INTRODUCTORY TOPICS IN CHEMISTRY / S25

CHM 181 Sections 001

Prof. Andrew J. Pounds, Ph.D.

Office:	Rm. 438 Godsey Science Center, (478) 301-5627
	Rm. 231 Willet Science Center
e-mail:	pounds_aj@mercer.edu
Alt Phone (SMS):	(478) 227-3444
Office Meetings:	MWF 11:30 a.m. – 12:30 p.m., (or ZOOM Videoconference)
ZOOM Meeting ID:	https://mercer.zoom.us/my/pounds

CHM 181 is a one semester survey to introduce engineering students to the foundational principles of Chemistry. Students in CHM 181 will be exposed to the fundamental laws of mass and energy conservation and their application to chemical systems and reactions. Students will also be introduced to various models of atomic and molecular structure and, within these contexts, shown how these models can be used to explain and predict elemental and molecular properties. These concepts will then be extended to predict physical properties of gases and solutions. Students in CHM 181 are expected to read at the college level and also set up and solve algebraic and trigonometric equations. For that reason, students taking the course must have sufficent math preparation to place them into MAT 191. CHM 181 is not a replacement for CHM 111.

Class Meeting Times and Locations

Lecture: MWF 1:25 p.m. – 2:15 p.m., WSC 156
Lab: R 2:00 p.m. – 4:45 p.m., GSC Lab 204

Course Materials

Chemistry, 6th ed., Burdge.
Laboratory Notebook
Scientific Calculator (graphing with numerical solver preferred)
Laboratory Instructions (From *CANVAS*)
Approved Safety Glasses/Goggles

Course Structure

Portions from twelve chapters of the text will be covered during the semester in the order listed on the class schedule. The lecture time will be used to expound on and augment the text and also discuss problem solving strategies. Students are responsible for all material covered in class as well as the material from the textual sections listed in the class schedule. While homework from the book will not be collected, students are encouraged to complete as many problems as possible to gain competency with the material. Online homework will be assigned and graded. Four 50 minute exams will be given per the schedule. A three hour comprehensive final exam will be administered at the end of the term.

Grading

Tests (4 @ 100 pts (weighted))	400 pts
Quizzes (best 6 @ 25 pts)	150 pts
Laboratory (10 @ 30 pts)	300 pts
Final Exam	150 pts
Total Possible	1000 pts

Course Grade Scale

A	≥900 pts
B+	≥880 pts
B	≥800 pts
C+	≥780 pts
C	≥700 pts
D	≥600 pts
F	<600 pts

The above course grading scale is assured, but may be *slightly* lowered based on class exam performance.

General Information

Honor Code: All students in CHM 181 are expected to adhere to the Mercer University Honor Code. Any suspected violations will be reported to the Honor Council for further investigation.

Attendance: Attendance will be taken for the first two weeks of class. Even if a student is not in class, they are responsible for all material covered in class as well as any announcements made during the lecture period. Laboratory attendance is mandatory.

Missed Exams: Anyone missing an exam for *any* reason (personal illness, death in the immediate family, or other emergency) must notify Dr. Pounds **in advance** via e-mail, text message, phone, or voice message. The absence will be considered unexcused otherwise and no make-up opportunity will be offered. Make-up exams will be individually scheduled.

Test Grade Weighting: The four fifty-minute test grades from the semester will be weighted in the final course average. The highest test grade will be multiplied by 1.5 and the lowest test grade will be multiplied by 0.5 in the final point total. *CANVAS* will be used to store the raw test grades, not the weighted test grades.

Quiz Grade Maximization: The six quiz grades that maximize the students quiz point total will be used in the final class average.

Partial Credit: Partial credit will not be awarded on any quiz, exam, prelab, or lab report unless individuals show their work and clearly delineate how they arrived at their answers.

Re-grading Policy: If a student suspects that an error was made in the grading of a submitted work, they may return the paper for re-grading with the understanding that the entire work will be re-graded and not only the portion in question.

Posting of Grades: The *CANVAS* course delivery system does not have the ability to utilize grade forgiveness policies like the one used in this class. Therefore, grades will be posted on CANVAS but the point totals on CANVAS will not correspond to those computed for the final grade in the class. Students needing information about their grades should contact Dr. Pounds via e-mail.

E-mail Listserve: I maintain an e-mail listserve which I use use copiously to send information to the class and which you can use to communicate with each other. Student Mercer e-mail addresses are automatically subscribed to the listserve. To add other e-mails to the listserve and to learn how to send information to it, please go to: `http://theochem.mercer.edu/mailman/listinfo/chm181`.

Tips for Succeeding in Chemistry 181

There is unquestionably a lot of material to be covered in Chemistry 181. For that reason it is imperative to keep up with the class. The last thing you want to worry about is covering two chapters of new material the night before the test. You are expected to keep up with the class reading and problems.

The book contains numerous problems which you should attempt. In addition I will give you a selection of problems you should attempt. The book problems and the additional problems are representative of some of the problems you will see on the exams. To become proficient you will need practice. In short, work as many problems as you can before the test. The student solutions manual provides solutions to the odd numbered problems. In addition, solutions to other problems described in class will sometimes be posted on the theoretical chemistry website (`http://theochem.mercer.edu/chm181`), or worked in class. Students who need solutions to additional even-numbered problems should contact the ARC or Dr. Pounds. Other than e-mail, the primary method of delivering information to the class will be via the theoretical chemistry website.

For more help in the course you should utilize the SI sessions for your class as well as the University's free tutoring service provided via the Academic Resource Center (ARC). Both of these resources are here for you to use and, although they can not guarantee a higher grade in the course, they will most likely increase your understanding of chemistry and thereby positively affect your performance in the class.

Tentative Class Schedule[1]

Week Starting	Chapter Sections	Lecture and Problem Solving Topics
January 5th	1.1 – 1.6, 2.1 – 2.4	Classification of Matter Measurement, Significant Figures,Unit Conversions Atoms, Molecules, and Ions
January 12th	2.5 – 2.7, 3.1 – 3.4 3.1 – 3.4	Atomic Mass and the Periodic Table Chemical Nomenclature The Mole and Molar Mass Stoichiometry of Compounds
January 19th	3.5 –3.7	**MLK HOLIDAY 1/20/25** Stoichiometry of Reactions Limiting Reactant
January 26th	4.1 – 4.6	Stoichiometry in Solutions Aqueous Solution Chemistry Acids & Bases **EXAM #1, 1/29/25, (Chapters 1,2)** Oxidation/Reduction and Charge Balance Concentration
February 2nd	5.1 – 5.5	Intro to Thermodynamics (Macroscopic Energy) Enthalpy and Calorimetry, Heat Capacity Hess's Law and Standard Enthalpies
February 9th	5.6 6.1 – 6.4	Enthalpies of Reaction Intro to Quantum Mechanics (Microscopic Energy) Light, Photons, and Quantum Theory
February 16th	6.5 – 6.9 7.1 – 7.5	Atomic Orbitals and Electron Configurations **EXAM #2, 2/19/25 (Chapters 3-5)** The Periodic Table, Ionization Energy and Electron Affinity Periodic Trends and Properties
February 23rd	8.1 – 8.8	Introduction to Bonding, Lewis Dot Diagrams Electronegativity and Polarity Resonance, Formal Charge Exceptions to the Octet Rule
March 2nd		**SPRING BREAK**
March 9th	9.1 – 9.5	Molecular Geometry (VSEPR) and Polarity Valence Bond Theory and Hybridization
March 16th	10.1 – 10.5	Properties of Gases Derivation of the Ideal Gas Law **EXAM #3, 3/19/25 (Chapters 6-9)** Gas Mixtures and Stoichiometry **Withdrawal Deadline, 3/20/25**
March 23rd	10.6 – 10.7	Kinetic Theory of Gases Real Gases, Intermolecular Forces
March 30th	18.1 – 18.2 11.1 – 11.3	Entropy and Spontaneity Properties of Liquids Properties of Solids, Crystal Structure
April 6th	11.6 – 11.7	Phase Changes and Phase Diagrams **EXAM #4, 4/8/25 (Chapters 10-11,18**
April 13th	13.1 – 13.5	Physical Properties of Solutions Concentration and Solubility
April 20st	13.6 – 13.7	Colligative Properties Colloids
April 27th		**FINAL EXAM, 5/2/25, 9 a.m.** (Friday)

[1] I reserve the right to modify this schedule as situations warrant.

The Laboratory

Safety always comes first in lab. Developing good lab safety habits is important, even if the day's lab activities are not particularly dangerous. You will not be allowed in lab if you are not prepared. That means being appropriately dressed, having your safety glasses and knowing what you are supposed to do during the lab. The lab schedule is found at the end of this document. A link to the lab instructions and report forms is found on the class web page.

The lab instruction PDF files SHOULD NOT be printed and brought to lab. No points will be awarded for printed laboratory procedures. Instead, read the manual and think about what you are going to do and why. Write down the procedure and any questions you have in your lab notebook before coming to lab. **If you do not have your notebook with the hand written procedure in it, you will not be allowed in lab.** The lab report forms available from the same web site should be printed and turned in along with the copy pages from your lab notebook. Data and observations MUST be written in your notebook, not on the lab report form. Due dates are listed on the class schedule. **No credit is available for the lab report if you miss lab for any unexcused reason, including showing up unprepared, or if you are more than 10 minutes late.** It is important to show up on time, since we will go over safety notes in the first few minutes. You will lose 1 pt for each safety violation in a lab period (ie. removal of safety glasses for any reason in the laboratory). Lab reports due dates will be posted in *CANVAS*.

Because there is only one scheduled lab time for CHM 181, there are no make-up lab periods. If you must miss a laboratory meeting for a Mercer University event, or are granted and excused absense, you must let Dr. Pounds know in advance so that he can arrange for you to get the information and data to complete the lab notebook and report. Students will not be penalized for laboratories missed due to excused absence (as defined below) – up to a limit of three laboratory absences – and a complete laboratory report will still be required on the announced due date. **A passing grade for CHM 181 will NOT be available to any student who misses more than three laboratory meetings (excused or otherwise).**

Excused Absences (1) medical or mechanical emergencies with appropriate documentation presented to the professor as soon as possible (2) illnesses reported to the professor prior to the scheduled course meeting (documentation may be required); or (3) Mercer University events for which the appropriate office has provided an advance request to excuse participants.

Laboratory Grading:

There will be ten lab reports (30 pts each) over the course of the semester for a total of 300 pts. The laboratory component is thus worth 30% of your final grade for CHM 181.

Laboratory reports:

Complete laboratory reports should be turned in ONLINE on or before the time specified in CANVAS. The laboratory components will come in as two separate submissions.

1. Ordered and dated laboratory notebook pages (15 pts). These must include your partner's name.
2. Laboratory report (15 points). The will consist of the following items, in this order:
   (a) Completed laboratory report form pages. These must include your partner's name.
   (b) Any graphs required to determine the final result of an experiment – please see the graphing protocol, below.
   (c) Sample calculations when needed to explain how you arrived at your results.
   (d) It is acceptable to use computer software (including Microsoft Excel, MathCAD, Mathematica, etc.) to perform any calculations required to determine the final result. If you do use such software, simply include a printout as the last item in your report.

Graphing protocol:

All required lab report graphs must be computer-drawn, usually with Microsoft Excel, although other software options are permissible if pre-approved the instructor. CHM 181 students are allowed to sketch graphs (and anything else related to an experiment) in their lab notes, but the lab report that is turned in should include a computer-drawn graph if graphing was required. All data points should be shown on graphs, and the axes should be correctly labeled with both a measurement descriptive word (like "length") and the corresponding units (like "cm") inserted in the graphing software. Don't include any hand-written work on your submitted graph unless specifically instructed to do so for a particular report.

Instructions for Writing in Your Lab Notebook:

Part of learning science includes practicing appropriate scientific methods. That process includes documenting your work. Here are a few instructions for using your laboratory notebook properly:

1. Every page should be dated; that's the first thing you should write when you turn to a new page; put the date in the box provided in the upper corner of the page
2. Every entry in the lab notebook should have a clear, descriptive heading; examples include:
   Instructions for Freezing Point Depression Lab
   Data from Calorimetry Experiments
   Calculations for Nickel Lab
3. Write under each heading in active voice in the first person, describing exactly what you plan to do, exactly what you did or exactly what you measured
4. Write in complete, grammatically correct sentences; lists, numbered protocols, and clearly labeled tables can also be appropriate in certain circumstances
5. Write in the notebook only with black ball-point pens [Chemistry students: get a supply of black ball-point pens, not just one]
6. Ideas and other notes about our lab work, including notes on preparing the lab report, should be entered in the lab notebook immediately after observations and other data recorded in the lab; this is part of what is called "thinking in the lab notebook"
7. Make drawings, especially of novel or unusual apparatus, big enough to draw lines/arrows in order to label the features illustrated
8. Construct tables with clearly labeled headings - including units - under which to record series of numerical data in the lab
9. Corrections to lab notes should be made on the originals with the copy page underneath. (Hint: You can put a torn-out copy page back under an original page and press firmly to record a correction on the copy page.) Don't ever write (at all) directly on the copy pages.

Laboratory Policies:

Report Due Dates and Turn-in Policy: Labs are due prior to the time speficied in CANVAS. Lab report items, including all graphs, will be submitted as **PDF documents** to a *CANVAS* dropbox. If you use your phone to make these documents please ensure that everything is readable. Late labs will be penalize 20% per day late.

Cell Phone: Out of courtesy for all those participating in the learning experience, all cell phones and pagers must be turned off before entering any classroom, lab, or formal academic or performance event.

Chemical Sensitivity Statement: This course includes the handling of chemicals, and the reasonable accommodation policy also applies to any chemical sensitivity, allergy, or other physical or medical condition that might limit a student's ability to participate in the required course activities. In these cases, the instructor may require a physician's documentation of the student's condition before arranging accommodation. If the instructor determines that the student's condition cannot be reasonably accommodated, then the student will be asked to select an alternative course.

Physical Limitations Statement: This course includes significant physical activity, and the reasonable accommodation policy also applies to any physical or medical condition that might limit a student's ability to participate in the required course activities. In these cases, the instructor may require a physician's documentation of the student's condition before arranging accommodation. If the instructor determines that the student's condition cannot be reasonably accommodated, then the student will be asked to select an alternative course.

Safety Statement: This course includes activities for which there are certain risks as well as established safety procedures to minimize these risks. The instructor will explain both the risks and the prescribed safety measures. Students enrolled in this course are required to document in writing their awareness of the reasonable risks inherent in the course activities and their agreement to follow the safety procedures specified by the instructor. If a student cannot meet these terms, then the student will be asked to select an alternative course.

Laboratory Schedule

Lab Day	Experiment
January 9th	NO LAB
January 16th	Check-in, Density of an Unknown Metal
January 23rd	Synthesis of Alum
January 30th	Standardization of NaOH
February 6th	Determination of Unknown KHP
February 13th	Thermochemistry
February 20th	Ni^{2+} Determination via Spectrophotometry
February 27th	Atomic Emission
March 6th	NO LAB - SPRING BREAK
March 13th	Molecular Models
March 20th	NO LAB
March 27th	Molar Volume of a Gas
April 3rd	NO LAB
April 10th	NO LAB - BEAR DAY
April 17th	Freezing Point Depression Check-Out
April 24th	NO LAB - LAST WEEK OF CLASS

University Compliance Statements

For a complete list of syllabus statements pertaining to this course, please refer to the syllabus statement sheet located under "CLAS Syllabus Statements" on the course Canvas page.