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Chemistry 341
MTWRF 9:30-10:30 & by appt.

Millersville University,Fall 2008
STB 214, 872-3661

Physical Chemistry I

Course Materials:

TEXT: *Physical Chemistry*, 4th ed., Keith J. Laidler, John H. Meiser, & Brian C. Sanctuary, Houghton-Mifflin, 2003.
COURSE NOTES & LABORATORY MANUAL: Available from the instructor at a cost of $5.00.
A CALCULATOR that has log, ln, 10^x (antilog), and e^x functions.
LABORATORY NOTEPAD: 8.5 X 11", alternating white and carbonless copy pages.
LABORATORY SAFETY GOGGLES: Available in the bookstore. You **must** wear goggles whenever you are in laboratory, even if just visiting.

Tentative Course Schedule

Chapt	T O P I C
1.	Physical Chemistry / Gases
2.	First Law of Thermodynamics
3.	2nd & 3rd Laws of Thermodynamics
4.	Chemical Equilibrium
5.	Phases & Solutions
6.	Phase Equilibria
7.	Solutions of Electrolytes

Guaranteed Letter Grades

(Course total = 1000 points)

			"+"	"–"
A	90%	900 points		
B	80%	800 points	"+"	"–"
C	70%	700 points	_7	_0
D	60%	600 points	_8	_1
F	<60%	<600 points	_9	_2

Problem Assignments: Daily problem assignments will be noted on the solutions to the previous set of problems. They are due at the **start** (no exceptions) of lecture the next time class meets. Solutions will be available at that time, and thus late problem assignments will **never** be accepted. Problem assignments are checked for an honest attempt on your part to work every problem (copied solutions do not count) and marked on a scale of 3, as follows:

3 = all problems attempted, most correct
2 = most problems attempted, some correct
1 = few problems attempted, few correct
0 = assignment not turned in or turned in late

Restating a problem is *not* an honest attempt. You must show some progress toward a solution. Assume problem sets will be collected daily. At the end of the semester, your total problem set score is scaled to a basis of 100 points. When letter grades are assigned, your course total percentage will never be raised above your total problem set percentage. (Thus, if you earn 694 points total for the course, but your problem set percentage is 65%, you cannot receive a grade of "C".) **Format:** on 8.5" X 11" paper with *no* ragged edges (**remove** the little nibs); in pencil in the order assigned; neatly and legibly done; they can be on both sides of the paper. Usual prohibitions regarding plagiarism apply.

Lecture Notes: Copies will be available the first day of lecture. They total more than 100 pages for the course. The cost for them (and the lab manual together) is $5.00 for the semester. These funds are used to pay for the cost of printing and binding and to purchase incidental lab supplies (batteries, mineral oil, etc.). You should read the lecture notes and the appropriate pages in the text *before* coming to lecture. We will discuss the material included in about eight pages of text each day of lecture. But be familiar with the entire chapter before we begin its study in lecture. As the semester progresses, the lectures notes on any topic may be revised. Gratis copies of revised versions are available to you in class. Questions or comments you have regarding existing or revised notes are welcome.

Tests: There will be eight 25-minute tests, closed book, closed notes, on the dates noted on the calendar. Each test is worth 50 points and is given at the beginning of the hour. The tests concentrate on the material covered in the problems, and also include other material discussed in class. Tests will emphasize answering questions and solving problems rather than derivations. However, you *will* be asked to derive some important expressions. You are responsible for **all** material covered to date in class; not just that since the previous test. You may bring one 3 ∞ 5 card on **one side** of which you have written all you believe you need to know. This card is to be signed (by you) and turned in with your examination. No 3 ∞ 5 card will be permitted for the final examination. You are responsible for all material covered in lecture, all material assigned in the text, all problems in any way similar to those assigned, and all material in the lecture notes.

Preparation and Diligence: The key to success in physical chemistry is that you have an adequate background and that you study the material conscientiously. If you lack and of the prerequisites for the course, and have not rectified this deficiency through vigorous self-study, physical chemistry will be very difficult. Every student should be prepared to spend *at least* three hours outside of class in study and problem solving between each class meeting.

Review: I plan to work through one of the assigned problems (chosen by majority vote) at the beginning of each class. You still must work all problems, and hand in your problem solution attempts at 11:00 a.m. Problem assignments handed in by 10:30 a.m. at my office, will be marked and handed back at 11:00 a.m.

Course Grading: In order to pass the course, you must perform all experiments, turn in all lab reports, and earn a lab grade of 60% (150 of 250 points) or more. You must also earn a test grade of 50% (200 of 400 points) or more.

Laboratory	250 points
Eight tests (50 points each)	400 points
Final examination	200 points
Summer review problems	50 points
Problem assignments	100 points
TOTAL	1000 points

Warning: Physical chemistry is a very personal class. I will quickly know your strengths and weaknesses. It will be difficult to hide as you may have done before in larger classes. (I may not *seem* to know you simply because learning names does not come quickly to me.) In order than this amount of attention can be paid to your learning the subject, I will not prompt you to follow procedures. Do not expect warnings to turn things in on time, follow the correct format in writing reports, etc. If you do not understand something, you are expected to ask a question.

Course Policies: If you have an objection to any aspect of the course, please communicate it (anonymously or otherwise) to the instructor. Because of "academic freedom," neither department chair nor dean can do as much to help. A Macintosh computer and a PC are available in the Physical Chemistry laboratory during the semester for your convenience with spreadsheets and word processing. If you treat them with care, they will remain. If they are abused, they will be placed elsewhere.

Absences: **YOU ARE RESPONSIBLE** for obtaining the notes for any class you miss, whether your absence is excused or not. You must arrange to make up any missed work. Absences may be excused for university-sponsored events, jury duty, military duty, death or critical illness in immediate family, or personal illness. Support each request for excuse with a written statement of the absence's reason, signed by the responsible person (coach, faculty member, judge, commander, physician), including that person's phone number. Except for death or illness, requests for excuse must be presented before the date of the anticipate absence. An excuse for personal illness is granted if a physician states you were too ill to come to class.

First Problem Assignment: All problems from Laidler, Meiser, & Sanctuary (LMS), unless otherwise stated. LMS: 1.2, 1.7, 1.10, 1.14, 1.15, 1.21. AND α. "If you did not do the summer problem assignments, work & hand in the first fifteen of all of those problems for Wednesday." (If you handed in your assigned summer problems by 11:00 a.m. on Monday 25 August 2008, you earned 50 points.). You are excused from summer problems if you scored 70% on the last test.

Objectives: At the conclusion of this course, you should have attained the following objectives, in addition to the competence implied by the laboratory goals. You should be able to explain physical and chemical phenomena in the language of elementary chemical thermodynamics or kinetic molecular theory, as appropriate. These explanations should be understandable to a beginning college sophomore. You should be able to solve problems involving the material of elementary chemical thermodynamics and elementary kinetic molecular theory, clearly stating your assumptions and justifying both those assumptions and the method of solution you have chosen. These solutions should correctly incorporate mathematics as sophisticated as integral calculus. For problems that you cannot solve, you should be able to suggest several plausible lines of attack. You should be able to find the data you need to solve problems in standard literature sources. You should be able to perform simple derivations of formulas, but more importantly, you must understand the limitations of the formulas you learn & use. You should be able to clearly communicate laboratory results.

Plagiarism: You have plagiarized when you submit someone else's work as your own. This includes copying lab reports or problem assignments without giving credit. University policy stipulates that any penalty for plagiarism becomes part of your official record. The penalty ranges from zero for the assignment plagiarized to a course grade of F. We may refer both parties (the copier and the one copied from) for appropriate action, since we cannot tell which one copied. However, we encourage working together on problems. To protect yourself from the charge of plagiarism, simply write, either: "I received help from Joe Smith on this part," or "I helped Sue Jones on this part."

Chemistry 341 — 13 July 2008 version — Fall 2008 Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
25| **1.** PhysGases	26| **Lib**rary & **Stat**istics	27| **1.** PhysGases (Library due 5 Sept; Statistics due 2 Sept)	28|	29| **1.** PhysGases
1| LABOR DAY HOLIDAY!	2| **Den**sity RPT**Stat**	3| **1.** PhysGases	4|	5| **1.** PhysGases RPT**Lib**
8| **1.** PhysGases **TEST** NFV**Den**	9| **Vi**scosity or **Du**mas	10| **2.** 1st Thermo RPT**Den**	11|	12| **2.** 1st Thermo
15| **2.** 1st Thermo NFV**ViDu**	16| **P**artial **M**olar **V**olume	17| **2.** 1st Thermo RPT**ViDu**	18|	19| **2.** 1st Thermo **TEST**
22| **3.**2nd&3rd Law	21| **P**artial **M**olar **V**olume	22| **3.**2nd&3rd Law	23|	24| **3.**2nd&3rd Law
29| **3.**2nd&3rd Law NFV**PMV**	30| **Sur**face **T**ension**TEST**	1| **3.**2nd&3rd Law RPT**PMV**	2|	3| **3.**2nd&3rd Law
6| FALL	7| BREAK	8| **3.**2nd&3rd Law NFV**SurT**	9|	10| **4.**ChemEquil RPT**SurT**
13| **4.**ChemEquil	14| BREAK **Dis**tribution **C**oef.	15| **4.**ChemEquil **TEST**	16|	17| **4.**ChemEquil
20| **4.**ChemEquil	21| **Dis**tribution **C**oef.	22| **5.**Phases&Soln	23|	24| **5.**Phases&Soln
27| **5.**Phases&Soln **TEST** NFV**DisC**	28| **T**ernary **P**hase **D**iag.	29| **5.**Phases&Soln RPT**DisC**	30|	31| **5.**Phases&Soln
3| **5.**Phases&Soln NFV**TPD**	4| **Bomb** & **ΔH**vap	5| **6.**PhaseEquil RPT**TPD**	6|	7| **6.**PhaseEquil **TEST**
10| **6.**PhaseEquil	11| **Bomb** & **ΔH**vap	12| **6.**PhaseEquil	13|	14| **6.**PhaseEquil
17| **7.** Electrolytes	18| **Bomb** & **ΔH**vap	19| **7.** Electrolytes	20| RPT**N2L**	21| **7.** Electrolytes
24| **7.** Electrolytes **TEST**	25| RPT**N2L** **Bomb** & **ΔH**vap	26| THANKS-	27| GIVING HOLIDAY!	28| BREAK
1| **7.** Electrolytes	2| **Bomb** & **ΔH**vap**TEST**	3| **7.** Electrolytes	4|	5| **7.** Electrolytes
8| **7.** Electrolytes NFV**Last**	9| **R E S T R**	10| **FINAL U C T U R E**	11| at 8:00 a.m. **D W E E K**	12| on **Friday**

THE SCHEDULE FOR LABORATORY REPORTS FOLLOWS.

1. Near final versions (NFV) of lab reports are expected by 11:00 a.m. on the Monday following completion of the experiment. If the NFV is received by 11:00 a.m. on one day, the corrected version will be available by 9:30 a.m. the next day. The NFV version is due at 11:00 a.m. the next Wednesday for those in the Thursday lab section.
2. The final version of a given laboratory report is due in class at 11:00 a.m. on the next Wednesday (RPT), six class days after the completion of the experiment; for Thurs. lab, final versions are due 11:00 a.m. Friday.
3. Calendar indications are for Tuesday lab. Penalties for late reports are discussed in the laboratory manual.
4. The next-to-last (**N2L)** laboratory report is due at 11:00 a.m. on Tues. **25** November. The last lab report is due at 11:00 a.m. on Wed. 10 Dec. The **absolute deadline** for all reports is 11:00 a.m. on Wed. 10 December.

End of Course Reports Two reports are due at the end of the lab course. The **first** is a "critique" of the physical chemistry laboratory that answers several questions. Has the lab course fulfilled its goals? Within the limitations imposed by scheduling, available equipment, etc., do you have any suggestions for improvement? Which experiments are good and which should be replaced (and with what)? The **second** is a proposed laboratory experiment. This experiment should follow closely the format of the experiments in this manual; use readily available apparatus; and, if possible, deal with the material of Physical Chemistry I. Although both of these reports are due at the end of the course (the last class meeting before finals week), you certainly can work on them much earlier and hand them in.

Physical Chemistry I Laboratory

Tentative Schedule——Fall 2008

Paragraph numbers in this tentative schedule of experiments refer to weeks in the term.

1. Introduction to scientific literature, the use of the library, and experimental uncertainty.
   a. Presentation of proper format for scientific reports: (a) Title, (b) Abstract, (c) Introduction, (d) Experimental, (e) Calculations, (f) Results and Conclusions, (g) References, (h) Acknowledgements.
   b. Propagation of uncertainty. Proper presentation of data and results.
2. Determination of the density of a solution as a function of concentration—Laboratory experiment.
3. Determination of the viscosities of liquids at various concentrations and temperatures—Laboratory experiment. Each pair of students will determine the viscosities of liquids at two temperatures.
4. Determination of the partial molar volume of a two-component system as a function of concentration—Laboratory experiment. Each student pair is assigned, or will choose, different pairs of components (such as, CH_3OH–H_2O, HCOOH–H_2O, CH_3OH–HCOOH, CH_3COOH–H_2O, CH_3OH–CH_3COOH, etc.). After calibrating pycnometers, they measure the densities of a range of concentrations (expressed as mole fractions) of thermostatted solutions.
5. Continuation of week 4.
6. Determination of surface tension by capillary rise or tensiometry—Laboratory experiment.
7. Distribution of an organic acid between H_2O and an organic solvent, perhaps as a function of temperature—Laboratory experiment. Make sure to carefully read the laboratory write up and to understand the three equilibria that are occurring.
8. Continuation of week 7.
9. Determination of a liquid phase diagram—Laboratory experiment.
10. Determination of the heat of isomerization by bomb calorimetry—Laboratory experiment.
11. Continuation of week 10.
12. Determination of the enthalpy of vaporization of a liquid—Laboratory experiment.
13. Continuation of week 12.
14. Continuation of week 13.

"Spell Checkers" by Jerrold Zar

Journal of Irreproducible Results, Jan-Feb, 1994. reprinted in *Chemical and Engineering News*, 1 August 1994, p. 56

eighth verse

To rite with care is quite a feet
Of witch won should bee proud
And wee mussed dew the best wee can,
Sew flaws are knot aloud.

ninth verse

Sow ewe can sea why aye dew prays
Such soft wear for pea seas,
And why I brake in two averse
By righting want to please.