Chemistry of the Representative Elements
The Periodic Table; Groups 1 through 3
Group 4
Groups 5 through 8
7.
Coordination Chemistry of the Transition Elements
Transition elements; coordination compounds; structure and isomerism
Ligands; valence bond theory
Ligand Field theory; magnetism and spectra
8.
Nuclear Chemistry
Radioactivity; nuclear decay; fission and fusion