

It is your responsibility to be aware of all announcements that may be made in class during this semester. If warranted by circumstances, the instructor may modify course policies during the semester.

CLASS	CHEM-5383-001 Physical Chemistry I MWF 11:00 AM-11:50 AM
ROOM	FOSC 157
INSTRUCTOR	W. Horsthemke Office: FOSC 313, Phone: 214-768-4241 e-mail: whorsthe@mail.smu.edu web page: http://faculty.smu.edu/whorsthe
OFFICE HOURS	Wednesday & Friday 2:00-3:00 PM, or by appointment
CELL PHONES	Cell phones must be turned off during class.
TEXT	P. Atkins and J. de Paula: <i>Physical Chemistry</i> , 8th ed. (W. H. Freeman and Company, New York, 2006) and the Solutions Manual are required. The core material is Chapters 1-7 and 22.
READING	You must read the assigned chapter of the text before coming to class. It is your responsibility to acquire the factual contents of the course. The lecture will highlight the essential information in the textbook. It will provide additional material where necessary, and focus on conceptual understanding and problem solving. Lecture notes are available for your convenience on the class web page, http://faculty.smu.edu/whorsthe/pchem1.html , but they are no substitute for regular class attendance. <i>Errors in the lecture notes, the textbook, or in the ancillary material are no excuse for mistakes on a test or the final.</i>
CALCULATOR	You need a simple "scientific" calculator for this class. Palm-size, laptop or other portable computing devices are not permitted during tests or the final. If the screen of your device is larger than 6 square inches or if the device has a (mini-) typewriter keyboard, the calculator will not be allowed. Sharing of calculators during tests or the final is not permitted.
ATTENDANCE	Regular class attendance is expected, and attendance will be monitored.
HOMEWORK	There is no graded homework for this class. However, for each chapter a certain number of Exercises and Problems are assigned, which are listed on the class web page http://faculty.smu.edu/whorsthe/pchem1.html .
TESTS & FINAL	There will be three tests and a final. All tests and the final are <i>closed book</i> and <i>no notes</i> . A formula sheet will be provided for each test, and a copy will be available approximately one week before the test on the class web page. You are allowed to use pen or pencil, eraser, and calculator (see above). Everything else , including <i>cell phones</i> which must be <i>turned off</i> , must be placed <i>under</i> the seat.

Exams must remain intact. All loose sheets will be collected immediately by the instructor.

Caps or sunglasses may **not** be worn during the tests and the final.

If you would like your test or the final returned, you need to pick it up in person in the instructor's office. During that conference, the instructor will discuss with you the test and the grading. If you have any concerns, *you must raise them at that time*. **Once you take the test out of the office, the score cannot be changed.** Also, if you pick a test up *after* the next test (or the final), the score cannot be changed.

The instructor will keep all tests and finals that are not picked up for *six* months after the end of the semester.

The **tests** will be **45 minutes long** and will be on the following Wednesdays during regular class hours:

Test 1 **Wednesday, September 23**

Test 2 **Wednesday, October 21**

Test 3 **Wednesday, November 4**

You must inform the instructor during the first two weeks of classes if any of these dates conflict with a University sponsored event, see POLICIES below.

*If a test cannot be given on its scheduled day due to circumstances beyond the instructor's control, it will take place on the following **Monday!***

No make-up tests.

You must take all tests and the final, unless you have a verifiable, legitimate reason for missing a test, e.g., a doctor's note. Otherwise, your score for the missed test or final will be a zero.

If you cannot take a test, you must contact the instructor as soon as possible.

If you miss a test for legitimate reasons, your grade for the missed test will be calculated by averaging the grade on the final and the grades on the tests you took.

The **final** will be on **Thursday, December 17, 11:30 AM–12:30 PM**, in **FOSC 157**. Make your plans accordingly. **You cannot take the final exam at any other time!** (Even if you have other finals on the same day.)

The final is ***one hour, closed book, no notes, non-comprehensive.***

The final will begin at *11:30 AM sharp*, and you are expected to be *punctual*. *It is your responsibility to know the date, time, and classroom of the final.*

If you cannot take the final for legitimate reasons, you must contact the instructor as soon as possible. A make-up final will be given during the second week of the Spring semester or at another mutually acceptable date.

DROP

If you are unable to complete this course, it is **your** responsibility to formally drop this class. The last day to drop a course is Tuesday, November 10, 2009.

INCOMPLETE	<p>The SMU Undergraduate Bulletin stipulates that “A student may receive a grade of Incomplete (I) if the majority of the course requirements have been completed with passing grades but for some justifiable reason, acceptable to the instructor, the student is unable to complete the full requirements of the course. In accordance with University policy, at the time an Incomplete is given the instructor must stipulate in writing to the student and to the University Registrar the requirements and completion date that are to be met and the grade that will be given if the requirements are not met by the completion date. The maximum period of time allowed to clear the Incomplete grade for an undergraduate course is 12 months.”</p> <p>A grade of Incomplete (I) will be assigned only if you have taken <i>at least</i> two tests resulting in an overall grade of <i>at least</i> a C–, and you have missed the final for legitimate reasons.</p>
COURSE GRADE	<p>The final course grade will be based on the scores of the three tests and the final:</p> $\max\{0.25 \times (\text{test 1} + \text{test 2} + \text{test 3} + \text{final}), 0.16 \times \text{worst test} + 0.28 \times (\text{best test} + \text{second best test} + \text{final})\} = \text{course score}$ <p><i>No test score will be dropped.</i></p> <p><i>No work other than the tests and the final can be considered for the final grade. Extra work for extra credit cannot be accepted.</i></p> <p>Grades will be assigned according to the break-point system: The highest cluster will receive an A, if students in that cluster have demonstrated consistent mastery of the key concepts and objectives. Lower grades will be assigned to the other clusters and will be based on the difference in score with the highest cluster.</p>
POLICIES	<p>1. Disability Accommodations: If you need academic accommodations for a disability, you must first contact Ms. Rebecca Marin, Coordinator, Services for Students with Disabilities, 220 Memorial Health Center, 214-768-4557, to verify the disability and to establish eligibility for accommodations. Then you should schedule an appointment with the instructor as soon as possible, but no later than two weeks before the first test, to make appropriate arrangements.</p> <p>2. Religious Observance: Religiously observant students wishing to be absent on holidays that require missing class should notify the instructor in writing at the beginning of the semester, and should discuss, in advance, acceptable ways of making up any work missed because of the absence.</p> <p>3. Excused Absences for University Extracurricular Activities: Students participating in an officially sanctioned, scheduled University extracurricular activity will be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work.</p>

4. Policy on Academic Dishonesty: All work undertaken and submitted in this course is governed by the University's Honor Code. Students who violate University rules on academic dishonesty (the SMU Honor Code) are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on academic dishonesty will be strictly enforced. You agree to abide by the SMU Honor Code, though there may not be a specific pledge on a test or final.

CHEM 5383 Physical Chemistry I: Key Concepts and Objectives

Concepts:

system, environment

thermodynamic equilibrium

equation of state

critical point, phase change, phase diagram, phase rule

state function, path function

reversible, irreversible

isotherms, adiabats

work, heat, internal energy, heat capacity, enthalpy, entropy, free energy, Helmholtz free energy, Gibbs free energy, Maxwell relations, chemical potential, standard state, fugacity

elementary reaction; reaction step; mechanism; rate law; rate equations

Objectives:

You should be able to use the methods of equilibrium thermodynamics and chemical kinetics to describe the properties and processes of macroscopic systems.

1. You should understand the critical point of a fluid and be able to work problems related to the critical point.
2. You should understand the relation between heat, work, and internal energy, and be able to calculate amounts of heat and work and internal energy and enthalpy changes for nonchemical processes in simple systems.
3. You should be able to calculate enthalpy and internal energy changes for chemical reactions.
4. You should understand the physical meaning of the entropy of a system, understand the use of the second law to determine whether or not a process is spontaneous, and be able to calculate entropy changes for a variety of systems and processes.

5. You should understand the physical meaning of the various free energies and be able to calculate changes in a free energy for various processes.
6. You should understand the role of the chemical potential in phase equilibria and be able to determine the equilibrium state of a multiphase system and to calculate phase boundaries.
7. You should be able to calculate the chemical potential of a solute or solvent.
8. You should understand the thermodynamic origin of equilibrium constant expressions and be able to carry out equilibrium calculation on various kinds of chemical systems.
9. You should be able to formulate rate equations for a given mechanism and solve them.

Problem Solving Strategy

(adapted from G. Polya, "How To Solve It", 2nd ed., Princeton UP, Princeton 1973)

- Read the problem.
- Read the problem again.
- Understanding the problem
 - Identify the actual problem.
 - What is the area of the problem (e.g., molecular motion)?
 - What is (are) the unknown(s)? (Make a list if more than one)
 - What are the data? List them.
 - What are the conditions?
- Devising a plan
 - Introduce suitable notation. (Draw a picture.)
 - Have you seen the problem before? In a different form?
 - Do you know a similar problem, a related problem having the same unknown(s)?
 - Look at the unknowns and list all equations, relations, theorems, etc., that you know and that have to do with the unknowns. (Carefully state all the limitations of the equations, e.g., only for ideal gas.)
 - Could you solve a simpler problem, a more special problem, a more general problem, part of the problem?
 - Could you restate the problem?
 - Could you work backwards from the unknowns to the data?
 - Did you use all the data?
 - Are there too many data, not enough data?
 - Did you take into account all special conditions?

- Carrying out the plan
 - Check each step (e.g., dimensional analysis).
 - Can you see clearly that the step is correct?
- Checking the solution
 - Does the result make sense (correct units, correct sign, order-of-magnitude of the numerical value is reasonable)?
 - Can you check the result, e.g., can you derive it differently?
 - Can you check some (easy) special cases?