CHM328: Modern Physical Chemistry

Location: Lash Miller, Room 123
Dates and Time: Tuesdays and Thursdays, 3:00 pm - 4:00 pm

Instructor:

- Prof. Jeremy Schofield

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    - Office hours: Fridays, 3:00 pm - 4:00 pm

Overview:

CHM328 looks at macroscopic phenomena from a microscopic point of view and builds a bridge between the quantum mechanics of atoms and molecules studied in CHM225/CHM223 and CHM326 and the thermodynamic treatment of macroscopic systems studied in CHM225/CHM222 and CHM151/CHM139/CHM135.

Recommmended text: Levine, Physical Chemistry.

Grading

1. 3-4 problem sets   40%

2. Term Test 1   30%

3. Term Test 2   30%

TOPICS COVERED

1. Elementary kinetic theory of gases: Expression for pressure as function of mean square velocity, relation between pressure, energy and temperature, distribution of molecular velocities (Maxwell's derivation), elementary treatment of collisions, collisional activation theory of rates of reaction in the gas phase.

2. Foundations of statistical mechanics: Introduction to ensemble theory with emphasis on canonical ensemble, fluctuations, applications to non-interacting subsystems, ideal gases with and without internal structure, temperature dependance of heat capacity, equilibrium constants of reactions in gas phase, transition state theory of reaction rates in gas phase.

3. Thermodynamics of non-ideal systems: Phase diagrams of two-component systems, activities and activity coefficients of components in solution, the Gibbs-Duhem equation, thermodynamics of mixing, regular solutions.

4. Statistical mechanics of non-ideal systems: Mean field theory, mean field treatment of non-ideal solutions, phase separation and upper critical solution temperature.

Possibly Useful References

1. *Physical Chemistry*, Peter Atkins

2. *Physical Chemistry*, Berry, Rice and Ross