

CHEMISTRY 115 (Sections A, B, E, F)
PRINCIPLES OF CHEMISTRY
SYLLABUS- SPRING 2015

INSTRUCTORS:

Dr. Ruth Beeston
236 Martin, x2303, [rubeeston@davidson.edu](mailto:rubeeston@ davidson.edu)
Office Hours: Mon and Wed 2:00-4:00;
Thurs 11:30-1:30; other times by appointment

Mrs. Karin Stevens
B50 Martin, x2196, kastevens@davidson.edu
Office Hours: TBA

REQUIRED TEXTBOOK AND MATERIALS:

S.S. Zumdahl and S.A. Zumdahl, *Chemistry*, 9th ed., Hybrid version (bundled with Online Web Learning (OWL) access card) OR Access card only (includes ebook)

Chemistry 115 Laboratory Manual- published and provided by Chemistry Department (student provides a 1 inch binder to contain the manual and a bound laboratory notebook with graph paper)

Any calculator with scientific notation and logarithm functions

COURSE DESCRIPTION:

Chemistry 115 is a fast-paced, rigorous course in General Chemistry for science majors, premedical students, and students who plan to continue the study of chemistry with additional courses. A good high school chemistry background or strong performance in CHE 110 should provide adequate preparation. Success in this course will require attendance and attention in class and lab, good math skills, and approximately 1-2 hours of **daily** work outside of class (going over notes, reading the textbook, and working problems on OWL). Please discuss with me any concerns you have regarding course placement.

LEARNING OBJECTIVES:

While there are numerous specific objectives involving understanding, relating, and applying the language, concepts, theories, and tools of chemistry, the overarching learning goals of this course are as follows:

1. To understand early and recent developments in the acquisition of knowledge about the nature of matter, and to apply that understanding to qualitative and quantitative problems.
2. To be able to predict and explain the properties of atoms and molecules based upon models of atomic and molecular structure and bonding.
3. To be able to predict and explain the chemical and physical properties of substances (gases, liquids, solids, and solutions) based on fundamental laws and theories.
4. To be able to make qualitative and quantitative predictions about chemical reactions, based on an understanding of reaction types as well as the application of stoichiometric, thermodynamic, kinetic, and equilibrium concepts.
5. To develop and practice logical thinking and problem-solving skills, including reading and interpreting the question; connecting the problem to core concepts; strategizing and solving the problem; and critically examining the answer.
6. In the laboratory, to develop and practice the skills necessary for scientific research and discovery, including handling chemicals and equipment; planning and carrying out experimental procedures; making qualitative and quantitative observations and measurements; using simple instrumentation; graphically representing and interpreting data; drawing conclusions; and recognizing the limitations of experimental methods.

CLASS MEETINGS:

Lectures will be held each week on MWF from 10:30 to 11:20 in Martin B25 (sections A and B) or MWF from 12:30-1:20 (sections E and F). Seating will be in the first six rows of seats. Use of cell phones, recording devices, or computers is not permitted in class without a specific accommodation. Students will be assigned to groups based on classroom seating arrangement, and lectures will incorporate some group problem-solving exercises. You are expected to prepare for class by doing the assigned reading and to participate in the class by taking notes and answering/asking questions. A schedule of lecture topics and reading assignments is attached.

Attendance is required and is important to your success in the class. You will keep track of your attendance using the sheet in your folder. Consistent with college policy, **a student who misses more than 10 lectures (25%) will not receive a passing grade. Missing more than 2 lectures will result in a small deduction (for each absence) in your attendance grade.**

LABORATORY: PLEASE NOTE ACTUAL LAB TIMES BELOW!!

Laboratory sessions will be held according to the schedule on the last page of the syllabus. Lab times are as follows:

<i>Section A Tuesdays 8:30-12:00</i>	<i>Section B Tuesdays 1:00-4:30</i>
<i>Section E Thursdays 8:30-12:00</i>	<i>Section F Thursdays 1:00-4:30</i>

You must come to your assigned laboratory section unless you make arrangements in advance to switch with another student. Notify Mrs. Stevens well in advance of any conflicts with school-sponsored activities, and do not make plans that conflict with your lab period, since missed labs are difficult to make up. If you miss a lab without notifying the instructor in advance, you will receive a zero for that experiment. If you arrive late, you will be unable to take part in any pre-lab quizzes.

Most lab sessions will begin with a pre-lab introduction in Martin B25. Before coming to the pre-lab, read through the experiment in the lab manual to become familiar with the concepts and procedures. During the first two weeks of the semester, the lab sessions will be used to review introductory concepts such as significant figures, units, calculations, and naming of chemical compounds. These sessions will take place in Martin B25 and will last 1-1.5 hour.

In addition to the laboratory manual provided by the Chemistry Department, you must supply a calculator and a bound notebook in which you will record data and observations, perform calculations, etc. Do not use the lab report sheets in place of a notebook; these sheets should be filled out (neatly) after the lab is completed. Lab reports are usually due at the beginning of the next laboratory session (the week following the week of the experiment).

There will be a lab bill (\$20 plus costs of any broken glassware) for this course. The lab bill covers the cost of the lab manual, safety glasses, paper towels, and other consumable items.

REVIEWS AND EXAM:

There will be four reviews. Dates are given on the attached class schedule. A sample review will be posted on Moodle one week prior to each review, and an optional help session will be held in B25 one evening before each review. Reviews are designed to be taken in 80 minutes, but will be administered in the chemistry library or open tutor room during your choice of several 2 hour time periods. The final exam will be cumulative (but with emphasis on new material) and will be administered during the self-scheduled examination period.

HOMEWORK:

Daily effort on assigned homework is expected. You will be using an online homework program (Online Web Learning, or OWL) in this course. This will offer instant feedback, provide links to additional resources, allow multiple attempts, and keep track of your progress.

Instructions for registering and getting started with the OWL system are found in a separate document, along with a list of tentative OWL deadlines for much of the course. Assignments will be due on Monday nights and Thursday nights at midnight. No OWL extensions will be granted for running out of time, forgetting a due date, or computer issues. You should start assignments early and work through problems as the concepts are presented in class.

You should keep a separate homework notebook in which you practice setting up OWL problems as demonstrated in class before entering answers into OWL. You will need to show all of your work to get full credit for problems on reviews; develop good habits while doing homework!

GRADING:

Your grade in this course will be determined as follows:

4 Reviews	45%
Cumulative Final Exam	20%
Laboratory grade	20%
Homework/OWL	12%
Attendance	3%

HONOR CODE:

You will be provided with a sample review from last year prior to each review; this is for your own use this semester. Use of CHE 115 reviews from other semesters is not permitted. Reviews and exams must be pledged. When you add your signature, you are making the following pledge: *“On my honor I have neither given nor received unauthorized information regarding this work, I have followed and will continue to observe all regulations regarding it, and I am unaware of any violation of the Honor Code by others.”*

Laboratory reports must be prepared on your own. You may not refer to lab reports prepared by previous or current CHE 115 students. When you are working with a lab partner or partners, you may share data, work together on calculations, and compare answers, but you may not copy any part of your partner's report. All written answers must be in your own words.

You are encouraged to discuss homework problems with classmates, tutors, study groups, or with me. Homework is not pledged.

ACCOMODATIONS:

Please talk to me as early as possible if you will need accommodations of any sort in order to fully participate in, and benefit from, the class. Recognizing that students have different learning styles, I try to incorporate multiple instructional approaches; please let me know if there is anything I can do to maximize your learning potential. If you have a documented disability, please visit the Dean of Students Office in order to set in motion the official communication of accommodations you are entitled to receive.

RESOURCES FOR SUCCESS:

The **Math & Science Center** (MSC) offers free assistance to students in all areas of math and science, with a focus on the introductory level courses. Trained, qualified peers hold **one-on-one and small-group tutoring sessions** on a drop-in basis or by appointment. Emphasis is placed on thinking critically, understanding concepts, making connections, and communicating effectively, not just getting right answers. In addition, students can **form or join a study group** and use the MSC as a group or individual study space. The MSC is located in the Teaching and Learning Center on the first floor of the E.H. Little Library. Hours are Sun-Thurs, 8:00-11:00 PM and Sun, Tues, and Thurs, 4-6 PM. Other times are available by appointment. The center opens on Tues, Jan 20.

Some recommendations for success in the course:

- Set aside time every day to review chemistry notes, read the book, and work on OWL problems. Do not attempt to complete a whole chapter in one sitting!
- Use the ungraded Mastery assignments to learn and practice the concepts prior to beginning the graded EOC assignments.
- Vary your study/work location. Studies have shown that the brain makes associations between concepts and background sensations (lighting, scenery...) and that making multiple associations with the same material can improve learning. It is worth a try!
- Avoid distractions (emails, texts, facebook...) during your study and OWL sessions. Set goals, and reward yourself when you have completed your work.
- Don't skip class. If you are really sick, obviously you need to stay away, but if you have a cold or are just not feeling your best, come anyway, sit in the back, and get up and leave if you need to.
- Get more sleep. You may have to give up or scale back on some extra-curricular commitments, but it will pay off academically.
- Get help during office hours (or make an appointment). Don't get behind. Let me know what else would help you succeed in the course.
- Form study groups and help each other. There is no better way to master something than to explain it to others. If you would like me to facilitate the process of finding a study group, please let me know.

CHE 115 SCHEDULE OF CLASS MEETING TOPICS- SPRING 2015

Date	Topics	Reading
1/12	Introduction to course Laws and theories, Classification of matter	Ch 1.1-1.2, 1.10
1/13 or 1/15 Lab	Units, Significant figures, Dimensional Analysis Density	Ch 1.3-1.9
1/14	Atomic Theory, Atomic Structure Atomic Symbols, Ions and Isotopes	Ch 2.1-2.5
1/16	Introduction to the Periodic Table Stoichiometry: Atomic mass, Mole concept, Molar mass, Conversions involving mass and moles,	Ch 2.6-2.7 Ch 3.1-3.5
1/19	MLK Holiday- No Class	
1/20 or 1/22 Lab	Naming simple compounds, Lab safety and general procedures	Ch 2.8
1/21	Chemical formula, Mass percent calculations Chemical reactions and equations, Balancing equations	Ch 3.6-3.9
1/23	Stoichiometric calculations involving reactants and products, Limiting reactant and theoretical yield	Ch 3.10-3.11
1/26	Chemical reactions in aqueous solution, Water as a solvent, Molarity, Dilution, Types of reactions in water	Ch 4.1-4.4
1/28	Precipitation reactions, Solubility rules, Writing molecular, complete ionic, and net ionic equations,	Ch 4.5-4.7
1/30	Solution stoichiometry, Acid-base reactions, Oxidation-reduction reactions	Ch 4.7-4.9
2/2	Oxidation states, Balancing oxidation reduction reactions Gases: Boyle's Law, Charles's Law, Avogadro's Law	Ch 4.9-4.10 Ch 5.1-5.2
2/4	Ideal Gas Law, Stoichiometry problems involving gases, Gas density and molar mass	Ch 5.3-5.4
2/6	REVIEW I (Ch 1- 5.3)	

Date	Topics	Reading
2/9	Dalton's Law of Partial Pressures, Kinetic Molecular Theory of gases, Root mean square velocity, Effusion, Real Gases	Ch 5.5-5.8
2/11	Thermochemistry: Energy, Heat and work, Internal energy, Enthalpy	Ch 6.1-6.2
2/13	Enthalpy and calorimetry, Thermochemical equations, Hess's Law	Ch 6.2-6.3
2/16	Standard Enthalpies of Formation Electromagnetic radiation, Wave and particle properties	Ch 6.4 Ch 7.1-7.2
2/18	Atomic emission, Bohr Model of the hydrogen atom, Quantum mechanics, Wavefunctions, Quantum numbers	Ch 7.3-7.6
2/20	Orbital shapes and relative energies, Polyelectronic atoms, Electron configurations	Ch 7.7-7.11
2/23	Electron configurations, Valence electron configurations Periodic table	Ch 7.11-7.12
2/25	Periodic properties (atomic size, ionization energy, and electron affinity) Introduction to bonding, Types of bonds	Ch 7.12 Ch 8.1
2/27	REVIEW 2 (Ch 5.4-7)	
3/2-3/6	SPRING BREAK- No class	
3/9	Ionic bonding, Covalent bonding, Electronegativity, Bond polarity, Dipole moment	Ch 8.2-8.6
3/11	Covalent bond energy, Localized Electron Model: Lewis Electron Dot structures, Multiple bonds	Ch 8.8-8.11
3/13	Resonance structures, Formal Charge, Violations of octet rule	Ch 8.12
3/16	VSEPR Model- Molecular geometry, bond angles, polarity	Ch 8.13
3/18	VSEPR Model, continued; Hybridization	Ch 9.1
3/20	Forces of attraction between molecules, Properties of liquids	Ch 10.1-10.2

Date	Topics	Reading
3/23	Vapor Pressure, Enthalpy of vaporization, Types of solids- ionic, molecular, and atomic solids	Ch 10.8 Ch 10.3-10.7 (parts)
3/25	Metallic solids- structure and bonding Phase change behavior; heating curves and phase diagrams	Ch 10.4 Ch 10.8-10.9
3/27	REVIEW 3 (Ch 8-10)	
3/30	Solutions: Solution composition (molarity, mass %, mole fraction, molality), Factors affecting solubility, Enthalpy of solution	Ch 11.1-11.3
4/1	Colligative Properties: Boiling point elevation Freezing point depression, Osmotic pressure	Ch 11.4-11.7
4/3	Chemical Kinetics: Reaction rate, Rate law, Rate constant, Initial rates	Ch 12.1-12.3
4/6	EASTER BREAK- No class	
4/8	First, second, and zero order reactions, Integrated rate laws, Half-life, Reaction Mechanism	Ch 12.4
4/10	Reaction Mechanism, Temperature and rate	Ch 12.5-12.6
4/13	Chemical Equilibrium: Equilibrium expression, Equilibrium constant, Calculations involving equilibrium concentrations	Ch 13.1-13.2, 13.5
4/15	Calculations involving equilibrium pressures, Heterogeneous equilibria	Ch 13.3-13.5
4/17	Le Chatelier's Principle Acids and bases, Arrhenius and Bronsted-Lowry models,	Ch 13.7 Ch 14.1-14.2
4/20	Acid Strength, Ionization of water, Acid dissociation equilibria, pH and pOH scales	Ch 14.3-14.4, 14.9
4/22	REVIEW 4 (Ch 11-13)	
4/24	Calculations involving strong and weak acids and bases, Percent ionization	Ch 14.4-14.6

Date	Topics	Reading
4/27	Acid-base behavior of salts, Common Ion Effect	Ch 14.8, 15.1
4/29	Thermodynamics: Review earlier concepts, Spontaneity, Entropy, Second Law of Thermodynamics, Gibbs Free Energy	Ch 17.1-17.4
4/29	Calculations involving entropy and free energy changes for chemical reactions	Ch 17.5-17.6
5/4	Free energy and equilibrium Course evaluations	Ch 17.7-17.8
5/6	Wrap up and Q&A for final exam	
5/8-5/13	FINAL EXAM PERIOD	

CHE 115 LABORATORY SCHEDULE, SPRING 2015:

- Jan 13 or 15 Units, significant figures, and dimensional analysis
- Jan 20 or 22 Naming Simple Compounds, Lab Safety and general procedures
- Jan 27 or 29 Check-in, Using the balances, Experiment 1
- Feb 3 or 5 Experiment 2 (*Exp. 1 due*)
- Feb 10 or 12 Experiment 4 (*Exp. 2 due*)
- Feb 17 or 19 Experiment 5 (*Exp. 4 due*)
- Feb 24 or 26 No scheduled lab. We will use this if a snow make-up lab is needed. (*Exp. 5 due*)
- Mar 3 or 5 Fall Break (no lab this week)
- Mar 10 or 12 Prelab for Experiment 6 (all students attend this)
- GROUP X- Experiment 6 GROUP Y- no lab work after prelab
- Mar 17 or 19 Prelab for Experiment 8 (all students attend this)
- GROUP X- begin Experiment 8 (*Exp. 6 due*) GROUP Y- Experiment 6
- Mar 24 or 26 GROUP X- finish Experiment 8 GROUP Y- begin Experiment 8 (*Exp. 6 due*)
- Mar 31 or Apr 2 GROUP X- no lab work (*Exp. 8 due*) GROUP Y- finish Experiment 8
- Apr 7 or 9 Easter Break (no lab this week) (*Group Y Exp. 8 due in class on Friday Apr 10*)
- Apr 14 or 16 Experiment 9
- Apr 20 or 22 Check-Out (*Exp. 9 due*)

OWL DEADLINES: Assignments are due on the dates indicated below, at 11:55 PM.

Please note that OWL consists of multiple parts. The main assignments are designated either “Mastery” (MAS) or “End of Chapter” (EOC). The mastery units are highly recommended, but not required or graded. Doing as many of these as you can will help you to practice and apply the skills and concepts you learn in class and from the book. The End of Chapter questions are required. For each chapter, I have selected a number of questions for you to answer by the deadlines specified below. For multistep problems, you should write out your answers in a homework notebook (showing all work, as you will need to do on Reviews).

Extensions to these deadlines will not be granted for running out of time, forgetting a due date, or poor planning. You are expected to work on OWL problems every day, keeping up with material as it is presented in class. Do not wait until the night an assignment is due to begin!

Your OWL enrollment includes access to an e-book version of your textbook, which includes numerous questions and problems at the back of each chapter that you can refer to if you want additional practice.

- Thurs 1/15** Complete OWL registration process with access code or two-week trial;
Complete OWL Intro assignments and Math Review
- Mon 1/19** Chapter 1
- Thurs 1/22** Chapter 2
- Mon 1/26** Chapter 3
- Mon 2/2** Chapter 4
- Thurs 2/5** This is the day before Review 1. It will cover chapter 5.1-5.3, so you should work problems related to these sections (even though the chapter 5 deadline is next week).
- Thurs 2/12** Chapter 5
- Thurs 2/19** Chapter 6
- Thurs 2/26** Chapter 7 (This is the day before Review 2, which covers chapter 7. Start early!)
- Mon 3/16** Chapter 8
- Thurs 3/19** Chapter 9.1, Written homework on Ch 8, 9.1 due in class Fri 3/20
- Thurs 3/26** Chapter 10 (This is the day before Review 3, which covers chapter 10. Start early!)
- Thurs 4/2** Chapter 11
- Mon 4/13** Chapter 12
- Mon 4/20** Chapter 13
- Mon 4/27** Chapter 14
- Wed 5/6** Chapter 17 (last day of classes)