Chem 100: Introductory Chemistry

Syllabus
Fall 2014
Brown University

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Lecture: Mondays, Wednesdays and Fridays 11-11:50am in MacMillan 117
Office hours: Wed 1-2:30pm, Thursdays 1-2:30pm, or email to arrange an appointment.

Course Description:

This course provides an introduction to the fundamental principles of chemistry with particular emphasis on the atomic and molecular nature of matter. We will begin our study with the classification and measurement of matter, experiments that led to the atomic theory, classification of elements and the periodic table, types of compounds and their nomenclature, chemical reactions, stoichiometry, solutions, gas laws, kinetic molecular theory, thermochemistry, description of phase changes, quantum mechanical model of the atom, bonding models, intermolecular forces, and end with an introduction to chemical equilibrium and acids/bases. You will apply the concepts and deepen your understanding of the connections between the concepts by solving problems in class and problem sessions. There are three hours of lecture and 1.25 hours of problem sessions every week.

Course Goals:

The main aim of Chem 100 is develop your knowledge of chemical principles to prepare for Chem 330 and more advanced science courses. The principal objectives of the course are for students to: 1) describe the atomic and molecular nature of matter, 2) classify and name substances, physical states of matter, chemical and physical processes, 3) measure quantities of substances and energy involved in chemical processes, 4) understand the electronic structure of the atom and relate with bonding and properties of molecules and compounds, and 5) develop analytical, quantitative reasoning and problem solving skills.

Required Textbook/Materials

1. Tro, Nivaldo J. *Chemistry, A Molecular Approach* 3e Third Edition, Pearson Prentice Hall, 2014, with MasteringChemistry online homework. An ebook is available with Mastering access included for approx. $110 online. Assigned reading begins September 3rd.
2. A scientific calculator; turn off programming during exams.
3. A registered iclicker device, obtained from the Friedman Study Center in the basement of the Sciences Library. Register the device at www.iclicker.com using your full name and the number of the device.
4. Access to Mastering Chemistry online homework. You can purchase access separate from the text ($66.00) at http://www.masteringchemistry.com/tro . The Course ID needed for registration is CHEM100FALL2014. Please take care to choose the correct Tro textbook (above, 3e) during registration.

Grades are calculated as a weighted sum based on:

5% conference quizzes
5% class participation with i-clickers
10% online homework and reading reflections
50% three midterm Exams
30% comprehensive final Exam

Grades: Chem 100 is a Pass/Fail or S/NC class. The estimated grading scale is:

90% and above, S_Dist 60% and above, S Less than 60%, NC

Course outline and schedule:

I. Foundations of Chemistry (September 3 – October 3) Exam 1 on Wednesday, October 8

A. Matter, Energy, Measurement and Problem Solving (Chapter 1, Appendix 1A)
   - classification of matter, properties, measurement of matter, units, significant figures, scientific notation, dimensional analysis, density, and problem solving.
B. Atoms, Elements and Ions (Chapter 2)
   - atomic theory; elements, ions, isotopes and the periodic table; atomic masses; the mole
C. Molecules and Ionic Compounds (Chapter 3)
   - ionic and covalent compounds, naming compounds, molar mass, molecular formulas and molecular composition
D. Chemical Reactions (Chapter 3.11 and 4)
   -balance chemical equations, stoichiometry calculations, classification of reactions, concentration of solutions and solubility

II. Gases and Energy in Reactions (October 10 – 27) Exam 2 on Wednesday, October 29

A. Gases (Chapter 5)
   -ideal gas law, gas-phase reactions, kinetic theory of gases, real gases
B. Thermochemistry, calorimetry and phase changes. (Chapters 6 and 11.5-11.7)
   -energy, heat and work, system and surroundings, enthalpy, calorimetry, energy in phase changes, Hess's Law, enthalpies of formation and standard enthalpies of reactions

III. Quantum mechanics and Bonding (November 1 – 21) Exam 3 on Friday, November 21

A. Quantum Mechanical Model of the Atom (Chapters 7 and 8)
   - waves and particles for light and matter; atomic orbitals; electron configurations, periodic trends
B. Bonding and Intermolecular Forces (Chapters 9 and 11.3)
   -Lewis model of bonding, electronegativity, lattice energies, bond energies, intermolecular forces

IV. Equilibrium (November 26 – December 9)

A. Chemical Equilibrium (Chapter 14)
   -calculate equilibrium constants and reaction quotients for gas and solution reactions, Le Châtelier's principle, calculate concentrations and partial pressures at equilibrium
B. Acids and Bases (Chapter 15)
   -definitions, pH, dissociation of strong and weak acids and bases

Comprehensive Final Exam on December 18, 2-5pm: is the required final assessment.

Academic Honesty

Please review http://www.brown.edu/academics/college/degree/policies/academic-code . All work submitted for grading should reflect your own individual work. Discussions with other students or the instructor to clarify some assignment questions are allowed, but copying is not acceptable. Active collaboration and discussions are expected in the problem sessions. All work submitted for grading in online homework, assessments, quizzes and exams is strictly individual. Sharing, copying, or obtaining information from unauthorized sources during quizzes, pretest, post-test, and exams are violations of the code. No electronics are allowed during exams or quizzes. Violations will result in NC in the course and notification to the Dean of the College.

Accommodations

If you need accommodation please submit documentation from Student and Employee Accessibility services (SEAS) in the first few weeks of the semester. Please come to my office hours or make an appointment (email).

Exam and Quiz Policies

Sorry, there are no makeup exams or makeup quizzes in Chem 100. There may be consideration for a single absence to an exam if documented by Dean's note or Health services. The final exam is required for completion of the class. Missing two midterm exams or the final exam without documentation will unfortunately result in NC in the course.
If you discover a grading mistake, submit the unmodified exam to me within a week after the exam is returned. On a separate page attached to the exam explain why the exam should be completely re-graded. Please note the grade may be lower or higher than prior to the re-grade.

Classroom Participation and Expectations

iClicker use during class and completion of a pretest and posttest will give you participation points. Please bring your i-clicker, calculator, and reading notes or textbook to lecture/class. Your active class participation will be rewarding for all of us. *Please do not distract yourself and others by using internet devices (laptops, smartphones) during class*.

CONFERENCE = Problem Sessions

Active participation in small-group problem sessions is required in this course.
During the weekly Conferences you will apply the concepts from lecture by solving problems; you will strengthen your understanding by explaining your reasoning in active discussions with other students. Open notes individual quizzes offer weekly feedback on your learning. To prepare to solve problems please read the Chapter and bring your textbook, reading notes and calculator to the sessions. *No internet devices are allowed during the problem sessions or quizzes.*

Tips for success: The class will move at a relatively fast pace. Read the text quickly before lecture, complete the reading reflections on time, engage in class activities, read text closely after lecture, ask questions, actively discuss and solve problems in conference, attend office hours, keep up with homework. Use academic support often: attend instructor hours, TA open hours, Science center hours; sign up for group tutoring if needed. *Underlined tips come from students' mid-semester surveys.*