

**Physical Chemistry I**

Instructor	Prof. Tom Trainor
Office	REICH 176, Tel: 474-5628
Email	tptrainor@alaska.edu
Class meeting	Monday, Wednesday, and Friday 10:30 - 11:30 AM, REICH 165
Lab	Tuesday 11:30 – 2:30 REICH 245
Office hours	Tuesday, Thursday 10:00 - 11:30 AM, and by appointment.
Text	Atkins and DePaula, Physical Chemistry

**Course Overview:** Chemistry 331 is the first semester of a two-semester series in physical chemistry. The course will cover principles of thermodynamics and kinetics with applications to phase equilibria, solutions, chemical equilibrium and electrochemistry.

**Prerequisites:** CHEM F106X, MATH F252X, PHYS F104X or PHYS 212X.

**Learning Outcomes:** At the end of the course students will have an understanding of thermodynamic and kinetic principles, their mathematical development, and application to chemical problems.

**Course structure:** The course primarily follows your text, in the order described in the attached schedule of topics. During Monday and Wednesday classes I will lecture on the material in the book. Reading the book before the lectures will be important for following and understanding the lectures. The Friday classes are a combination of lecture and in-class quizzes. These Friday quizzes are an important part of the course as they will help you to stay current with and to understand the material of the course. This course also has a laboratory section to give examples of in-class concepts.

**Exams, Quizzes, & Grading:** Your course grade will be based on the total points of the hour exams, the final exam, the quiz scores, and possibly extra credit exercises. Material assigned in readings, in lecture, or in homework problems may appear on an exam. The maximum number of points for each is given below:

Exercise	Points
Hour exams 100 pts each	300
Final exam	100
Quizzes	100
Labs	150
<b>Total</b>	<b>650</b>

Make-up exams will be allowed if you have a good reason. If you anticipate an absence (work commitments, intercollegiate sports), talk to me **before** the exam to make arrangements. If the absence is unexpected (illness, family or personal difficulties), *talk with me at the earliest possible opportunity*. Students with documented disabilities who may need reasonable academic accommodations should discuss these with me during the first two weeks of class. You will need to provide documentation of your disability to Disability Services in the Center for Health and Counseling, 474-7043, TTY 474-7045

**Homework:** Homework and in-class quizzes are a critical aspect of learning physical chemistry. Every week you will be assigned 3 to 6 homework exercises. These homework exercises are not graded (you do not have to turn them in), and you will be provided with homework keys. If you attempt a problem but don't get an answer, see me for help. A few of these exercises are selected to improve your mechanical skills and also help you to find the right formula to apply to a problem. Many of the problems will be conceptual in nature. These questions address the theoretical connections between various physical chemistry problems.

**Working in groups:** While working on your homework and/or preparation for Friday quizzes, you may work in groups. In fact, working in groups usually results in faster and deeper learning. Whether you work in a group or alone, you must take the exams and quizzes alone. Copying the solution of another student is not working in a group and will lead to a hole in your understanding that will appear in your exam and quiz performance. My advice is to work in groups but don't cheat yourself.

**Quizzes:** The quizzes will be given during class, and will be about 15 minutes in length. You are permitted to use a calculator, and a formula / unit sheet (distributed with the quiz). The formula / unit sheet will have all appropriate formulae as well as numerical values for constants and unit conversions. The quizzes will be on all Fridays except those during the week of an hour exam or a holiday. See the calendar for exact dates. The purpose of the quiz is to provide a frequent check on learning progress. Doing the homework diligently is the best way to assure good grades on the quizzes, and past experience has shown that good quiz grades translate to good course grades. There will be no makeup quizzes, but your two lowest quiz grades will be dropped.

**Exams:** The exams will be given during class, and will be one hour in length. You are permitted to use a calculator, a unit sheet (distributed with the exams), and one sheet of paper (8.5"x11") containing only formulas. You should continually prepare this sheet as you study the material. Don't copy your friend's sheet. Preparing and organizing material is essential. Your formula sheets will be collected with the exam. Chemistry Department regulations require that any student caught cheating on graded work will be assigned a course grade of F.

Course drop forms will not be signed in these cases. The exams will be given on the following (tentative) dates.

<b><u>Exam</u></b>	<b><u>Material Included</u></b>	<b><u>Date</u></b>
1	Weeks 1-4	28-Sep
2	Weeks 5-7	19-Oct
3	Weeks 8-11	16-Nov
Final	Approximately 50% weeks 12-15, 50% cumulative	12-Dec, 10:15am

Tentative Grade Scale (using +/-). If you get at least 90%, you are guaranteed an “A”. I may elect to set the grade cutoffs lower, but we will not set them higher.

<b><u>Grade</u></b>	<b><u>Percentage</u></b>
A, A-	90-100, 87 – 89
B+,B,B-	84-86, 80-83, 77-79
C+,C,C-	74-76,70-73,67-69
D	60-68

**Important Dates:**

Sept 9 – Deadline for late registration

Sept 9 – Deadline for drop

Nov 4 – Deadline for withdrawal

**Tentative Schedule of Topics:**

Week	Chapter	Topic
1	F,1	Introduction and gases (ideal and real)
2	2	Heat, work, internal energy and enthalpy. First law.
3	2	First law and state functions
4	3	Second law, direction of spontaneous change
5	3,4	Entropy and Gibbs energy
6	4,5	Phase transitions and mixtures
7	5	Mixtures
8	5,6	Phase diagrams, non-ideal solutions, activities, spontaneous rxn
9	6	Equilibrium
10	6	Equilibrium electrochemistry
11	20	Kinetic theory of gases
12	20,21	Diffusion, kinetics
13	21	Kinetics ( <b>Thanksgiving</b> )
14	21,22	Kinetics, reaction dynamics
15	23	Catalysis and final review

**Tentative Lab Schedule:**

Week	Date	Topic
1	30-Aug	Intro and lab safety
2	6-Sep	Predictions of an improved equation of state
3	13-Sep	Heat capacities of materials
4	20-Sep	Adiabatic expansion and cooling of gases
5	27-Sep	Enthalpy of chemical reaction
6	4-Oct	Entropy of phase transition
7	11-Oct	Vapor pressure above a solution
8	18-Oct	Colligative properties
9	25-Oct	Temperature dependence of equilibrium (solutions)
10	1-Nov	Temperature dependence of equilibrium (gases)
11	8-Nov	Activities for isopropanol in aqueous solution
12	15-Nov	Voltaic cells and battery discharge curves
13	22-Nov	Chemical kinetics
14	29-Nov	Complex kinetics simulation
15	6-Dec	No lab