Chemistry 161: Statistical Thermodynamics

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Sections and locations:

- Monday, 9 AM – 10:15 AM, Science Center 111
- Monday, 3 PM – 4:15 AM, Science Center 304
- Thursday, 4:30 PM – 5:45 PM, Science Center 110

Office hours: TBA

Course text: Fundamentals of Statistical and Thermal Physics by Reif

Course description
An introduction to statistical mechanics, thermodynamics, and chemical kinetics with applications to problems in chemistry and biology.

Prerequisites
Chem 160 or Phys 143a, or equivalent. Math 21a or equivalent. Familiarity with probability calculations and statistics is helpful.

Problem sets
Hand out on Tuesdays and due on the following Tuesday.

Grading

Homework (~ 1 set/week):	40%
In-class midterm exam (covers 1st half of the course):	30%
In-class final exam (covers 2nd half of the course):	30%

Tentative lecture schedule

Lecture 01: Introduction	
Lecture 02: Random walk	Reif Chapter 1
Lecture 03: Statistical description of systems I	Reif Chapter 2
Lecture 04: Statistical description of systems II	Reif Chapter 2
Lecture 05: Statistical thermodynamics I: the attainment of equilibrium	Reif Chapter 3

Lecture 06: Statistical thermodynamics II: thermal and mechanical interactions	Reif Chapters 2,3
Lecture 07: Statistical thermodynamics III: thermodynamic laws	Reif Chapter 3
Lecture 08: Statistical thermodynamics IV: thermodynamic functions and specific heat	Reif Chapters 3,5
Lecture 09: Statistical thermodynamics V: some biological applications	
Lecture 10: Statistical thermodynamics VII: heat engines	Reif Chapter 5
Lecture 11: Statistical mechanics I: statistical ensembles	Reif 6
Lecture 12: Statistical mechanics II: applications	Reif 7
Lecture 13: Statistical mechanics III: applications - Specific heat of solids	Reif 7
Lecture 14: Statistical mechanics III: applications - Specific heat of solids	Reif 7
Lecture 15: Statistical mechanics V: applications - polymer dynamics	
Lecture 16: Statistical mechanics VI: applications -polymer dynamics, chemical equilibrium.	Reif 8
Lecture 17: Chemical equilibrium and kinetics, transition state theory	Reif 8; Steinfeld *et al.* 10
Lecture 18: Transition state theory	Steinfeld *et al.* 10
Lecture 19: Transition state theory: applications	

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Policy for the use of AI

Certain assignments in this course will permit or even encourage the use of generative artificial intelligence (GAI) tools such as ChatGPT. The default is that such use is disallowed unless otherwise stated. Any such use must be appropriately acknowledged and cited. It is each student's responsibility to assess the validity and applicability of any GAI output that is submitted; you bear the final responsibility. Violations of this policy will be considered academic misconduct. We draw your attention to the fact that different classes at Harvard could implement different AI policies, and it is the student's responsibility to conform to expectations for each course.