

ANOKA-RAMSEY COMMUNITY COLLEGE COURSE SYLLABUS

Course:	Chemistry 1062: Principles of Chemistry II, 4 credits, Spring 2010
Prerequisite:	MATH 0210 with a grade of C or better, appropriate score on math placement test, or equivalent. CHEM 1061 (not 1020) with a grade of C or better, or equivalent MATH 1200 strongly recommended
Lecture:	M/W 1:30 pm – 2:45 pm E241
Laboratory:	M 3:00 pm – 5:40 pm E226
Instructor:	Professor Andrew Aspaas (you may call me Andy), Office E224
E-mail:	andrew.aspaas@anokaramsey.edu
Phone/Voicemail:	763-433-1108
Course Webpages:	http://www.anokaramsey.edu/onlineProg (D2L course: announcements, handouts, notes, audio/video lectures, worksheets, discussion boards, grades) http://www.masteringchemistry.com (Online homework) http://webs.anokaramsey.edu/chemistry/Chem1062 (lab experiments)
Office Hours: (all are in E224)	M 11:00 am – 1:20 pm W 11:00 am – 12:00 noon (additional office hours available by appointment)
Lab Manager:	Daniel Harmon, Office E225, 763-433-1813, daniel.harmon@anokaramsey.edu

COURSE OUTCOMES

Upon successful completion of the course, the student should be able to:

1. Demonstrate the ability to solve problems and demonstrate conceptual knowledge in the following areas:
 - A. Organic chemistry
 - B. Liquids and solids
 - C. Solutions
 - D. Kinetics
 - E. Equilibrium
 - F. Acids and bases
 - G. Solubility equilibria
 - H. Thermodynamics
 - I. Oxidation-reduction and electrochemistry
 - J. Introductory nuclear chemistry
2. Demonstrate the following abilities as they relate to labs in the major areas of course content:
 - A. Collecting data using a variety of equipment – especially computer interfaced probeware
 - B. Recording, organizing, and analyzing data in tables and graphs
 - C. Interpreting the results of experiments relative to the objectives and the uncertainties of the data
 - D. Individually and/or collaboratively prepare laboratory reports with proper scientific writing style
 - E. Formulating and testing hypotheses through the development of an inquiry-based experiment
 - F. Laboratory and chemical safety and waste disposal
 - G. Effectively communicating experimental results and concepts orally
 - H. Working effectively and cooperatively in groups

REQUIRED MATERIALS

Textbook: Chemistry: A Molecular Approach, 1st edition, Nivaldo J. Tro (Same as for CHEM 1061)

Ebook available on <http://www.masteringchemistry.com> for \$79.50

MasteringChemistry Access: bookstore bundled with text or separately, also available on masteringchemsitry.com

(MasteringChemistry Access is good for 2 years – **your same password will work if you've used it previously.**)

REQUIRED MATERIALS (cont'd)

Lab Activities: Available at <http://webs.anokaramsey.edu/chemistry>

Labs must be **downloaded, printed, and read *before* coming to lab** each week

Bound Lab Notebook (okay to continue from 1061)

Non-programmable scientific calculator with LOG key

Outside-class access to an internet-connected computer at home **or** using the ARCC computer labs

Access to school-provided MetNet email address. Instructions at <http://www.anokaramsey.edu/IT/emailmetnet.cfm>

ADDITIONAL RESOURCES

Ball, David W., Essential Algebra for Chemistry Students (available in bookstore)

Study Guides and Solutions Manual

Website Links: Available at <http://webs.anokaramsey.edu/chemistry> and <http://webs.anokaramsey.edu/aspaas/>

On-Campus Tutoring: Schedule will be posted at http://www.anokaramsey.edu/StudentServices/cr_chemistry.cfm and at the Academic Support Center

BE RESPECTFUL, BE RESPONSIBLE, RISE TO THE CHALLENGE

By enrolling in this course, you have become a welcome member of a *community of learners*, an honor and a privilege for each one of us. Your membership in this community and your success in this course are dependent upon your ability to do the following:

Be Respectful. Respect your instructor as an expert in his or her subject area and as the person responsible for facilitating a productive course for everyone. Respect each of your classmate's right to a valuable class experience, free of offensive language, intolerance, or harassment of any kind. Respect these facilities and our time together by eliminating all distractions, especially cell phones, iPods, and other gadgets, and by refraining from disruptions of any kind, including sleeping in class or talking when no formal class discussion is taking place. Finally, respect yourself by participating fully in each class session and making the most of this learning opportunity.

Be Responsible. As a student in this college course, you are entirely responsible for your own success. You are responsible for reading and following the syllabus. It's expected that you arrive to each class session on-time, with assigned work completed, ready to participate fully. If you miss class, you are responsible for the consequences. You are also responsible for obtaining notes, assignments, and syllabus adjustments. Finally, you are responsible for being an active participant in this class rather than a passive observer.

Rise to the Challenge. College-level courses are demanding. They require deeper thinking, more effective writing, and greater personal involvement than many students realize. In order to succeed at this level, you must be willing to accept the challenges presented by the course material, your instructors, and a rigorous schedule. One of the rewards of this challenge can be the discovery that you are capable of much more than you imagined. Therefore, expect great things from yourself, work hard to achieve them, and seek help when you need it. The other members of this community of learners are here to support you, but it's up to you to *rise to the challenge*.

While I do not take attendance, class attendance is expected by college policy. **Students are responsible for all information and assignments given in class.** The easiest way to fall behind and ultimately fail a class is to be absent multiple times. Material moves relatively quickly in this course, so even one absence can put you behind. This is even more important for block and summer schedules, where missing one class is like missing a whole week of the course!

LABORATORY

Laboratory attendance is mandatory and experiments must be performed at the assigned time. If you must be absent, including for an illness, notify the instructor in advance. Make-up labs may be arranged during other scheduled lab periods, *on a space-available basis, during the same week only*, by consulting with the instructor of that particular laboratory section. If you miss a lab, or are unable to make it up during one of the other lab periods, it will count as a ZERO. However, the lowest laboratory score for the semester will be dropped. Students missing three labs will have their grade reduced by one full letter grade. Students missing four labs will have their grade reduced by two full letter grades. Students missing five or more labs will fail the course.

Laboratory reports will be due at the beginning of your assigned lab period the following week. A portion of the total points will be deducted for each day a report is turned in late. Laboratory reports that are more than one week late will receive a ZERO. Prelaboratory assignments (if any) must be completed by the beginning of the laboratory period in which the experiment will be performed. They may not be turned in late. Lab quizzes may be administered. Students will either work individually or in pairs. There will be no groups of three or more, unless assigned by the professor. A laboratory course should involve as much "hands-on" work as possible for each student.

ASSIGNMENTS AND QUIZZES

Reading assignments are given later in this syllabus. Please have each of the reading assignments completed *before* the class period where that material is covered.

A small number of **quizzes** (usually 3) will be administered in class. Quizzes are usually worth 15 points. Make-up quizzes for excused absences *may or may not* be available. See the instructor.

Textbook practice problems will also be assigned. You should plan to work on these assignments while the related topics are covered in class. These assignments will ***not be collected***. You have college-level expectations in this course, so therefore I will not "hold your hand" and collect and grade daily work each period. Students should take the initiative to keep up with their work in order to prepare themselves for quizzes and exams.

Online homework problems for credit will be assigned in **MasteringChemistry**. There will be at least one MasteringChemistry assignment per chapter in this course (except ch 19). The assignments are 5 points each. Due dates for the assignments are at 11:59 pm on the following dates:

Ch 20: Fri, Jan 22	Ch 11: Fri, Jan 29	Ch 12: Tue , Feb 9
Ch 13: Fri, Mar 5	Ch 14: Fri, Mar 12	Ch 15: Fri, Mar 26
Ch 16: Fri, Apr 16	Ch 17: Fri, Apr 23	Ch 18: Fri, Apr 30

Assignments submitted after the due date will be deducted by 10% for each day they are late.

Discussion boards will be set up in D2L for you do discuss problems or questions with your classmates and instructor. You will be required to make at least one post per chapter, for a total of 10 participation points that will be awarded at the end of the semester. **Questions on chemistry content, homework assignments, lab reports, etc. should be posted to the discussion boards first!** That way I can answer questions for the entire class, rather than just emailing with one student. Often another student will address the concern before I get to it. Please restrict your emails to me to issues involving your own situation, or you may email me if nobody is responding to a pressing question you have posted on the discussion boards.

EXAMS

There will be three 75-minute midterm exams plus one 110-minute comprehensive final exam. Only those topics covered in lecture, laboratory, the reading assignments, or the problem assignments will appear on the exams. Exams must be taken at the scheduled time. ***Make-up exams may only be given in the case of documented emergencies or school sponsored activities, and must be completed before the exams are returned to the class (1-2 class periods following the exam).*** The instructor has the right to refuse a make-up exam. Exams may be arranged to be taken early, see the instructor as soon as possible if you may need this option. Make-ups may be allowed for excused absences from the final exam ***if the instructor has been consulted in advance.***

The lowest midterm exam score will be replaced with your final exam percent score (if it is an improvement). If you miss one exam, its score will be replaced by your final exam score. You should try your very best for each exam, since you never know when unplanned events may prevent you from taking a future exam. If you miss more than one exam, you should talk to me and seriously consider dropping the course.

The final exam is a standardized general chemistry exam from the American Chemical Society. You must use a **non-programmable** scientific calculator on this exam. Its emphasis will be on concepts taught in this course, but some concepts from the first semester will also appear. A study guide is provided at the end of this syllabus.

ACCOMMODATIONS

Alternative testing situations can be arranged for those students with a documented learning disability. Contact the school's disability services office for more information. Please notify the instructor well in advance of the exam if you elect for this service. *The alternative exam time may not be later than the assigned exam time.*

Every effort will be made to provide accommodations for religious observations. Please notify the instructor as far in advance as possible.

Please notify the instructor if you have any issues with loud noises, small explosions, flames, or other concerns.

ACADEMIC DISHONESTY

Cheating or plagiarism of any kind will not be tolerated. Students will be given one warning upon the first instance of any cheating or plagiarism. Any incidents after the warning will result in the exam, quiz, or assignment in question to be given a grade of zero, which cannot be made up. Care will be taken to discuss proper formats for citing sources in written projects as needed throughout the semester. Many lab reports and group projects involve sharing of data and collaboration between several students; these instances do not constitute plagiarism as long as all contributors are listed on the assignment.

STUDYING

"By failing to prepare, you are preparing to fail." -Benjamin Franklin

It is very important that you *discipline* yourself to become an organized, conscientious student who studies regularly. Set aside some time each day and devote it to studying chemistry. Last-minute cramming for cumulative exams usually results in poorer understanding of concepts and lower exam scores.

Read the assigned text ***before*** each chapter is covered in lecture. No matter how clearly the material is presented in lecture, you will not retain the information if that is the first time you see it. By reading the material carefully in advance, the lectures will become entirely more valuable by reinforcing and cementing your understanding of the concepts.

Work the assigned practice problems after each class by yourself, ***without resorting to the answer key!*** If you're stuck, re-read the relevant section of the text, come back to it later, or ask a friend, a tutor, or the instructor for a nudge in the right direction. The struggle to get a problem solved is an integral part of the learning process. Only ***after*** you've gotten an answer you're confident with should you check the answer key.

You should also form or join a study group as a ***supplement*** to your individual studying and practicing. Helping another student with a difficult problem is one of the best ways to reinforce your own learning.

Overall you should try to focus on ***underlying concepts, problem solving skills,*** and ***common themes*** more than simply memorizing facts. You should always view difficulty as a challenge to overcome.

KEEPING TRACK OF YOUR PROGRESS IN THIS COURSE

You should always, on your own, keep track of your scores for all work you do in this course. To determine where you stand in the course, divide the total of your points earned by the total number of points possible. Then multiply by 100. This will give you a percentage which you can use to determine your letter grade. All your recorded scores will appear in D2L. Check these regularly to ensure they were entered correctly.

GRADES

1. Laboratory	about 145 points
2. Quizzes/Homework/Participation	about 100 points
3. Three midterm exam scores	300 points
4. Final Exam	150 points
Total	about 655 points

The final grade will typically be based on a total point system with the following letter grades:

- A** 90.0 % and above
- B** 80.0 - 89.9 %
- C** 70.0 - 79.9 %
- D** 60.0 - 69.9 %
- F** below 60.0 %

No scores or grades will be curved in this class. In some semesters, the above percentages may be lowered, but will never be raised. In other words, if you get greater than 90%, you are guaranteed an A.

READING AND PROBLEM ASSIGNMENTS

In teaching this course, one thing that I've noticed that sets the successful students apart from the rest of the class is doing the assigned textbook problems. These problems will not be collected, but a student serious about doing well in this course will do them **ALL**. In-text have answers in the back of the book, end-of-chapter problems have answers in the solutions manual available in the bookstore – only consult the answer after you've given the problem your best attempt. Quiz and exam questions will be very similar to some of these assigned problems.

Chap	Title	Reading Assignments	Suggested Problem Assignments (End-of-Chapter)
20	<i>Organic Chemistry</i>	20.1-20.13	6, 9, 13, 21, 24, 27, 29, 31, 32, 35, 37, 43, 45, 51, 53, 55, 63, 65, 67, 73, 77, 81, 83, 85, 87, 95, 97, 107
11	<i>Liquids, Solids, and Intermolecular Forces</i>	11.1-11.12	3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 24, 26, 30, 31, 34, 38, 41, 45, 49, 51, 53, 55, 57, 59, 61, 63, 67, 71, 73, 75, 77, 79, 81, 83, 85, 89, 95, 97, 99, 101, 103, 105, 107, 117, 119, 123, 125, 143
12	<i>Solutions</i>	All sections	1, 2, 6, 8, 12, 13, 15, 18, 19, 22, 23, 24, 25, 27, 29, 31, 33, 35, 41, 43, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 93, 95, 99, 101, 105, 117, 119
13	<i>Chemical Kinetics</i>	All sections	5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 17, 19, 20, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 59, 61, 63, 65, 69, 77, 79, 85, 89, 91, 107
14	<i>Chemical Equilibrium</i>	All sections	3, 4, 5, 6, 7, 9, 10, 12, 14, 15, 16, 20, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 73, 75, 77, 79, 81, 83, 91
15	<i>Acids and Bases</i>	All sections	4, 5, 6, 9, 10, 12, 13, 14, 15, 16, 17, 19, 23, 27, 28, 30, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 129, 131, 133, 135, 139, 145,
16	<i>Aqueous Ionic Equilibrium</i>	16.1-16.6	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 19, 21, 22, 23, 27, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 83, 85, 87, 89, 91, 93, 95, 99, 113, 115, 117, 119, 121, 123, 141, 143, 145
17	<i>Free Energy and Thermodynamics</i>	All Sections	1, 5, 6, 7, 8, 11, 12, 13, 16, 17, 21, 23, 24, 26, 27, 31, 33, 35, 37, 39, 41, 43, 47, 51, 53, 57, 59, 61, 65, 67, 69, 71, 73, 75, 77, 79, 83, 101
18	<i>Electrochemistry</i>	18.1-18.6, 18.8	3, 4, 5, 7, 9, 10, 11, 13, 17, 18, 19, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 61, 63, 65, 67, 73, 75, 77, 79, 89, 97
19	<i>Radioactivity and Nuclear Chemistry</i>	19.1-19.7	3, 4, 5, 6, 7, 8, 10, 15, 33, 35, 43, 47, 49, 51, 53, 55, 57, 99, 101

Chemistry 1062 Tentative Lecture, Exam, and Lab Schedule

Changes and updates to this schedule will be announced in class and posted in the class announcements in D2L.

Lab	Monday	Tuesday	Wednesday	Thursday	Friday
Lab Report Tools, Computer Refresher	Jan 11 Ch 20	Jan 12	Jan 13 Ch 20	Jan 14	Jan 15
No lab	Jan 18 School Closed Holiday	Jan 19	Jan 20 Ch 11	Jan 21	Jan 22
Organic Functional Groups	Jan 25 Ch 11	Jan 26	Jan 27 Ch 11	Jan 28	Jan 29
Solubility Curves	Feb 1 Ch 12	Feb 2	Feb 3 Ch 12	Feb 4	Feb 5
F.P. Depression	Feb 8 Ch 12	Feb 9	Feb 10 EXAM 1 Ch 20, 11, 12	Feb 11	Feb 12
No lab	Feb 15 School Closed Holiday	Feb 16	Feb 17 Ch 13	Feb 18	Feb 19
Kinetics	Feb 22 Ch 13	Feb 23	Feb 24 Ch 13	Feb 25	Feb 26 School Closed Faculty Devel.
Equilibrium	Mar 1 Ch 14	Mar 2	Mar 3 Ch 14	Mar 4	Mar 5
Lab Project Intro	Mar 8 Ch 14	Mar 9	Mar 10 Ch 15	Mar 11	Mar 12
No Lab	Mar 15 School Closed Spring Break	Mar 16 School Closed Spring Break	Mar 17 School Closed Spring Break	Mar 18 School Closed Spring Break	Mar 19 School Closed Spring Break
pH	Mar 22 Ch 15	Mar 23	Mar 24 Ch 15	Mar 25	Mar 26
Titration Curves	Mar 29 EXAM 2 Ch 13-15	Mar 30	Mar 31 Ch 16	Apr 1	Apr 2
Lab Project	Apr 5 Ch 16	Apr 6	Apr 7 Ch 16	Apr 8	Apr 9
Lab Project	Apr 12 Ch 16	Apr 13	Apr 14 Ch 17	Apr 15	Apr 16
Lab Project	Apr 19 Ch 17	Apr 20	Apr 21 Ch 17	Apr 22	Apr 23
Lab Project	Apr 26 Ch 18	Apr 27	Apr 28 Ch 18	Apr 29	Apr 30
Lab Project	May 3 EXAM 3 Ch 16-18	May 4	May 5 Ch 19	May 6	May 7
Project Presentations	May 10 Ch 19	May 11	May 12 FINAL EXAM 1:30 - 3:30 pm	May 13	May 14

CHEM 1062: Reviewing for the American Chemical Society (ACS) Standardized Final Exam

The CHEM 1062 Final Exam will be a **full-year** standardized exam written by the ACS. The goal is to see how well students know and understand chemistry, and to see how well the students compare to other students across the country. There is not a huge emphasis on math problems, but more so than the standardized exam administered at the end of CHEM 1061 this past fall. While the exam covers the entire year, many topics covered in your first semester of chemistry have been used throughout your second semester. Some of the topics, such as gases and atomic theory, have been used less, but should be relatively easy to review for the final now that you have almost completed the sequence and text.

Because the exam covers what you know and understand, the best way to review and study for the exam may be to go over previous exams in this course and end-of-the chapter questions. As with the exams in this course, there are no direct questions on definitions or terms. However, you are expected to know chemistry vocabulary. There will, of course, be things which we emphasized a lot which will only show up briefly on the final exam and vice versa. However, if you understand the material, you should be able to reason through things which you don't remember as well.

The exam has 70 multiple choice questions, each with four choices. You will be given 110 minutes – the exam is timed. Programmable calculators are not permitted on the exam. Please remember to bring a non programmable calculator to use on the exam. If you don't have one and cannot borrow one from a friend, let me know ASAP and I'll see what I can do.

What is provided for you?

- A comprehensive list of abbreviations and symbols
- The values of numerous constants used throughout the course
- Periodic Table (just like the ones you have received in class)
- Arrhenius Equation, Graham's Law of Effusion, Nernst Equation, Integrated Rate Law Equations

Directions

- You may NOT make marks in the exam booklet.
- Answers will be placed onto an answer sheet using a soft #2 pencil.
- All calculations must be done on the scratch paper provided.
- Each question has only one correct answer and has four choices.
- Your score is based solely on the number of questions answered correctly.
- **It is to your advantage to answer every question.**

Strategies

- **Don't allow yourself to get stuck on a single problem.** If you don't know how to do it, move along and go back to it later.
- Remember, your score on the final depends on your percentile ranking – there will be several students across the nation that were unable to perform the same problems.
- Consider writing answers onto scratch paper and transferring several onto answer sheet at one time.
- Spend the least time studying what you know well and the most time studying what you DON'T know well.

CHEM 1062: Reviewing for the American Chemical Society (ACS) Standardized Final Exam

Things you are expected to know (*items in italics are first-semester topics*):

- basic chemistry vocabulary/terminology (Look at the end of each chapter for Important Terms given in **bold**)
- intermolecular forces, lattice energy, phase transitions, relation of b.p. and m.p. to intermolecular forces, phase diagrams, types of solids, unit cell calculations
- types of solutions, solution concentrations (molarity, molality, %, mole fraction), solubility curves, colligative properties, colloids, solubility curves for gases vs. curves for solids
- kinetics, experimental determination of rate, determining the rate law using the initial rate method, rate constants, elementary reactions, catalysis, reaction mechanisms, collision & transition state theory, activation energy, concentration-time calculations, temperature and rate, half-lives, graphical determinations of reaction order and rate constant, potential energy diagrams
- chemical equilibrium, equilibrium constant, reaction quotient, Le Chatelier's Principle, predicting reaction direction, calculating equilibrium concentrations, ICE tables
- acid-base theories: Arrhenius and Brønsted-Lowry, acid-base strength and relation to molecular structure, self-ionization of water, and pH, *strong and weak acids and bases*
- acid & base ionization equilibria, polyprotic acids, salt solutions, common ion effect, buffers, titration curves
- solubility product constant, common ion effect, pH and solubility, precipitation calculations, *solubility rules, particularly for ions for which there are no exceptions to the rule*
- 2nd & 3rd laws of thermodynamics, entropy and ΔS , free energy and ΔG , spontaneity, relation to the equilibrium constant, work, *state function, extensive property, enthalpy and ΔH , Hess's Law, specific heat capacity*
- balancing redox reactions, voltaic and electrolytic cells, cell notation, emf, E_{cell} , electrode potentials, *oxidation numbers (know your rules), oxidizing and reducing agents*, strength of these agents, applications of electrochemistry, electrolysis
- fission, fusion, radioactivity, nuclear bombardment reactions, radioactive decay, half-lives, mass-energy calculations, *isotopes and nuclide symbols, mass numbers and atomic weights, subatomic particles*
- *chemical/physical change/properties, significant figures, SI units and prefixes*
- *nomenclature – polyatomic ions and Greek prefixes, molecular compounds, ionic compounds, acids, binary compounds, ion charge based on position in periodic table, diatomic elements*
- *completing and balancing combustion and double replacement reactions, net ionic equations, spectator ions, molecular equations, gas-producing reactions*
- *basic stoichiometry – molar masses, molar ratios, limiting reactant, percent composition, molarity, percentage yield, empirical and molecular formulas*
- *gas laws: empirical, ideal, effusion, partial pressures, STP, kinetic-molecular theory, barometers and manometers*
- *energy, frequency, and wavelength, emission spectra, electron configurations, orbital diagrams, quantum numbers (n, l, m_l, m_s)*
- *periodic trends (atomic radii, ionization energies, electronegativities, ionic radii)*
- *Lewis structures, resonance, formal charges, bond polarity, exceptions to octet rule, bond order*
- *VSEPR model: hybridization, polarity of molecules, lone pairs, bonding pairs, σ and π bonds*
- g/cm^3 may be written as $\text{g}\cdot\text{cm}^{-3}$ and $\frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}}$ may be written as $\text{L}\cdot\text{atm}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$

CHEM 1062: Reviewing for the American Chemical Society (ACS) Standardized Final Exam**Know the following equations:**

$d = \frac{m}{V}$	$\Delta H^\circ = \sum n\Delta H_f^\circ(\text{products}) - \sum n\Delta H_f^\circ(\text{reactants})$
$M_1V_1 = M_2V_2$	$\Delta G^\circ = \sum n\Delta G_f^\circ(\text{products}) - \sum n\Delta G_f^\circ(\text{reactants})$
$PV = nRT$	$\Delta S^\circ = \sum n\Delta S^\circ(\text{products}) - \sum n\Delta S^\circ(\text{reactants})$
$q = m \times s \times \Delta T$	$\Delta T_f = K_f c_m$ and $\Delta T_b = K_b c_m$
Calculating Molarity, molality, %, mole fraction	Formulas for equilibrium constant and reaction quotient
$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ (combined gas law)	$[\text{H}_3\text{O}^+][\text{OH}^-] = K_w = 1.0 \times 10^{-14}$
$q(\text{system}) = -q(\text{surroundings})$	$\text{pH} = -\log[\text{H}_3\text{O}^+]$
$\Delta G^\circ = \Delta H^\circ + T\Delta S^\circ$	$\text{pOH} = -\log[\text{OH}^-]$
$\Delta G^\circ = -RT \ln K$	$\text{pH} + \text{pOH} = 14.00$
$\Delta G^\circ = -nFE^\circ_{\text{cell}}$	$\text{pH} = \text{p}K_a + \log \frac{[\text{base}]}{[\text{acid}]}$
$E^\circ_{\text{cell}} = \frac{0.0592}{n} \log K$	$K_a K_b = K_w$
$t_{1/2} = \frac{0.693}{k}$	$\text{Rate} = kN_t$
$\ln \frac{N_t}{N_0} = -kt$	

CHEM 1062: Reviewing for the American Chemical Society (ACS) Standardized Final Exam

How Your Final Exam Score Will Be Determined

The table below shows how raw scores on the ACS exam will be converted to scaled final exam scores. The ACS standardized exam has 70 questions, two of which are on material we did not cover over the course of two semesters (resulting in a slight adjustment from the national norms).

In the event you are unfamiliar with how percentiles work, an 84th percentile means that you scored higher than 84% of the students on the national norms and a 25th percentile means that you scored higher than 25% of the students taking the same exam on the national norms. Students scoring in the 80th to 100th percentile will be assigned an "A" score on the final, the 60th to 79th percentile will be assigned a "B", the 40th to 59th percentile will be assigned a "C", the 20th to 39th percentile will be assigned a "D", and the 0th to 19th percentile will be assigned an "F".

Raw Score	Percentile Ranking	Scaled Percentage
70	100	100
69	100	100
68	100	100
67	100	100
66	100	100
65	100	100
64	100	100
63	99	99.5
62	99	99.5
61	99	99.5
60	98	99
59	97	98.5
58	96	98
57	95	97.5
56	94	97
55	92	96
54	91	95.5
53	89	94.5
52	88	94
51	86	93
50	82	91
49	78	89
48	76	88
47	72	86
46	69	84.5
45	66	83
44	63	81.5
43	60	80
42	56	78
41	53	76.5
40	50	75
39	47	73.5
38	43	71.5
37	40	70
36	37	68.5
35	34	67

Raw Score	Percentile Ranking	Scaled Percentage
34	31	65.5
33	27	63.5
32	25	62.5
31	22	61
30	19	59.5
29	17	58
28	14	55
27	12	54
26	10	52
25	9	50
24	7	48
23	6	47
22	4	46
21	3	45
20	2	44
19	2	43
18	1	42
17	1	41
16	0	40
15	0	39
14	0	38
13	0	36
12	0	34
11	0	31
10	0	28
9	0	25
8	0	23
7	0	20
6	0	17
5	0	14
4	0	11
3	0	8
2	0	5
1	0	2
0	0	0