

## CHEM 250: Physical Chemistry I (Thermodynamics) (Fall 2023)

1. **Contact:** Professor Allan East, Room RI312. Office Hours: 13h30-14h30 MTWF, or by appointment. Don't be shy - I want to help! E-mail: [allan.east@uregina.ca](mailto:allan.east@uregina.ca).

2. **Text:** *Physical Chemistry*, P. Atkins and coauthor(s), 11th ed. (ch. 1-6 and 14). This textbook is also used for Chem360 - we're trying to save you money. Strongly recommended, as we follow it closely, and it has useful data tables needed for assignments.

3. **Grading Scheme:** Laboratory 20%, Problem Sets 10%, Midterm Exam 20%, Final Exam 50%. Any student who fails either the LABORATORY or FINAL EXAM components will fail the course with a grade of 45% or less.

Midterm exam: Oct. 26

Final exam: Dec. 19, 14h00-17h00, likely in the gymnasium.

4. **Laboratory:** Room LB308, lab instructor Andrew Chan (office LB321.2). Check his URCourses Chem250Lab page for information. Labs start the week of Sept. 4-8.

5. **Problem Sets:** Roughly 8 week-long ones, HAND-WRITTEN ONLY on lined paper and stapled together before handing in, in class or under my door. Show your work; in the math problems, show each step you can't do in your head. Remember: the point of assignments is to get practice for tests and exams, so I still recommend doing the math step-by-step on paper with an exam-type calculator.

YOU MUST AVOID PLAGIARISM or you will lose credit. Plagiarism is the act of COPYING: either a sequence of steps exactly or the answer itself, from another source (classmate or artificial intelligence!) tasked with the same question, and handing it in for credit. If you are only checking a source for help on how to START a problem, or for COMPARING to see if you are "on the right track" or not, that is okay with me. If you are copying things like a standard integral table result or an atomic mass, that is okay (and expected), but cite your source for any used integral result. My tips for how to work with a friend are:

- (i) try each problem at the same time but without consulting,
- (ii) if one is stuck, consult verbally first,
- (iii) IF you show your work to another student, DON'T LET IT LEAVE YOUR HANDS. THIS INCLUDES SENDING PHOTOS OF IT TO OTHER STUDENTS. This will tempt even the best of friends into plagiarism, and you both would be penalized.

6. **Lectures:** in classroom RI119 (near the Lab Cafe), TR 11h30. Bring a notebook to take notes - almost all lectures are planned as chalkboard lectures, and since the tests are hand-written, you need to practice writing step-by-step math examples.

7. **Class Outline:** see next page.

The following topics are planned:

Ch. 1. Properties of Gases (2 lectures)

- a) Perfect gases
- b) Real gases

Ch. 2. The First Law of Thermodynamics (4 lectures)

- a) Basic concepts: work, heat, energy
- b) Enthalpy, standard enthalpies of processes
- c) Numerical Examples: constant p, constant V, reversible

Ch. 3. The 2nd and 3rd Laws of Thermodynamics (2 lectures)

- a) Entropy and the Second Law
- b) Zero temperatures and the Third Law
- c) Gibbs and Helmholtz energies

Ch. 4. Phase changes, pure substances (1 lecture)

- a) Phase diagrams, Clapeyron equation

Ch. 14C. Molecular interactions (1 lecture)

- a) Surface tension, capillary rise

Ch. 5. Simple mixtures (7 lectures)

- a) Thermodynamics of mixing
- b) Colligative properties of solutions: freezing point depression, boiling point elevation
- c) Activities of solvent and solute
- d) Phase diagrams, binary (2-component) systems
- e) Phase diagrams, ternary (3-component) systems

Ch. 6. Chemical equilibrium and Electrochemistry (4 lectures)

- a) Equilibrium constant K, reaction quotient Q
- b) Le Chatelier's principle
- c) Electrochemical cells
- d) Standard potentials

Ch. 14DE. Macromolecules and self-assembly (2-3 lectures)

- a) Macromolecular structure
- b) Colloids and micelles (self-assembly)