

MWF 9:15-10:15 **201 Reichardt Building**

Instructor: Thomas Clausen

Office: 188 Natural Science Facility

Office Hours: By appointment (call or email me)

Telephone: 474-5512 (Voice mail)

E-mail FFTPC@UAF.EDU

Required Materials: Text: "Chemistry & Chemical Reactivity", 7th ed. Volume 2; by Kotz, Treichel and Weaver

Lab Experiments: These will be made available on Blackboard (<http://classes.uaf.edu>)

"Preparing for your ACS Examination in 2nd Semester General Chemistry; The Official Guide"

Calculator (a \$10 calculator will meet the needs of this course so long as it has the standard arithmetic keys along with Log, 10^x, Exp, Ln and e^x keys). Note- **programmable calculators are not allowed for taking exams.**

OWL pin number

RI Response Card for use in daily quizzes

Suggested Material: Solution Manual for above text

Prerequisites: The course is conducted assuming the student has successfully completed Chem 105X or a transfer course with similar content, with a C grade or better. Students who have not successfully passed Chem 105X may be dropped from the course.

Course Overview: Chemistry 105/106 at UAF is a standard sequence of introductory chemistry. Successful completion of the sequence should be transferable to any university.

Approximately two-thirds of this course will focus on the quantitative aspects of rates and equilibria of chemical processes. The chemical equilibria will focus on reactions involving gases, solutions, acids/bases, precipitations, complex ions/coordination compounds, and voltaic/electrochemical cells. The remaining third of the course, however, is more varied and includes nuclear chemistry, intermolecular forces, solutions, descriptive chemistry

of the metals and nonmetals, and current topics in the popular media.

Instructor's Expectations: Your attendance and attention (no sleeping) at lecture is expected. Please be respectful of other students. Arrive on time and conduct yourself in a business-like and professional manner. If you arrive late, please enter at the back of the auditorium. Have cell phones turned off unless you are expecting an emergency phone call.

Chemistry and Department Policy on Cheating: Any student caught cheating will be assigned a course grade of "F". The student's academic advisor will be notified of this failing grade and the student will not be allowed to drop the course. Unauthorized "dry labs" and unauthorized collaborations during exams and quizzes are *examples* of cheating.

Grading: Your final grade will be based on three (3) hour exams (100pts each), a two-hour comprehensive final (100pts), the best ten (10) laboratory reports (100pts), regular quizzes (100pts) and On Line Web-based Learning (OWL) homework (100pts). Hence a total of 700 points are possible. Percentages of 90, 80, 70, and 60 correspond to grades of A, B, C, and D. Plus/minus grades will not be given. In assigning final grades, I may deviate *slightly* from these cutoffs but only in a manner to your advantage; the cutoffs will not be *raised*.

Laboratory: Your lab experiments are available on blackboard.

The first lab for this course is a review of Math and Excel and is not used in calculating your final lab grade or the number of labs completed. It will, however, be used for *up to 10 extra credit* points on your first exam.

An important component of Chem 106 is the laboratory session. The purpose of the lab is to reinforce lecture concepts through hands-on investigation, and to gain skills in scientific reasoning and use of chemicals and laboratory apparatus. Teaching assistants who will have specific office hours conduct the labs. Your final lab grade will be based on the scores of the best ten (out of 11) lab reports. **You must complete at least eight laboratory reports and experiments in order to pass Chem 106.**

There are significant hazards in any chemistry laboratory. If you suspect you are pregnant or have other health concerns, you should contact your doctor. For most individuals, the most significant

concern is eye safety. **You are required to continually wear approved eye protection while in the laboratory.** Having safety glasses pushed onto your forehead is not acceptable. **Being uncooperative in obeying our safety policies will result in a faculty initiated withdrawal from the course.**

Other details of the laboratory will be provided by your TA.

Exams: Three exams are scheduled for the course along with a cumulative 2-hour final. All exams count toward your grade; **there are no dropped exams.** If you can anticipate an absence (work commitments, visits by family...), talk to me before the exam to make arrangements. If the absence is unexpected (illness, transportation problems, jail time...), contact me *ASAP* by phone or email to see if anything can be done. **Do not wait until the next class to speak with me about a missed exam.**

As mentioned earlier, there are *up to* 10 extra credit points available for completing the Math and Excel Review that is offered during the second week of classes.

You are allowed to bring a **non-programmable** calculator. Important equations and constants will be itemized on the front page of each exam and a periodic table will be provided.

A copy of the periodic table will also be supplied for each exam and the final.

The final exam will be a standardized American Chemical Society exam that will cover the entire Chem 106X course. Most Chem 105X material will not be on the exam with the exception of basic Organic Chemistry. The ACS official guideline book for taking general chemistry exam will provide details about the types of questions you will encounter and a strategy for approaching questions. It also has sample problems (with solutions) to practice with.

Practice is the best (actually only) way to ensure you will do well on the exams. Happily, there are numerous mechanisms to get this practice: worked problems in class (must be present to count), text problems, the ACS guide to taking the general chemistry exam, OWL homework, and frequent quizzes.

OWL Homework: Homework assignments will be administered via an interactive computer based program called

OWL. Success in Chemistry 106 requires practice doing problems. Higher achievement in the course and on exams is strongly correlated with time spent doing homework assignments in their entirety. *In a recent assessment, we found that students who failed the course invariably did not do out of class OWL problems on a regular basis and/or had large number of absence.*

Your OWL grade will be calculated after your lowest 10% of scores have been dropped. In other words, even if you only achieved a raw score of 90%, 80%, or 70%, your calculated score would calculate as 100%, 89% and 78% respectively. There will be no extra credit for doing better than 90% on OWL. **There will be no extensions granted.**

Quizzes: Many lectures will incorporate a quiz that will cover recent material. These quizzes will be projected on the screen and your answers will be submitted via your response cards. You will receive two (2) points for each correct answer, one (1) point for each incorrect answer, and zero (0) points for no answer. At the end of the semester your total score will be converted to a 100pt scale using an appropriate multiplier.

In order to get full credit for your quizzes, you **must** bring to class a Response Card that is registered to you (no exceptions). To register your clicker, email me (tpclausen@alaska.edu) your response card number which is a 6-digit number/letter code located on the back of your card under the bar code. **Do this by labor day to ensure you get credit for the first quiz.**

Spare batteries for your card can usually be purchased for about \$1.50 in the chemistry office (room 194).

There are generally two ways to tell if your clicker is functioning. First, the green light should turn on when you submit an answer. A better (and more reliable) test, however, is by monitoring your personal number on the response table during any quiz. Please see me at the end of class if the response table does not respond to your clicker.

Freshman Grade Reports: I will use a combination of your first exam grade (75%) and your quiz average (25%) to estimate your progress in the course for the freshman grade report.

Faculty Initiated Withdrawals: Students who 1) do very poorly on the first exam and 2) have a poor attendance records (based on quizzes), poor OWL completion scores, or are not current with their laboratory work may, at my option, be removed from the course.

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.

Tentative Schedule

Week of	Topic (Highlights)	Lab
Aug 31 st	No class on Monday or Wed Introduction on Friday	No Lab
Sept 7 th	Chapter 12- Intermolecular Forces (No class on Monday- Labor Day) 1. H-bonding, London Dispersion, Dipole-Dipole... 2. effects on boiling points, vapor pressure, surface tension, critical temperatures... 3. Phase diagrams	Math and Excel Review (This does not count as one of your ten graded lab experiments. It will, however, contribute 0-10 extra credit points to your exam I score.
Sept 14 th	Chapter 13- Chemistry of Solids 1. Crystal structures; unit cells 2. Types of Solids (ionic, molecular, network, metallic) 3. amorphous solids Friday is last day to drop without having a W on your transcript	Exp #1 10 Solutions, 10 Unknowns
Sept 21 st	Chapter 14-Solutions 1. units of concentration: molarity (M), molality (m), mole fraction (X), percent, ppm... 2. solubility of gases (Henry's Law) 3. Effect of Temperature on solubility of gases and other compounds 4. Colligative properties (changes in boiling/freezing points, osmotic pressure, vapor Pres 5. Colloids	Exp #2-Photochemistry
Sept 28 th	Chapter 23-Nuclear Chemistry 1. Nuclear Reactions (transmutations & radioactive decay) 2. types and properties of radioactive decay (α , β , γ , β^+ , and electron capture) 3. nuclear stability 4. nuclear energy ($E = \Delta mc^2$) 5. rate of radioactive decay (first order) 6. health issues regarding radiation 7. uses of radioactive isotopes	Experiment #3- Introduction to Nuclear Chemistry
Oct 5 th	REVIEW AND / OR CATCH-UP EXAM 1 ON FRIDAY; CHAPTERS 13-15	No lab this week
Oct 12 th	Chapter 15-Kinetics 1. Rate laws from: a. initial rate data b. integrated rate laws and graphical plots c. mechanism and the rate determining step 2. half-life for 1 st order reactions 3. Arrhenius equation (E_a , k , T relationships) catalyst, intermediates, E_a , ΔH ...	Exp #4 Kinetics of Oxidation
Oct 19 th	Chapter 16-Equilibria 1. K vs. Q uses (favorability of a reaction; Quantitative aspects, direction of reaction) 2. Manipulating chemical reactions and K 3. LeChatlier's Principle	Exp #5 LeChatelier and Factors that Affect Equilibrium Constants
Oct 26 st	Chapter 17 Acids and Bases 1. defining and recognizing acids and bases (Bronsted-Lowry, Arrhenius, Lewis definitions) 2. Strong vs. weak Acids and Bases 3. pH scale and calculating pH of strong acids and bases 4. Calculating pH of weak acids / bases given K_a , K_b and $K_a K_b = K_w$ 5. Conjugate acid / base relationships Calculations involving polyprotic acids and bases	Exp #6 Determination of an Equilibrium Constant
Nov 2 nd	Chapter 18- More on Equilibria 1. Buffers: $pH = pK_a + \log\left\{\frac{[B]}{[HB]}\right\}$ 2. Calculations and generalizations regarding acid base titrations 3. Solubility rules of salts; K_{sp} Effects of Acids / Bases, common ions, and complex ions (K_f) on solubility Friday is the last day to drop the course	Exp #7 Acid Base

Nov 9 th	REVIEW AND/OR CATCH-UP EXAM II ON FRIDAY; CHAPTERS 16-18 Friday is last day to withdrawal from course	Exp #8 Buffers and Hydrolysis of Salts
Nov 16 th	Chapter 19-Free Energy and Entropy <ul style="list-style-type: none"> 1. Three Laws of Thermodynamics 2. $\Delta G = \Delta H - T\Delta S$ 3. Concept of Entropy, Enthalpy, Free Energy, and Spontaneity 4. Relationships between ΔG, ΔG°, Q, and K 	Exp #9 Thermo and Free Energy
Nov 23 rd	Chapter 20- Oxidation-Reduction (Redox) Reactions <ul style="list-style-type: none"> 1. Terminology: oxidation / reduction; [O] / [R] agents, anode / cathode\ 2. Algorithm for balancing Redox Reactions 3. Voltaic vs. Electrolytic Cells 4. Quantitative relationships (amp = C/s; Watt = J/sec = volt amp; F = 96480 C...) 5. Cell potentials (E) 6. Activity series 7. Nonstandard cells; Nernst Equation Relationship between E, E ^o , K, Q, ΔG , ΔG° and T No class on Friday (Thanksgiving Break)	No lab this week; Thanksgiving
Nov 30 th	REVIEW AND/OR CATCH-UP EXAM III ON FRIDAY; CHAPTERS 19-20	Exp #10 Voltaic Cells and Free Energy
Dec 7 th	Chapter 22- Chemistry of the Transition metals <ul style="list-style-type: none"> 1. Periodic trends- atomic radii (and density), melting point 2. metallurgy 3. coordination compounds (description, nomenclature, isomerism...) 4. geometry, hybridization of coordination compounds 5. ligand (crystal) field theory to explain color and magnetic properties 	Exp #11 Salt Solubility
Dec 14 th	REVIEW for FINAL on Monday (which will is scheduled for 8:00-10:00 on Wednesday Dec 16th)	No lab