CHEMISTRY 115 - Fall 2015

Lectures	8:50 am MWF, 2311 Chemistry
Instructor	Professor Arun Yethiraj 8305 B Chemistry 262-0258 yethiraj@wisc.edu Office hours: By appointment
Lab director	Dr Pam Doolittle 2303a Chemistry, 262-9679 pam@chem.wisc.edu
Teaching assistants	Kushal Bagchi kbagchi@wisc.edu

INTRODUCTION

Chemistry 115 is the first course of a two-semester honors sequence focusing on chemical principles. It is designed for very well prepared and highly motivated students with an interest in science or engineering. The structure of the course presumes a sound background in chemistry, physics, and calculus. The course is quite mathematical, with an emphasis on development and manipulation of physical models. The primary focus of the course is exploring a detailed atomic and molecular view of matter and its interactions. Subjects will include quantum theory, molecular structure and bonding, kinetic theory of gases, and descriptions of liquids, solids, and phase transitions. Thermodynamics, chemical and physical equilibrium, electrochemistry, acid-base chemistry, solubility, chemical kinetics, and spectroscopy will be treated in Chemistry 116, the second course of the sequence.

TEXTBOOK AND OTHER REQUIRED MATERIAL

1. D. W. Oxtoby, H. P. Gillis, and A. Campion, Principles of Modern Chemistry, 6th edition, Thomson Brooks/Cole, 2008.

2. Laboratory notebook (for example, made by Tyden) with provision for making copies. The notebook is on sale in the Chemistry lobby during the first week of classes.

3. Safety goggles. Industrial-quality eye protection is required in all chemistry laboratories. Safety goggles that fit over regular glasses can be purchased from local bookstores. Contact lenses should not be worn in the laboratory because fumes or splashes may be trapped between them and your eyes.

4. A scientific calculator.

COURSE INFORMATION

Lectures. During lectures we will discuss principles, and illustrate them with examples and demonstrations. Attendance at lectures is important. The lectures will define the course, and it will be practically impossible to keep up without faithful attendance. You should take your own notes during lecture. Lectures will follow, roughly, the material in Chapters 1-10 and 21 of the textbook, although the lectures will generally be at a higher level.

Textbook. The textbook supplements the lectures. It provides background material for the lectures, and many relevant examples are worked out. In addition, for each chapter there are a number of unworked problems. For an understanding of the material in this course it is important to solve as many of these problems as possible.

Problems. Weekly problem sets will be assigned on Mondays, and due the following Monday. Your solutions will be graded, and correct solutions will also become available on learn@uw. You should be prepared to discuss the problems in your discussion section. We encourage you to discuss the problems with each other but you must hand in and take responsibility for your own solutions.

Discussion Section. Discussion sections are primarily for review and problem solving relevant to the recent lecture material. Your TA will go over some of the assigned problems. You should be prepared when you come to discussion section. Ask specific questions of your TA. Your TA may also discuss material relevant to the laboratory in discussion section.

Research Paper/Presentation. A research paper is due at the beginning of class period on November 20. The paper should be 8-10 pages double-spaced (about 2500 words), and should deal with a modern research topic related to the material in the course (broadly defined). Your paper should include the relevant bibliographic citations. You should begin looking for a topic that interests you, and have it approved by the professor on or before October 30. You will also give a short oral power-point presentation, briefly summarizing your paper, in laboratory sections during the week of November 30 (Monday/Wednesday afternoons and Tuesday/Thursday mornings).

Laboratory. Laboratories meet on Wednesday afternoons and Thursday mornings in room 2365 (see the schedule that follows). In all laboratory periods in which you work with chemicals you are required to wear safety goggles and shoes with closed toes (not sandals).

Your TA will supervise the laboratories and direct your work. He will discuss related material, demonstrate unfamiliar techniques, and answer questions. The goal of the laboratory is to provide experience with a variety of techniques and to illustrate the principles we are discussing in lecture. We especially want you to learn to generate accurate and precise quantitative results and to interpret them critically.

You must come to the laboratory prepared, having read and understood the procedure, and completed a statement of the objective of the experiment in your notebook. Your TA will give you more detailed instructions for the pre-laboratory assignments.
You must keep a laboratory notebook providing a detailed record of your primary data, as described in the manual, and you must prepare a report for each laboratory. The style and detail of the laboratory reports will vary with the experiments.

You must complete the laboratory to pass the course.

Scheduled lab periods on Monday afternoons and Tuesday mornings will be used by your TA for exam review, office hours, and other discussion.

Exams. There will be three in-class exams of 50 minutes each (on October 9, November 11, and December 11) and a two-hour final exam (on December 18 at 12:25 pm). The exams will primarily be based on the material presented in the lectures, and on material illustrated by the assigned problems. Exams may also include questions based upon the laboratory material. No make-up exams will be given. The final exam will be comprehensive, covering topics from the entire semester.

Grades. Exams, problem sets, your research paper/presentation, and laboratory reports will each receive numerical grades. The points for the various components are

Exam I	100
Exam II	100
Exam III	100
Final exam	200
Problem sets	100
Research paper	100
Presentation	100
Laboratory	200
Total	1000

Final letter grades will be assigned at the end of the semester based on your numerical score, and your participation in the various aspects of the course. There is no pre-determined numerical score that is required for an A or any other letter grade.

Chemistry 115

Fall 2015

List of topics

1. Introduction – Atoms and molecules
2. Chemical Bonding – Classical description
3. Introduction to Quantum Mechanics
4. Quantum mechanics and atomic structure
5. Quantum mechanics and molecular structure
6. Spectroscopy
7. Volumetric properties of gases
8. Kinetic theory of gases
9. Solids, liquids, and phase transitions

University of Wisconsin
Chemistry 115 – Chemical Principles I (Yethiraj)
Fall Semester 2015
Laboratory Schedule

	Scheduled Experiment
Week 1 (8/31)	Check-in/Series of Reactions
Week 2 (9/7)	Synthesis of Cu-Ammine Compounds
Week 3 (9/14)	Synthesis of Cu-Ammine Compounds—Day 2
Week 4 (9/21)	*Literature Searches—(Ariel Andrea)*
Week 5 (9/28)	Propagation of Error
Week 6 (10/5)	Determination of Creatinine by Rate Spectroscopy*
Week 7 (10/12)	*Computer Activity on Quantum Mechanics*
Week 8 (10/19)	Atomic Emission*
Week 9 (10/26)	*Mathcad MO Models*
Week 10 (11/2)	Spectrophotometric Determination of Fe
Week 11 (11/9)	Nine Solutions
Week 12 (11/16)	Dumas Method and GC-MS (meeting M&T)
Week 13 (11/23)	Optical Diffractions+
Week 14 (11/30)	*Presentations***
Week 15 (12/8)	Solid State Structures and Properties/ *Check Out*

Lab is scheduled for Thursday from 7:45 AM to 10:45 AM in room 2365 for section 891 and Wednesday from 2:25 PM – 5:25 PM in room 2365 for section 892.

*Laboratory report should be submitted as a formal paper.
+Labs this week will be on Monday afternoon and Tuesday morning.
**Presentations will occur on Monday/Wednesday afternoons and Tuesday/Thursday mornings of week 14.

Entries in italics do not require experimental work.