Course Info and Policies

Instructor: Dr. Richard A. Himes
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e-mail: himesra@cofc.edu Phone: (843)953-3618
Connect web page: http://connect.mcgraw-hill.com/class/chem-112-spring14-himes
Office hours: Subject to change – T 9:30-10:30 am, W 10am-12pm, 3:30-4:30. If I'm in my office, I'll usually take questions!
Lecture: Section 06: 10:50 am – 12:05 pm, TR. Location: LCTR 346.
Section 07: 12:15 pm – 1:30 pm, TR. Location: LCTR 346.

Important dates: Jan. 14: Last day to Drop/Add Jan. 30: Exam 1 Feb. 27: Exam 2 Mar. 1-9: Spring Break (no class)
Mar. 10: Mid Term grades available Mar. 21: Last day to withdraw with a grade of ‘W’ Mar 27: Exam 3
Apr. 17: Exam 4 Apr. 24: Reading Day (no class)
FINAL EXAM: SECTION 06: Apr. 26, 8-11 am, LCTR 346. SECTION 07: Apr. 29, 12-3 pm, LCTR 346.

Required Text: Chemistry: Atoms First, Burdge/Overby (same text as CHEM 111)

Calculators: A calculator that performs exponential and logarithmic functions is required and not provided. Please bring it to class meetings and all exams. Graphing calculators are permitted but not required; memory must be cleared prior to exams.

Prerequisite: A basic working knowledge of general algebra; CHEM 111. Co-requisite: You must be registered for Chem 112 lab concurrently. Withdrawing from either lecture or lab course requires withdrawing from both courses.

Attendance: Attendance is not required, but is strongly recommended. You are responsible for material that you miss; office hours will not be used to teach missed topics. Participation in lecture is highly recommended. Exams: You are expected to take each exam in class, on the dates listed above. Only documented (health center note for severe illness, etc.) circumstances will be considered for re-scheduling exams and ONLY if the instructor is consulted prior to the scheduled exam. Re-scheduling the final exam requires pre-approval from the registrar and the chemistry department chair.

Disabilities: If there is a student in this class who has a documented disability and has been approved to receive accommodations through SNAP Services, please feel free to come and discuss this with me during my office hours.

Academic integrity: This course is conducted under the Honor Code of the College of Charleston (http://www.cofc.edu/studentaffairs/HonorBoard?HonorBoard.htm). Review the Department of Chemistry and Biochemistry’s policy on Scientific Integrity (http://www.cofc.edu/~chem/advising/integ.pdf).

Email: Email is considered an official method for communication at the College of Charleston. If students wish to have email redirected from the official College-issued account to another email address (e.g., @gmail.com, @hotmail.com), they may do so, but at their own risk. Having email redirected does not absolve the student from the responsibilities associated with communication sent to his or her College account. The College is not responsible for the handling of email by outside vendors or unofficial servers. Students are expected to check their CoC official email frequently for College related communications. Checking email on a daily basis is recommended. Students are responsible for reading all time-sensitive communications. “I didn't check my email”, forwarding errors, or email returned to the College with “Mailbox Full” or “User Unknown” are not acceptable excuses for missing official College communications via email. Please check your e-mail frequently and carefully read each e-mail from the instructor.

Course Performance and Evaluation

Grades: Assignment weighting and the grading scale for the course are below. You are responsible for picking up graded assignments, either in class or the instructor's office. Graded papers cannot be left in public areas nor will grades be distributed by e-mail or over the phone. Please come to office hours if you need to discuss your grade and class performance.

<table>
<thead>
<tr>
<th>Grading Scale:</th>
<th>A 92-100%</th>
<th>B- 80-81%</th>
<th>D+ 68-69%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulas:</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quizzes:</td>
<td>A- 90-91%</td>
<td>C+ 78-79%</td>
<td>D 62-67%</td>
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<tr>
<td>Problem Sets:</td>
<td>10%</td>
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<tr>
<td>4 Exams:</td>
<td>B+ 88-89%</td>
<td>C 72-77%</td>
<td>D- 60-61%</td>
</tr>
<tr>
<td>Final Exam:</td>
<td>20%</td>
<td>B 82-87%</td>
<td>C- 70-71%</td>
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</table>

(ACS final: 19%; Gen Ed Assessment: 1%)
The lowest in-class quiz and take-home quiz will be dropped. No exam will be dropped, but your lowest exam score will carry half the weight of each of your three best exams. Grades will not be “curved” (i.e., re-calculated to fit a distribution with a certain number of A’s, B’s...). In other words, you will not be competing with classmates for a limited number of A’s, B’s, etc.

**Homework:** Suggested textbook problems and “extra” instructor-written problems will be given for each topic covered. These assignments are not collected, but you are expected to keep up with the homework as the course progresses in order to reinforce the material and gain proficiency in solving the problems. WORKING THESE PROBLEMS WILL BE CRUCIAL FOR EXAM PREPARATION. Our section will have a website on Connect from McGraw-Hill: [http://connect.mcgraw-hill.com/class/chem-112-spring14-himes](http://connect.mcgraw-hill.com/class/chem-112-spring14-himes). Extra problems and review materials will be posted there but are NOT required assignments.

**Quizzes:** In-class quizzes (~5 min., multiple choice or short problems) will be given at the start of certain Tuesday class meetings and will be announced in advance. Not more than ten such quizzes will be given. Your lowest score will be dropped.

**Problem Sets:** Will allow you to demonstrate an understanding of concepts and problems associated with each chapter and should help you prepare for exam problems. Each set will consist of ten problems (or five two-part questions, etc.). Available on OAKS every Thursday; no set the week before an exam. Due the following Thursday. Problem sets not submitted by 6pm receive no credit. Answers and worked-out solutions will be provided on OAKS prior to the relevant exam. Lowest is dropped.

**Exams:** Four midterm exams will be given during regular class meetings on the Thursday dates provided above. The material covered on each exam will be announced in class. Exams will consist of a more conceptual multiple choice/fill-in-the-blank/etc. section and a problem-working section that is not multiple choice. Preparation for these exams should include a substantial amount of PRACTICE PROBLEMS. Review the textbook and the notes for the conceptual questions. A practice exam may be provided on OAKS and/or in SI before the first exam to acquaint you with the instructor’s style of testing.

**Final Exam:** Consists of two portions. The first is a standardized, timed, multiple-choice test prepared by the American Chemical Society (95% of the overall final exam score). The second is a written assignment that will assess how you meet the General Education Learning Outcomes, below (5% of the overall final exam score). Date, time and location are listed above.

### Course Learning Outcomes and Topics

**Course Description:** An introductory course in chemistry emphasizing theoretical aspects, and designed primarily for students intending to take one or more additional courses in chemistry. This is the second semester of a year-long course. You must have taken and passed, or exempted out of, Chem 111.

**Learning Outcomes:** The student who successfully completes this course should be able to meet the following outcomes:

- **General Education Learning Outcomes:**
  - Students apply physical/natural principles to analyze and solve problems.
  - Students will develop an understanding of the impact that science has on society
  - THESE LEARNING OUTCOMES WILL BE ASSESSED AS A PORTION OF THE FINAL EXAM.

- **Chemistry 112 Overall Course Learning Outcomes:**
  - Demonstrate competency with all of the learning objectives stated for Chem 111 and Math 111
  - Apply common mathematical techniques to describe the kinetic and thermodynamic processes related to chemical equilibria.

  **Chapter-specific topics:**

**Chapter 13 Physical Properties of Solutions**
- Describe important factors in the solution process.
- Express concentrations in mass %, parts per million, mole fraction, molarity, and molality.
- Predict the effect of pressure and temperature on solubility.
- Use Raoult’s law in vapor pressure lowering and distillation problems.
- Use boiling point elevation and freezing point depression to determine molar mass.
- Calculate osmotic pressure.
- Explain what colloids are.
- Relate the effect of colligative properties.

**Chapter 14 Chemical Kinetics**
- Determine rate laws using the method of initial rates.
- Determine first order rate laws from data.
- Relate rate laws to reaction mechanisms.
- Draw reaction pathway diagrams illustrating catalysis pathways and activation energy.
- Use the Arrhenius equation to calculate rate constants at different temperatures.
- Explain the effect of heterogeneous and homogeneous catalysis.
• Relate the role of enzymes to rates and selectivity of reactions.

Chapter 15 Chemical Equilibrium
• Calculate equilibrium constants and equilibrium concentrations.
• Predict effects on equilibrium using Le Chatelier's Principle.

Chapter 16 Acids and Bases
• Describe Bronsted acids and bases. Discuss the acid-base properties of water. Recognize strong acids and bases.
• Recognize weak acids and bases.
• Calculate the pH, pOH, [H+], [OH-], and dissociation constants for acid-base, salt, and buffer solutions.
• Know the relationship between conjugate acid-base pairs.
• Work with diprotic and polyprotic acids. Recognize and use the acid-base properties of salt solutions.
• Describe Lewis acids and bases.

Chapter 17 Acid-Base Equilibria and Solubility Equilibria
• Describe the common ion effect in equilibria. Describe buffer solutions. Calculate the pH of a buffer solution.
• Describe how to prepare a buffer solution with a specific pH. Calculate acid-base titrations.
• Calculate concentration, solubility, and solubility product constants for slightly soluble compounds.
• Describe the qualitative analysis of metal ions in solution using differences in solubility.
• Calculate concentrations, solubilities, and formation constants for complex ions.

Chapter 18 Entropy, Free Energy, and Equilibrium
• Relate the first, second, and third laws of thermodynamics to spontaneous processes.
• Calculate and interpret enthalpy, entropy, and free energy changes for chemical systems.
• Calculate equilibrium constants from thermodynamic data.
• Explain the role of thermodynamics in living systems.

Chapter 19 Electrochemistry
• Balance oxidation-reduction reactions.
• Draw and explain processes in galvanic, voltaic, and electrolytic cells.
• Use the Nernst equation to calculate cell potentials.
• Calculate cell emf, concentrations, equilibrium constants, enthalpy, and entropy using electrochemical methods.
• Calculate stoichiometric quantities in electrolytic processes.
• Relate electrochemical theory to the storage of energy.

Chapter 20 Nuclear Chemistry
• Describe and predict radioactive processes using nuclear equations.
• Use first order kinetics in radiocarbon dating and other decay processes.
• Calculate the mass defect, and binding energy, of nuclei.
• Describe nuclear fission and fusion and calculate the associated energy changes.
• Discuss the role of radioactive isotopes in medicine and the environment.

Suggestions for Approaching CHEM 112

Class Preparation and Participation: Chem 112 involves a large amount of information and problem solving, and material covered early in the semester must be understood before grappling with topics taught later in the course. It is essential to keep up with the material. The following are suggestions for class preparation and study:

Before class: Read and become familiar with the material prior to each class meeting. This prep time will help you get the most out of the lecture, and help you ask questions that will most augment your understanding of the topics.

During class: Participate! I encourage and expect questions. Questions help me evaluate what you have understood and when I need to be clearer. When preparing for class, jot down potential questions you may want to ask – the more focused and specific, the more you will get out of the answer. (Coming up with a good, focused question is an excellent way to pinpoint what you understand and what you don’t.) But you should ask any question you have. To keep class moving, I may eventually need to cut off questions on a single topic, but do not let that discourage you from asking your questions! Further questions during office hours or in e-mail are encouraged. I will make every attempt to respond to all e-mail questions same-day.

Homework and study: The assigned textbook problems represent the bare minimum of problem solving that you should be doing outside of class. Working example after example is the only way to become proficient in the problem solving part of this course. You should be able to work all of the example problems given. For more practice, work as many of the end-of-chapter problems as you can. Reinforce the skill by revisiting the assigned problems over time.

Chem 112 also emphasizes theoretical concepts. A good way to demonstrate your understanding is to give a clear explanation (to a study group, or in writing – which may be practice for exams!) of a concept without resorting to notes or the text. I recommend group study. “Teach” certain topics to others and discuss questions that come up in response. Being able to clearly explain a topic and answer questions about that topic will force you to fill conceptual gaps that you may not have known were there. Parts of the take-home quizzes will be designed to help you in this respect.