Students

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Chemistry 154: Chemistry for Engineering

Course Level: First Year
Academic Year: 2014/2015

TEXTBOOK:

New Custom Edition for University of British Columbia for Chemistry 154(ISBN 13: 9780132898904) from General Chemistry (10 ed.): *Principles and Modern Applications* by Petrucci, Herring, Madura and Bissonette.

Chem 154 Laboratory Manual, by Nussbaum et al.,

The first half of this course is focused on an introduction to chemical ideas which are needed to understand the basic properties of materials. The second half of the course is an introduction to basic thermodynamic and kinetic ideas useful in working with chemical processes.
Note that the course is defined by the material covered in the lectures, which is not necessarily the same material as in the textbook.

Outline:

Reaction stoichiometry (Ch 4)

Periodicity (Ch 9)
Electronic Configurations of the Elements; periodic trends including atomic/ion sizes, ionization energies, electron affinity, electronegativity

Bulk Properties of Matter (Ch 12)
Gases; Liquids; Phase Diagrams

Intermolecular Interactions (Ch 10)
Bond Polarity; Bond Lengths; Molecular Polarity; Intermolecular Forces; van der Waals eqn of state; Lennard-Jones potential; dispersion forces; phase transitions & vapour/liquid equilibrium calculation

Principles of Chemical Equilibrium:(Ch 15, Ch 16, Ch 17 and Ch 18)
Solubility Equilibria; Acid-Base Theories; Acid-Base Equilibria; buffers; activity; TX & PX phase diagrams; due-point calculation

Thermochemistry and Thermodynamics (Ch 7, Ch 19)
First Law; Enthalpy; Standard State; Calorimetry; Hess's Law; Kirchoff's law; Standard Enthalpy of Formation; Entropy; Spontaneity in Chemical Reactions; Second Law; Third Law; Gibbs Free Energy; Spontaneity and Approach to Equilibrium

Kinetics (Ch 14)
Rate equation; zero, first and psuedo-first order; equilibrium; maximum conversion; catalysis

Electrochemistry: Batteries, Corrosion, Fuel Cells and Membrane Potentials (Ch 20)
Redox processes; Electrochemical cells; Nernst Equation; Applications of Electrochemical cells

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