

Chemistry 204

Physical Chemistry for Biological Sciences

January 2019 – April 2019

Instructor

Prof. Pat Kambhampati Otto Maass 423

Office Hours

Thursday 10:00-12:00 for PK

Lectures

M/W 4:05 – 5:25

Otto Maass 112

TA session

Tu 10:35 – 11:25

Otto Maass 112

Contacting me

- Please do use MyCourses to contact me using the email interface
- Please *do not* use my office phone/email unless it is a *real* emergency

Required Textbook

- Physical Chemistry: Principles and Applications in BioSciences, by I. Tinoco
- Available in the McGill Bookstore

Grading

- 20 / 20 / 10 % Midterm. Jan 30 / Feb 20 / March 27
- 50% Final Exam TBA
- Conflicts must be identified As Soon As Possible
- If you miss a midterm with a good excuse, the total will be re-weighted
- Exams are in class. Please note the McGill Honor Code.

Homework

Assigned, but will not contribute to final grade

Suggestions

- Briefly review the notes and textbook soon after class
- Read one day ahead of the lectures
- Do the homework problems
- Keep track of where we are in the course outline

Course Outline

I. Introduction: The Gas Laws

- Reading
- Ideal vs. Real Gas, Boyle's and Dalton's Laws
- Gas condensation & the Critical State
- Kinetic Theory of Gases: Maxwell Distribution Laws, Equipartition of Energy

II. The First Law of Thermodynamics

- Reading: Chapter 2
- Concepts of Work & Heat. Enthalpy, Heat Capacity
- Isothermal & Adiabatic Gas Expansion
- Thermochemistry, Bond Energies & Enthalpies

III. The Second Law of Thermodynamics

- Reading: Chapter 3
- Thermodynamic and Statistical Definitions of Entropy
- The Carnot Cycle, The 2nd Law of Thermodynamics, Entropy Changes

IV. Free Energy

- Reading: Chapter 4
- Gibbs versus Helmholtz Energies
- Phase Equilibria, Phase Diagrams, The Phase Rule

V. Ideal and Real Solutions

- Reading: Chapters 6
- Chemical potential, Thermodynamics of Mixing
- Solid-Liquid Phase Equilibria, Distillation
- Colligative Properties: Boiling pt. elevation, Freezing pt. depression, Osmotic Pressure

VI. Chemical Equilibrium and Bioenergetics

- Reading Chapter 6
- The Equilibrium constant: Effect of Temperature, Pressure and Catalysts

VII. Chemical Kinetics

- Reading: Chapter 9
- Reaction rates, 1st and 2nd order reactions, Theories of reaction rates