

**Chemistry 204**  
**Physical Chem./Biol.Sci. 1**  
**September 05, 2017 - December 07, 2017**

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**Instructor** Prof. Pat Kambhampati Otto Maass 423  
**Office Hours** Tuesday 10:00-12:00

**Lectures** M/W/F 12:35 – 1:25  
Otto Maass 10

**Contacting me**

- Please do use WebCT 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 / 20 % Midterm. Oct 2 / Oct 30 / Nov 27
- 40% Final Exam TBA
- Conflicts must be identified As Soon As Possible
- If you miss a midterm with a good excuse, the final will be re-weighted

**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
- Standard State in Biochemistry, Glycolysis

### VII. Chemical and Enzyme Kinetics

- Reading: Chapter 9
- Reaction rates, 1st and 2nd order reactions, Theories of reaction rates
- Enzymes: Michaelis-Menten and Steady-State Kinetics, Enzyme Inhibition