CHEM1200: Problem Solving in General Chemistry

The University of Toledo
College of Natural Sciences and Mathematics
Department of Chemistry and Biochemistry
CHEM1200 Sections 001-015

Instructor: Dr. Amy Toole
Email: amy.toole@utoledo.edu
Office Hours: T 10-12 and 2-3; W 2-3; F 11:30-1
also by appointment. I like visitors!
Office Location: BO2086G
Office Phone: 419-530-1503
Term: Fall 2019
Check your class schedule for the time and location of your section

Congratulations! Taking this class was a great decision.

COURSE/CATALOG DESCRIPTION
Problem solving and skill development for students enrolled in CHEM 1230 who obtained a satisfactory score on the chemistry placement test, but need additional assistance in selected topics. May be taken only as P/NC.

COURSE STATEMENT
This course is designed to supplement CHEM 1230, General Chemistry I. It is hoped that your experiences in this course will help you 1) to improve your understanding of the material from that course and to 2) develop study, problem solving and communication skills valuable in many courses.

STUDENT LEARNING OUTCOMES
Because this is a supplement to General Chemistry I, the outcomes expected for this course are identical to those for General Chemistry I. At the conclusion of the course students will be able to:

- Demonstrate the use of equations and dimensional analysis to solve problems in chemistry and justify the number of significant figures in the result.
- Explain the underlying principles for their calculations.
- Explain fundamental chemical terms and concepts.
- Convert between atomic level representations, symbols and names of atoms, isotopes, ions and molecules (including Lewis structures and geometric descriptions).
- Describe the modern model of the atom and explain how it compares to earlier models.
- Describe and compare bonding in different types of substances.
- Identify and describe intermolecular forces in given substances, then predict relative melting point, boiling point and solubility based on intermolecular forces.
- Qualitatively and quantitatively describe the behavior of real and ideal gases.
- Describe the interconnectedness between periodic trends, atomic properties and element reactivity.
- Predict, complete and balance reactions (double replacement, combustion and single replacement).
- Describe and calculate energy, entropy and free energy changes in chemical reactions and physical processes.
TEACHING METHODOLOGY
A method of teaching/learning that has been shown both within our university and nation-wide (https://pubs.acs.org/doi/10.1021/ed085p990) to improve student success rates in Science, Technology, Engineering and Math (STEM) courses is “Peer-Led Team Learning (PLTL)”. Here are some findings at UToledo:

1) At the end of the course, 75% of students said they would suggest or recommend it to their friends. That sounds like very strong evidence for what the course can do for you.

2) At the end of the semester, students who take CHEM 1200 with CHEM1230 indicate a significantly greater confidence in their ability to solve problems in general chemistry than those who do not take CHEM 1200.

3) For students with comparable backgrounds, like placement and ACT scores, taking CHEM 1200 with 1230 makes an average difference of one-third of a letter grade, that is, from a C to a C+ or from a C+ to a B-. The course gives you an **EDGE**!

The general format for PLTL is small group workshop and discussion. During class time you will solve general chemistry problems with a small group of peers (usually about 6). Your group will be guided by a student who has successfully completed General Chemistry I, and who trains weekly on how to facilitate group learning. In addition to acquiring a better understanding of chemistry, students who take CHEM1200 will sharpen problem solving, collaboration and communication skills.

As your instructor, I am here to help. You are always welcome during my office hours or to make an appointment. I will do my best to respond to email within 24 to 48 hours. I will also be soliciting frequent feedback regarding your experience in the course in an attempt to constantly improve your experience.

PREREQUISITES AND COREQUISITES
All students taking CHEM1200 will also be taking CHEM1230.

REQUIRED INSTRUCTIONAL MATERIALS
You are required to download problem sets from Blackboard and bring them with you to each session. Some weeks you will also be required to bring a way to access the electronic textbook for CHEM1230, or copies of problems from the textbook.

TECHNOLOGY REQUIREMENTS
Blackboard (https://blackboard.utoledo.edu/webapps/login/). Students need to have access to a properly functioning computer throughout the semester. Student computers need to be capable of running the latest versions of plug-ins, recent software and have the necessary tools to be kept free of viruses and spyware. Updated software is available from the Online Learning Download Center (https://www.utoledo.edu/dl/main/downloads.html). You will need to use a calculator in the weekly sessions.

UNIVERSITY POLICIES

Policy Statement on Non-Discrimination on the basis of Disability (ADA):
The University is an equal opportunity educational institution. Please read The University’s Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.

Academic Accommodations: The University of Toledo is committed to providing equal opportunity and access to the educational experience through the provision of reasonable accommodations. For students who have an accommodations memo from Student Disability Services, it is essential that you correspond with me as soon as possible to discuss your disability-related accommodation needs for this course. For students not registered with Student Disability Services who would like information regarding eligibility for academic accommodations due to barriers associated with a potential disability, please contact the Student Disability Services Office.
COURSE EXPECTATIONS
Each week you are expected to:

- Access the materials for the week from Blackboard and bring them with you to the class session.
- Complete a brief pre-test and bring it to the class session. The pre-tests are meant to help assure that all students have reviewed some common background material before attempting the session problem solving.
- Arrive to the class on time, participate, ask questions, and help others.
- Treat others with respect, patience and dignity.
- Provide feedback on session content and mechanics to your peer-leader before you leave.
- Check your UT Toledo email (consider setting up notifications on your phone!) and Blackboard regularly for important course information.

Additionally, there are pre-course and post-course surveys, plus four 1-hour quizzes for you to complete during the semester.

OVERVIEW OF COURSE GRADE ASSIGNMENT
This course is graded on the Pass/No Credit grading system. If you earn 70 of the 105 possible points in the course you will receive a grade of Pass. If you earn less than 70 points you will receive a grade of No Credit. If you miss a class due to a reason that is consistent with the university’s Missed Class Policy, you should immediately contact the instructor in order to request an excused absence. Your goal should be to not miss any classes since each class will help you.

Point Summary and Grade Scale

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>22 pts</td>
</tr>
<tr>
<td>Weekly Sessions</td>
<td>55 pts</td>
</tr>
<tr>
<td>[attendance (2), participation (2), feedback (1)]</td>
<td>20 pts</td>
</tr>
<tr>
<td>Quizzes</td>
<td>8 pts</td>
</tr>
<tr>
<td>Pre- and Post-Course Surveys</td>
<td>105 pts</td>
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</tbody>
</table>

Add/Drop Deadlines - Dropped courses do not appear on your transcript. The deadline for dropping is Monday, September 9th. You may withdraw from the course and receive a grade of W. The deadline for withdrawal is Friday, November 1st.

Course registration changes and attendance might affect your financial aid. During the term instructors report student attendance, so you will want to be sure that you are in attendance. However, you will remain enrolled in the class independent of these reports, unless you take the action of dropping or withdrawing. A course grade of Incomplete is given only to those who have completed all but a small percentage of course requirements for an acceptable reason. Participation in this course is contingent upon enrollment in CHEM 1230, so if you drop or withdraw from that class you are to do the same for this class.

ACADEMIC SUPPORT SERVICES
Course scheduling assistance: Chemistry Department Secretary, Ms. Samples, is in Room BO 2022, telephone 419-530-2698. She takes care of all scheduling changes.

Chemistry Help Center, Room BO 2043, is where the teaching assistants hold their office hours so it is a great place to receive assistance. It is generally open all day Monday through Friday & evenings Monday through Thursday. A schedule will be posted early in the term. No appointment is necessary.

Tutoring support for all UT students is available through the Learning Enhancement Center located in Carlson Library.
**COURSE SCHEDULE**

<table>
<thead>
<tr>
<th>WEEK</th>
<th>Class Meeting Dates</th>
<th>CHEM1200 Topics</th>
<th>Additional Notes</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 29 or 30</td>
<td>Welcome 1 Matter and Measurements RECITATION 2 Atoms, Molecules and Ions</td>
<td>Pre-Course Survey should be completed by Aug. 30 at 5 PM</td>
</tr>
<tr>
<td>2</td>
<td>Sept 5 or 6</td>
<td>3.1 Molecular and Formula Mass 3.2 Percent Composition 3.3 Balancing Equations 3.4 The Mole, Grams and Numbers of Things, Empirical Formula</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sept 12 or 13</td>
<td>3.5 Combustion Analysis and Molecular Formula 3.6 Reaction Stoichiometry 3.7 Limiting Reagents, Reaction Yield and Types of Reactions</td>
<td>Last day to Drop via the web is Mon 9/9</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td><strong>Exam 1 in CHEM1230</strong> is Wed 9/18. It covers Chapters 1, 2, 3, 4 (partial – see CHEM1230 syllabus)</td>
<td>There is NO CHEM1200 meeting this week but you do have <strong>QUIZ 1 (online)</strong> covering material from Chapters 1-3 of the CHEM1230 text. The quiz is meant to help prepare you for the CHEM1230 exam so it is due TUESDAY at 8AM. You can access it through the Quizzes link on Blackboard. <em>Note that CHEM1200 does not cover all the material that will be on Exam 1 in CHEM 1230.</em></td>
</tr>
<tr>
<td>5</td>
<td>Sept 26 or 27</td>
<td>4.5 Molarity, Dilution, Solution Stoichiometry 4.6 Titrations and Gravimetric Analysis</td>
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1 Some CHEM1200 sections meet Thurs., others Fri. Check your schedule to see which date applies to you.

2 The numbers refer to chapters and sections in the CHEM1230 textbook. **Unfortunately, there is not enough time in CHEM1200 to cover ALL of the CHEM1230 topics.**

3 Each week you will come to class with a completed pre-test for the WEEK (see Blackboard – “Weekly Assignments” link) and a copy of the problems you will work on during your session.
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| 6    | Oct 3 or 4          | 5.3 Enthalpy and Enthalpy Changes  
5.4 Specific Heat and Calorimetry  
5.5 Hess’s Law  
18.1 Spontaneous Processes  
18.2 A Qualitative Description of Entropy  
18.4 Gibbs Free Energy Change |  |
| 7    |                     | None            | Fall Break – No CHEM1200 |
| 8    | Oct 17 or 18        | Exam 2 in CHEM1230 is Wed 10/16. It covers Chapters 4 (partial), 5, 6, 7 (partial), 18 (partial), and review of Exam 1 – see CHEM1230 syllabus | There is NO CHEM1200 meeting this week but you do have QUIZ 2 (online) covering material from Chapters 4, 5 and 18 of the CHEM1230 text.  
The quiz is meant to help prepare you for the CHEM1230 exam so it is due TUESDAY at 8AM.  
You can access it through the Quizzes link on Blackboard.  
Note that CHEM1200 does not cover all the material that will be on Exam 2 in CHEM 1230. |
| 9    | Oct 24 or 25        | 7.3 Effective Nuclear Charge  
7.4 Periodic Trends (Radii, Electron Affinity and Ionization Energy)  
7.5 Electron Configurations of Ions  
7.6 Ionic Radii  
7.7 Periodic Trends in Chemical and Physical Properties of Elements |  |
| 10   | Oct 31 or Nov 1     | 8.3 Covalent Bonding  
8.4 Bond Polarity  
8.5 Lewis Dot Structure  
8.6 Lewis Structures and Formal Charge  
8.7 Resonance  
8.8 Exceptions to the Octet Rule  
8.9 Bond Enthalpy | Last day to Withdraw via the web is Friday 11/1 |
| 11   | Nov 7 or 8          | 9.1 Molecular Geometry  
9.2 Molecule Polarity  
9.3 Valence Bond Theory (VBT)  
9.4 Hybridization |  |
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| 12   | Nov 14 or 15        | 9.5 VBT: Double and Triple bonds  
         |                     | 9.6 Molecular Orbital Theory  
         |                     | 9.7 Delocalized Bonding  
         |                     | 11.1 Intermolecular Forces | QUIZ 3 (online) covering material from Chapters 7, 8, 9 and 11 of the CHEM1230 text.  
         |                     | SURPRISE! YOU WILL MEET WITH YOUR PLTL GROUP to begin review for the final but there is no pre-test to take or assignment to print.  
         |                     | Exam 3 in CHEM1200 is Wed 11/20, Chapters 7 (partial), 8, 9, 11 (partial) and review of Exams 1 and 2 | The quiz is meant to help prepare you for the CHEM1230 exam so it is due TUESDAY at 8AM.  
         |                     | None            | You can access it through the Quizzes link on Blackboard.  
         |                     |                 | Note that CHEM1200 does not cover all the material that will be on Exam 3 in CHEM 1230. |
| 14   | Nov 21 or 22        | 10.1 Properties of Gases  
         |                     | 10.2 Gas laws  
         |                     | 10.3 The Ideal Gas Law  
         |                     | 10.4 Reactions with Gases  
         |                     | 10.5 Partial Pressures  
         |                     | 10.6 Kinetic Molecular Theory  
         |                     | 10.7 Deviation from Ideal Behavior | Thanksgiving Break – No CHEM1200 |
| 15   | Dec 5 or 6          | 10.1 Properties of Gases  
         |                     | 10.2 Gas laws  
         |                     | 10.3 The Ideal Gas Law  
         |                     | 10.4 Reactions with Gases  
         |                     | 10.5 Partial Pressures  
         |                     | 10.6 Kinetic Molecular Theory  
         |                     | 10.7 Deviation from Ideal Behavior | QUIZ 4 (online) includes three questions on material from Chapter 10 of the CHEM1230 text and two other review problems.  
         |                     | All              | Post Course Survey should be completed by Dec. 11 at 5 PM |