General Chemistry I
The University of Toledo
College of Natural Sciences and Mathematics
Department of Chemistry and Biochemistry
CHEM1230-001 and 081

Instructor: Dr. Kristi Mock
Email: kristi.mock@utoledo.edu
Office Hours: MW 10-11; TWR 12:30-1:30. Also by appointment.
Office Location: BO2086F
Office Phone: 419-530-4080
Term: Fall 2019
Lecture Location: WO1201
Lecture Sections/Day/Time: L1, L81/MWF/ 9:10am – 10:05am

REQUIRED INSTRUCTIONAL MATERIALS
- Access to a properly functioning computer with internet access in order to login to Blackboard (https://blackboard.utdl.edu/webapps/login/). From the Blackboard course site you will access:
  - An electronic copy of the textbook, Chemistry by Julia Burge 5th edition
  - Connect online homework assignments
  - ALEKS online homework assignments
- A Turning Point account/subscription (Free of Charge this semester) to be used on a wireless device (phone, computer, tablet)
- A non-programmable calculator. Only non-programmable calculators are allowed when you take exams in this course.

OPTIONAL INSTRUCTIONAL MATERIALS
- A hard copy of Chemistry by Julia Burge 5th edition (3-ring hole-punch version is available in the bookstore).
- Updated versions of plug-ins, recent software and the necessary tools to be kept free of viruses and spyware. Updated software is available from UT’s Online Learning Download center (https://www.utoledo.edu/dl/main/downloads.html).

COURSE/CATALOG DESCRIPTION
An introduction to atomic structure, chemical bonding, kinetic-molecular theory, energy relationships and structural concepts. This sequence is for students who major in science, engineering or other fields which require chemistry as a prerequisite subject. Three hours lecture and one hour discussion (recitation) per week.

COURSE STATEMENT
CHEM 1230 General Chemistry I and CHEM 1240 General Chemistry II are the lecture courses in the general chemistry sequence. The parallel lab courses are CHEM 1280 and CHEM 1290, which you may be taking with the lecture. General Chemistry is appropriate for students who are majoring in the natural sciences, science education, pharmacy, engineering and some allied health fields. Chemistry is sometimes called the “central science” because application of chemical principles is key to understanding many other sciences. In CHEM1230 you will study the atomic level structure of matter and how this structure determines the physical properties and reactions of substances. You will become familiar with the language and symbolism of chemistry as well as sharpen your critical thinking and problem-solving abilities.
STUDENT LEARNING OUTCOMES
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.

COURSE PREREQUISITES AND CO-REQUISITES:
Your success in CHEM 1230 is important, therefore we require that you meet one of these course prerequisites:

- A score of 50% or higher on the ALEKS chemistry placement exam (earned on the initial assessment or after learning in ALEKS and a subsequent assessment), OR
- A grade of C or above in CHEM 1090.

If you do not meet either of the above criteria, you must withdraw from CHEM 1230 and register for CHEM 1090.

If your ALEKS initial assessment is below 50% you are required to take CHEM 1200 with CHEM 1230.

TEACHING/LEARNING STRATEGIES
Research has shown that learning occurs when the learner is actively involved in “doing” rather than just listening or watching. Practice and repetition are also key to learning. With these ideas in mind the following are used to facilitate learning in this course.

Lecture sessions: Attendance is required and you are expected to arrive on time. You are responsible for all material, experiments, and problems covered in class. You will be actively involved in the sessions by taking notes, answering questions posed through a classroom response system (Turning Point), and working through problems and calculations with guidance from the instructor.

Textbook: You should read relevant textbook sections before the lecture sessions and complete any pre-class assignments so you are familiar with concepts on which we will build in class.

Recitation sessions and Connect assignments: Weekly recitation sessions will provide an opportunity to ask questions and solve problems with a smaller group of students and a graduate teaching assistant (TA). To spark questions and identify topics requiring more explanation, you will work problems in an online program called “Connect” prior to attending your recitation session. Your work will be immediately electronically graded so that during recitation, you can collaborate with peers to improve your score. The goal of the session: all students leave with confidence in their ability to solve all the types of problems assigned for the week.

ALEKS assignments: ALEKS is an online platform that provides additional practice in problem solving. ALEKS is completed individually. Unlike Connect, this program adapts to the different pace of learning and understanding among different students. Like Connect, ALEKS assignments will be given weekly, but because ALEKS provides extensive explanations, it is possible to work ahead. In fact, you are encouraged to use ALEKS assignments as an introduction to concepts we will cover during lecture. You should definitely complete ALEKS problems before the more challenging Connect assignments. Note that because ALEKS is just one of several learning tools we use in the course, it may not completely cover all topics.
UNIVERSITY POLICIES
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 access to education for all students. If you have a documented disability, or believe you have a disability, and would like information regarding academic accommodations/adjustments in this course please contact the Student Disability Services Office.

ACADEMIC POLICIES
Taking Exams: You must show a photo identification card at all exams. You may use a non-programmable calculator, but you may NOT use a programmable calculator or phone.

Exam Conflicts: If you cannot take an exam at the scheduled time due to an irresolvable conflict with a major University related responsibility, you must provide written documentation to verify the conflict before the exam date and obtain instructor approval before the exam. This situation may occur for students on official university business. If the documentation is approved, you will be given an opportunity to take the exam at an arranged time before the scheduled test date.

Midterm Exam Absence: Make-up exams will not be given for any circumstance. If you unexpectedly miss a midterm exam due to illness, car accident or similar extreme circumstance you should inform the instructor of your difficulty as soon as possible. The problem must be documented by a physician’s note indicating you were advised not to attend class, an accident report, etc. An email to your instructor and a telephone call within 24 hours is expected. If your excuse is acceptable, your final course grade will be computed with the score on the missed exam equal to the average of the other midterm exams. In all other circumstances a missed exam will result in a grade of 0.

Final Exam Absence: The final exam cannot be excused.

Academic Dishonesty: You are urged to refer to the University’s policy on Academic Dishonesty in the university catalogue. Violation of this policy can result in a course grade of F with additional university sanctions possible. You are also required to read and agree to a course specific Academic Honesty Statement which has been posted on Blackboard. Both the University and course specific Academic Honesty Statement will be strictly enforced.

COMMUNICATION GUIDELINES
You are expected to check your UT email account and Blackboard frequently for important course information. As your instructor, I am here to help, and will do my best to respond to email within 24 to 48 hours. My office hours are listed at the beginning of the syllabus and you are always welcome to make an appointment outside of those hours.
GRADING

Course Points: The following is the distribution of possible points in the course.

<table>
<thead>
<tr>
<th>Course Aspect</th>
<th>Points</th>
<th>Percentage of Total Points</th>
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</thead>
<tbody>
<tr>
<td>Mid-term exams (100 points each)</td>
<td>300</td>
<td>46.2%</td>
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<tr>
<td>Final exam</td>
<td>150</td>
<td>23.1%</td>
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<tr>
<td>Participation (Turning Point, Connect assignments, participation during recitation, additional at instructor’s discretion)</td>
<td>100</td>
<td>15.4%</td>
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<tr>
<td>ALEKS assignments</td>
<td>100</td>
<td>15.4%</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>650</strong></td>
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Note: You will have the opportunity to earn more than 100 points for “Participation”, however, no more than 50 Connect+recitation points and 50 Turning Point points will be counted for any student.

Letter Grades: These are the minimum percentages of total points needed to receive the indicated letter grade.

- A     88%  A-  85%
- B+    81%  B    77%
- C+    69%  C    64%
- D+    57%  D    53%

Drop, Withdrawal and Incomplete Grades: Dropped courses do not appear on your transcript. The deadline for dropping is September 9th. You may withdraw from the course and receive a grade of W. The deadline for withdrawal is November 1st. W’s do not affect your GPA. 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. The Incomplete must be removed before you take CHEM 1240.

Course registration changes and attendance may affect your financial aid. Throughout the term instructors report student attendance, so you will want to be sure that you are in attendance for all classes. You will remain enrolled in the class independent of attendance reports, unless you take the action of dropping or withdrawing.

Note: If you drop or withdraw from CHEM 1230, you are to drop/withdraw from the lab course CHEM 1280 because you need to know the lecture material to be in lab.

STUDENT SUPPORT

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: Located in room BO 2043, the Center is generally open all day Monday through Friday & evenings Monday through Thursday. TAs are available here: a schedule of their hours will be posted early in the term. No appointment is necessary and all TAs can help with General Chemistry.

UT Tutoring: Tutoring is available for a variety of subjects through the Learning Enhancement Center located in the Carlson Library.

CHEM 1200 – Problem Solving in General Chemistry: CHEM 1200 is a supplemental course to CHEM 1230 and we encourage you to add it to your schedule if it is not there now. It is a workshop-based class designed to help you master the CHEM 1230 material. You will work in small groups under the guidance of an advanced student. It is scheduled for 1 hour 50 minutes on Thursdays or Fridays but some sessions are completed in 90 minutes.
### COURSE SCHEDULE:

As instructor, I reserve the right to modify the schedule if I believe it to be in the best interest of the class, however, Exam dates will NOT change. **Be Sure That Your Travel & Employment Plans Do Not Conflict With The Exam Schedule.**

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Chapter Sections and Topics</th>
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<tbody>
<tr>
<td>1</td>
<td>Aug 26 – 30</td>
<td>Welcome&lt;br&gt;1 Matter and Measurements&lt;br&gt;2 Atoms, Molecules and Ions&lt;br&gt;3.1 Molecular and Formula Mass&lt;br&gt;3.2 Percent Composition&lt;br&gt;3.3 Balancing Equations</td>
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<td>2</td>
<td>Sept 2 – 6</td>
<td>Labor Day – No class&lt;br&gt;3.4 The Mole, Grams and Numbers of Things, Empirical Formula&lt;br&gt;3.5 Combustion Analysis and Molecular Formula</td>
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<td>3</td>
<td>Sept 9 – 13</td>
<td>3.6 Reaction Stoichiometry&lt;br&gt;<strong>Last day to Drop via the web is Mon 9/9</strong>&lt;br&gt;3.7 Limiting Reagents, Reaction Yield and Types of Reactions&lt;br&gt;4.1 Solutions and Electrolytes&lt;br&gt;4.2 Precipitation Reactions&lt;br&gt;4.3 Acid-Base Reactions</td>
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<td>4</td>
<td>Sept 16 – 20</td>
<td>4.4 Redox Reactions, Oxidation Numbers and Activity Series&lt;br&gt;<strong>Midterm Exam 1: Wed 9/18, Chapters 1, 2, 3, 4 (partial)</strong>&lt;br&gt;4.5 Molarity, Dilution, Solution Stoichiometry</td>
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<tr>
<td>5</td>
<td>Sept 23 – 27</td>
<td>4.6 Titrations and Gravimetric Analysis&lt;br&gt;5.1 Energy definitions&lt;br&gt;5.2 State Functions, Work and Heat, Internal Energy&lt;br&gt;5.3 Enthalpy and Enthalpy Changes&lt;br&gt;5.3 Enthalpy and Enthalpy Changes (cont’d)&lt;br&gt;5.4 Specific Heat and Calorimetry</td>
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<td>6</td>
<td>Sept 30 – Oct 4</td>
<td>5.4 Calorimetry Continued&lt;br&gt;5.5 Hess’s Law&lt;br&gt;5.6 Standard Enthalpies of Formation&lt;br&gt;18.1 Spontaneous Processes&lt;br&gt;18.2 A Qualitative Description of Entropy (pp. 834-835 only)&lt;br&gt;18.4 Gibbs Free Energy Change (pp. 850-852 only)&lt;br&gt;6.1 The Nature of Light&lt;br&gt;6.2 Quantum Theory and the Photoelectric effect</td>
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<tr>
<td>Week</td>
<td>Oct</td>
<td>Topic</td>
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| 7    | 7– 11 | 6.3 The Bohr Model  
6.4 Wave Properties of Matter  
6.5 Quantum Mechanics  
6.6 Quantum Numbers  
6.7 Atomic Orbitals  
**Fall Break – No class** |
| 8    | 14– 18 | 6.8 Electron Configurations, Orbital Diagrams  
6.9 Abbreviated Electron Configurations and Exceptions  
7.1 Historical Perspective  
7.2 The Modern Periodic Table  
**Midterm Exam 2: Wed 10/16 Chapters 4 (partial), 5, 6, 18 (partial) and review of Exam 1** |
| 9    | 21– 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  
8.1 Lewis Dot Symbols  
8.2 Ionic bonding and Born-Haber  
8.3 Covalent Bonding  
8.4 Bond Polarity  
8.5 Lewis Dot Structure |
| 10   | 28 – Nov 1 | 8.6 Lewis Structures and Formal Charge  
8.7 Resonance  
8.8 Exceptions to the Octet Rule  
8.9 Bond Enthalpy  
**9.1 Molecular Geometry  
Last day to Withdraw via the web is Friday 11/1** |
| 11   | Nov 4 – 8 | 9.2 Molecule Polarity  
9.3 Valence Bond Theory (VBT)  
9.4 Hybridization  
9.5 VBT: Double and Triple bonds |
| 12   | Nov 12 – 15 | **Veterans Day – No class**  
9.6 Molecular Orbital Theory  
9.7 Delocalized Bonding  
11.1 Intermolecular Forces  
11.2 Properties of Liquids |
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| 13 | Nov 18 – 22 | Chapter 11 cont’d or review for Exam 3  
**Midterm Exam 3: Wed 11/20, Chapters 7, 8, 9, 11 (partial) and review of Exams 1 and 2**  
10.1 Properties of Gases  
10.2 Gas laws |
| 14 | Nov 25 – 29 | 10.3 The Ideal Gas Law  
10.4 Reactions with Gases  
**Thanksgiving Break – No class**  
**Thanksgiving Break – No class** |
| 15 | Dec 2 – 6 | 10.5 Gas Mixtures  
10.6 Kinetic Molecular Theory  
10.7 Deviation from Ideal Behavior  
11.6 Phase Changes  
11.7 Phase Diagrams  
21. Environmental Chemistry |
| Finals Week | Dec 9 – 13 | ****** Comprehensive Final Exam ******  
Wednesday, 12/11, 8:00 – 10:00am; Room TBA  
You Must Take The Final At This Time! |