

SYLLABUS

Required Text: *Physical Chemistry*, Raymond Chang, University Science Books

Recommended Supplement: *Solutions Manual for Physical Chemistry*, Leung and Marshall.

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GRADING. There will be a two-hour examination given on Friday, May 16 covering the material in Chapters 14,15,16,17 of Chang. This exam will be the final exam for the Chem. 261 people and one of three two-hour exams for the Chem. 260 people. The second two-hour exam will be given on Monday, June 2 and will cover the material in Chapters 2-6 and a third two hour exam will be given on Monday, June 16, covering the material in Chapters 6,9,10,12. In addition, there will be several quizzes and problem sets. For the Chem.261 people, the quizzes and problem sets will count 30 points and the final will count 70 points totaling 100 points. For the Chem. 260 people, the quizzes and problem sets will be 90 points and each two-hour exam will count 70 points, giving a grand total of 300 points.

REFERENCES:

Physical Chemistry, Peter Atkins, Seventh Edition. This text is the Standard nationally for the 300/400 level physical chemistry course.

Physical Chemistry-A Molecular Approach. Donald A. McQuarrie, John D. Simon. The principal competitor to Atkins 7th edition and the text used in the 400 level P.Chem course @ U of M.

Physical Chemistry, E.A. Moelwyn-Hughes, Second Edition. This is an advanced text, much of which will be intractable, but it is extremely well written and several sections are classics.

Advanced Mathematics in Physics and Engineering, Arthur Bronwell. Even though this is an old text, it is about as well written and as easy to understand as any I have come across.

Applied Mathematics for Physical Chemistry, Second Edition. James R. Barrante.

Physical Chemistry, Walter J. Moore, Third Edition. There is a fourth edition of this text that is excellent, but in my opinion, the third edition is considerably easier to understand and a better choice for 200-level students.

Subtle is the Lord — The Science and Life of Albert Einstein. Abraham Pais. An excellent biography of Albert Einstein, complete with lots of interesting physics.

Schrodinger-Life and Thought. Walter J. Moore. A fascinating biography with lots of good physics and physical chemistry.

Chemical Thermodynamics. M.L. McGlashan. A very sophisticated text but extremely well written and precise. In my opinion it is the best classical thermodynamics text around.

The Feynman Lectures on Physics. A marvelous three-volume discussion of virtually all of general physics .

GENERAL REMARKS. Chemistry 260/61 is a difficult course. It requires you to think in terms of calculus, trigonometry and intermediate algebra. You have to integrate, differentiate, use trig functions and logarithms, draw inferences from graphs, deal with exponentials as well as learn many abstract concepts. This, in turn, means that you can be quite proud of yourself if you get a good grade, but not feel too badly about yourself if you find that you are in over your head, as it were, and have to struggle to get a C. It also means that **you cannot get behind in your studies and expect to succeed by cramming the night before an exam. STUDY AND WORK PROBLEMS AT LEAST THREE HOURS EVERY DAY.** When you are studying, be active not passive. Ask yourself questions and answer your own questions by writing out the answers. Work all of the assigned problems. Ask questions during lecture and, if you are still unsure of a concept, discuss it with the GSI or with me during office hours and recitations. If you have difficulty working by yourself, form a study group with several colleagues. Over the years, I have found that this is a good idea and a good way to learn chemistry. Also, in order to make the course more interesting, I've selected several problems and applications from biology and medicine as well as biochemistry because many people in the class are biology majors, premed and pre-dent students as well as chemists and chemical engineers

There are several basic equations and ideas that I will assume you are more or less familiar with. These are:

Coulomb's Law: $V = Q_1Q_2/4\pi\epsilon_0r$, or, $F = -Q_1Q_2/4\pi\epsilon_0r^2$

Where V is the Coulomb Potential Energy, Q_i are the charges, r is the distance between the charges, ϵ_0 is the permittivity of a vacuum and F is the force of attraction or repulsion

The de Broglie equation: $p = mv = h/\lambda$

Where p is the particle's momentum, m is the particle's mass, v the particle's velocity, h is Planck's constant and λ is the wavelength of the particle.

The Heisenberg Uncertainty Principle: $\Delta p \Delta q \geq h/4\pi$

Where q is the particle's position and p is its momentum.

The Ideal Gas Law: $PV = nRT = [m/M] RT$

Where P is the pressure, V the volume, R the universal gas constant, n the number of moles, m the mass, M the molecular weight and T the temperature in Kelvins.

The basic equations of quantum theory and electromagnetic radiation: $E = h\nu$ and $\lambda\nu = C$ where ν is the frequency of the electromagnetic radiation and C is the velocity of light in a vacuum.

Syllabus Chem. 261/260

Day/Date	Topic/Chapter	Assignment
Wed. April 30	Chapter 1. Introduction, Chapt. 2, sect. 7-1, Chapter 3, section 3-8: Equipartition of energy and the Boltzmann Distribution Law. Chapt. 7, sect. 7- 1	With the exception of the Boltzmann Distribution Law and the Equipartition Principle, this will all be a review of concepts that you already know.
Fri., May 2	Chapter 14, <i>Quantum Mechanics and Atomic Structure</i>. Read 14.1-8, omit electronic spectra of polyenes, 9, 10 (form of solutions only), first three entries in Table 14.2, 11.	14:1-6,11,14,24,25,31,34,35,39,54
Mon. May 5	Chapter 15 <i>The Chemical Bond</i> Read 15:1-7 (omit 8,9,10)	15. 1,5,7,9,12,13,18.
Wed., May 7	Chapter 16 <i>Intermolecular Forces</i>	16.2-5,21
Fri., May 9-Wed., May 14	Chapter 17 <i>Spectroscopy</i> Read Sections 1-7	17.1-10,13-18,22,26
Friday, May 16. There will be a two hr. exam covering material in Chapters 14-17 + Boltzmann Distribution. This will be the final exam for the Chem. 261 people.		
Mon., May 19 — Fri., May 30	Chapter 2, <i>The Gas Laws</i>, sections 1-9, omit virial equation of state	2,4-8,12,30,42-44
	Chapter 4, <i>The First Law of Thermodynamics</i>	4-4,10,13,16,21,22,25,36,37,51,53,54
	Chapter 3, <i>The Kinetic Theory of Gases</i>, sections 1-4	3-6,13,41,42

	Chapter 5, <i>The Second Law of Thermodynamics</i>, Omit section 5-3. This section is the basis for much of mechanical and chemical engineering and the engineers have departed.	5-1,7,9,13,14,15,19,45
There Will be a 2 hr exam on Friday, May 30 Covering the material in Chapters 2-5		

Day/Date	Topic/Chapter	Assignment
Mon. June 2	Chapter 6. <i>Gibbs and Helmholtz Energies and their Applications</i>. Sections 1-5	6-1,3,17,18,19,21,
Fri. June 6	Chapt. 9, <i>Chem. Equilibrium</i>, sections 1-4, Begin Chapt. 10, <i>Electrochemistry</i>	9-1,2,8,9,12,13 10-1,2,8,9,11,13,27,28
Mon. June, 9-Fri. June 1	Chapt. 12, <i>Chemical Kinetics</i>	12-1-6,9,22,26,27,29,30
There will be a two hr. exam on Monday, June 16 covering the material in Chapters 6, 9,10,12		