Chemistry 105

Course Manual

Fall 2011

Section B

Dr. Crawford

The cost of this manual includes a $10.00 charge which supports the development of this manual as well as materials and supplies that will be provided during the actual laboratory sessions.

Table of Contents

I. INSTRUCTORS AND CONTACT INFORMATION:

Name	Assignment	e-mail	Office	Telephone
Kevin Crawford	B section Lecture, B section discussions, Lab 1 & 2	crawfork@uwosh.edu	HS-410	424-7433
Sharon Hawi	A section Lecture, A discussions	hawi@uwosh.edu	HS-443	424-1029
Rosalice Silva-Ayers	Labs, Discussions	silvaayr@uwosh.edu	HS-417	424-2039
Michael Foley	Labs, Discussions	foleym@uwosh.edu	HS-440	424-1314
George Olsen	Labs, Discussions	olsengp@uwosh.edu	HS-444	424-2398

Administrative Assistant: Diane Kromm, krommd@uwosh.edu, HS-432, 424-1400

Dr. Crawford's OFFICE HOURS: Monday 2-3pm, Wednesday 1:30-2:30, Thursday 3-4pm and whenever my office door is open and I am not busy. I will likely be preparing for lab/lecture/discussion and NOT available Tuesdays 11am-1pm, Wednesdays 8-10am, and Thursdays 12-1:30pm

II. MATERIALS:

Text: Chemistry by Raymond Chang, 10th edition, McGraw-Hill Publishing, © 2010.

Lab notebook: Bundled with the textbook or purchased separately. It must be bound and have duplicate pages. It may NOT be spiral bound and will be used both for Chem 105 and Chem 106.

Course/Lab manual: Chemistry 105 Course Manual, Fall 2011 Section B (Green cover)

Goggles: Indirect vented safety goggles (must bear the number Z87.1) are required for admission to the first lab period. We require that goggles be worn at all times during the lab. They are available at the bookstore, and from the UW Oshkosh Chemistry Club. **No goggles? No lab!**

Calculator: Any make with scientific notation, powers, roots, and logs. A graphing calculator is **not** necessary. Cell phones and other internet-enabled devices will NOT be allowed for tests and quizzes.

Clicker: eInstruction response clickers will be used during lectures to award extra credit points. The class code and a registration coupon will be provided in class. You will need:

Serial number of clicker:_____ (on back or on the screen when powered on)

Class name: Chemistry 105BF11

Class Key: F68132K278

Coupon code for payment of enrollment fee:_____ (if this is not in your textbook one will be provided in class – DO NOT PAY CPS directly)

Create an Account

1. Go to www.einstruction.com.
2. Click on the **Students** link at the top left of the window.
3. Select your school or university from the drop-down menu.
4. Click **Choose Site**.
5. Enter your serial number in the space provided. You can find your serial number on your LCD screen when you turn on your pad: if your pad does not have an LCD screen, your serial number is on the back of the pad, under the battery cover.
6. Click **Create Your Account**.
7. Create a CPSOnline Username and Password and fill in your contact information. Click **Submit** to create your account.

You've now created a CPSOnline account. You can use your CPSOnline username and password to login anytime to CPSOnline. Now you can enroll your pad in your class.

Enroll in a Class

1. Click **Yes** to enroll immediately in your class.
2. Enter your **Class Key** in the space provided. If you have a Code, enter it in the **Code** box. Note that a Code is not required.
3. Click **Submit** and choose your payment options. Click **Continue**.
4. Fill in your billing information and click **Continue**.
5. To join an additional CPSOnline class, click the **Enroll in a class** button from the main menu.
6. Once you have finished enrolling in all of your classes, click **Log Out**. *So that CPSOnline properly records your information, log out of CPSOnline.*

You may then enroll the same clicker in any number of classes at UW Oshkosh. Each course will have a different name and key code and will require an enrollment fee (coupon). After enrolling in Chemistry 105BF11, note your assigned pad number. It will be between 1 and 200. When using your clicker in class watch for your number to register on the screen to verify your clicker is working properly.

III. GRADING SYSTEM:

A. Attendance:

Regular attendance in all parts of the course is essential to achieve the course objectives. An **unexcused** absence during a scheduled quiz or examination in any part of the course will result in a zero point score for that quiz or exam. There are **no makeup quizzes or exams**.

The reason for any **excused** absence from an exam, quiz, or laboratory session must be presented to your instructor (in advance if possible) and substantiated **in writing** with the student's signature. Emailed excuses are **not** enough. Assignments and tests missed for a valid reason will not be counted against you, but you will be responsible for material covered in your absence. Advance notice of a pending absence will often make it possible to arrange for an alternate time for a quiz, exam or attendance in another lab section. **If you miss more than one exam for any reason, you will receive an incomplete or a failing grade depending on the circumstances.**

B. Point Distribution:

	Points
Exams (3 x 140 pts.)	420
Discussion (125=best 5 quizzes, 100=homework)	225
Laboratory	155
Total	800

C. Grading Scale:

Your final grade in the course will be determined by the total number of points you have accumulated, according to the following scale:

Minimum percentage	Letter grade	Minimum total points (out of 675)
0 %	F	0
50 %	D-	400
54%	D	432
58%	D+	464
62%	C-	496
65%	C	520
69%	C+	552
73%	B-	584
77%	B	616
83%	B+	664
89%	A-	712
91%	A	728

Grades will be posted on D2L as they become available, so you may check your current course grade at any time during the semester.

D. **Laboratory Grade**:

The 155 laboratory points are divided among pre-lab assignments, in-lab performance, post-lab data analysis, and lab quizzes. Pre-lab assignments help you prepare for lab, and must be turned in when you arrive in lab. In-lab performance includes being present at the beginning of lab, contributing to your team, working safely, wearing goggles at all times, and properly recording data and observations in your lab notebook. Post-lab data analysis includes interpretation of lab results, such as graphs and written summaries in your lab notebook. The two lab quizzes will be based on your lab notebook record-keeping.

Attendance in laboratory is mandatory. Two unexcused absences from lab or unsuccessful completion of the laboratory component (<75 lab points) will result in a failing grade for this course, regardless of exam scores. If you miss a lab, you may attend another lab during the same week, if space allows. Please contact the instructor ahead of time. Do not expect laboratory experiences to directly correlate with lecture, since some of the experiments require several weeks to complete and lab sections meet throughout the week.

Lab Section	Instructor	Meeting Time
A-01	Olsen	W 8-10:10
A-02	Silva-Ayers	T 11:30-1:40
A-03	Silva-Ayers	T 1:50-4:00
A-04	Hawi	W 10:20-12:30
A-05	Silva-Ayers	Th 11:30-1:40
A-06	Hawi	W 12:40-2:50
A-07	Silva-Ayers	Th 1:50-4:00
B-01	Crawford	M 8-10:10
B-02	Crawford	M 10:20-12:40
B-03	Silva-Ayers	T 8-10:10
B-04	Foley	W 3-5:10
B-05	Foley	M 12:40-2:50
B-06	Foley	M 3-5:10

E. **Discussion Grade**:

Discussion sections provide an opportunity to reinforce lecture material and introduce new material in a smaller group setting. Class time will be spent working in small groups on worksheets provided by the instructor, or participating in group activities. New material will be presented, which will not be covered in lecture, but will be on the exams.

Quizzes will also be conducted in discussion sections. These quizzes will be based on the previous material. A maximum of 125 quiz points may be accumulated throughout the semester. Make-up quizzes will not be offered. If you know you are going to miss a discussion, please contact your instructor. You may be able to attend another discussion section.

Online homework assignments will also be provided throughout the semester. The total possible points for these assignments is 100 which will be included in your discussion points. **It is your responsibility to gain access to the homework site and to complete the assignments before the due date**. There will be 13 weekly assignments due on Mondays at 6pm. Your best 12 assignments will count toward your 100 points. For example, if your top 12 assignments average to 90% of the possible points, you will receive 90 points (90% of 100). The first assignment is due Sep. 19.

F**. Exam Schedule:**

Four 90-minute exams will be given. You must take the exam at the testing center anytime between 8am and 5:30pm. You might not be allowed to begin the exam if you arrive after 4pm. Bring your own calculator for the test.

Dates for the four 90-minute exams are given below:

Exam	Dates
1	Tuesday, October 4
2	Tuesday, November 8
3	Tuesday, December 13

IV. COURSE POLICIES:

Misgraded quizzes or exams must be returned to your instructor for possible regrading no later than one week following their return. You must save all tests, quizzes, and lab reports so that you will have them available for review, and so that any chance of clerical error may be avoided.

It is YOUR responsibility to check D2L for the exam scores, quiz scores, lab scores and discussion points to determine that your scores were entered properly. Any error must be reported within a week of the posting date in order for it to be considered.

No radios, MP3 players, headsets or other recording or transmitting devices may be used during exams (including cell phones). Caps with bills must have bills turned to back of head. A student ID card is required when handing in exams and when taking exams at the testing center.

Early exams will be offered for students who cannot attend the exam during the scheduled day. Students who need to take an early exam must sign up with the instructor the week before the exam. Students taking an exam at times or places different than the regularly scheduled exam will not be allowed to use a graphing calculator. You must either bring a simple calculator of your own, or use one provided by the chemistry department.

Lecture examinations will be computer scored and the answer sheet will not be returned to you, but retained by the lecturer for a permanent record. Answer keys will be posted on D2L and on the bulletin board outside HS-403.

A WORD TO THE WISE: The most common reason for a poor grade in this course is the failure to keep up with the work on a daily or weekly basis. In general, if you attend all parts of the course, read the text, complete and ***understand*** the problem assignments and lab experiments, you will pass the course (grade of C). If you study in addition to that, you should do better. If you experience difficulty with any part of the course, seek help immediately. If you let it slide, it becomes more difficult to catch up because the subject matter tends to be cumulative.

NOTE: The last date to drop this course without a Late Add/Drop Request Form is **October 21.** Students dropping the course should check out of lab in order to pick up your goggles and lab notebook (both of which may be used on a re-take of the course).

HOMEWORK ACCESS:

Off Campus Student Enrollment

- Obtain the unique number of your course from your instructor:
- If you have not already done so, obtain a UT EID from http://www.utexas.edu/eid.
  If you give the EID system bogus information, you may not be able to retrieve your EID nor the password in the future. If your email address changes, you need to return to this URL and correct it.
  NEVER obtain a second EID.
- Log into http://quest.cns.utexas.edu/student
  You will be sent to the EID system for your EID and password, then redirected back to us. If the redirection doesn't work, type in the URL again:
  http://quest.cns.utexas.edu/student
- Click the arrow beside "Get Started"
- Make sure that the "Hello" in the upper right-hand corner has your name.
- Under the MY COURSES tab, choose "ENROLL IN NEW COURSE"
- Supply the unique number (**32-105BKC**) in the box and choose "LOOKUP COURSE INFO"
- Select the appropriate course (if more than one option) and choose "REQUEST ENROLLMENT"
- Your instructor has to approve your request before you can proceed in the course.

V. COURSE OBJECTIVES

This course is intended to introduce the student to the language and the elementary theories of chemistry, to provide training and practice in analytical reasoning and problem solving, and to serve as the basis for further studies in chemistry. The lab portion is designed to provide training in the experimental techniques of chemistry, and to reinforce lecture material with concrete experience.

Specific areas in which the student is expected to achieve minimal competency by the end of the semester are the following:

FUNDAMENTALS - scientific notation, significant figures, SI or metric system, dimensional analysis, names and symbols of common elements and compounds, basic definitions of important chemical and physical terms.

STOICHIOMETRY - writing and balancing chemical equations, recognizing redox reactions, use of mole concept to perform calculations based on formulae and balanced equations.

ATOMIC STRUCTURE - composition of the atom, electron configuration and quantum numbers, Aufbau procedure, periodic variation in chemical and physical properties.

MOLECULAR STRUCTURE - molecular geometry prediction by VSEPR, valence bond theory, hybridization, resonance, correlation of molecular structure and properties.

SOLUTIONS - concentration units, solution stoichiometry.

INTERMOLECULAR FORCES-types of forces, relate to physical properties, solution formation

PRINCIPLES OF CHEMICAL REACTIVITY - enthalpy, entropy, calorimetry, Gibbs free energy.

COURSE SCHEDULE: Assigned Textbook readings are in parentheses

Week Beginning	Lecture Tues	Discussion Wed	Lecture Thur	Lab
September 5	----	Matter, Properties, Density (1.1-1.6)	Atomic Theory (2.1-2.3)	No lab
September 12	Dimensional Analysis & Sig Figs (1.7-1.9)	Quiz 1 Naming (2.7-2.8)	Periodic Table, Ions, Molecules (2.4-2.6)	No lab
September 19 HW#1 Due	Mole, Molar Mass, Balancing Rxns (3.1-3.4, 3.7)	Stoichiometry (3.8, 3.9)	Stoichiometry Mass Spectrometer (3.4)	Check in, safety, Lab Notebooks
September 26 HW#2 Due	Electrolytes, Precip Rxns (4.1-4.2)	Quiz 2 Molarity, Dilutions, titrations (4.5, 4.7)	Acid-Base, other rxns (4.3-4.4)	Significant Figures
October 3 HW#3 Due	Test #1 (Ch 1-4) At testing center	Metals analysis (7.1)	EM radiation, H atom, e duality, QM (7.2-7.5)	Acid/Base Titrations
October 10 HW#4 Due	Quantum Numbers, orbitals, configurations (7.6-7.9)	Quiz 3 Periodic table, chemical properties (8.1-8.2,8.6)	Periodic table trends (8.3-8.5)	Acid/Base Titrations (continued)
October 17 (Oct 21 is the last day to drop a class) HW#5 Due	Lewis Dots, Ionic Bonds (9.1-9.3)	Covalent Bonds, Lewis Structures (9.4-9.6)	Formal Charge (9.7)	Periodic Properties
October 24 HW#6 Due	Resonance, Exceptions (9.8-9.9)	Molecular Geometry (10.1)	Dipole moment, hybridization (10.2-10.4)	Periodic Properties (continued)
October 31 HW#7 Due	KM Theory – Liquids Properties (11.1-11.3)	Quiz 4 Phase Changes, diagrams (11.8, 11.9)	Solids (11.6,11.7)	LAB QUIZ I Atomic and Molecular Spectroscopy
November 7 HW#8 Due	Test #2 (Ch 7-11) At testing center	Gases (5.1-5.2)	Gas Laws (5.3-5.4)	Atomic and Molecular Spectroscopy (continued)
November 14 HW#9 Due	Gas Stoich and Daltons Law (5.5-5.7)	Quiz 5 Energy (6.1)	Energy, Thermodynamics (6.2-6.3)	Properties of Gases
November 21 (Nov 24-28 is Thanksgiving Recess) HW#10	Enthalpy of Rxns (6.4)	---	---	---
November 28 HW#11 Due	Standard enthalpy, calorimetry (6.5-6.7)	Enthalpy (6)	Entropy (18.1-18.3)	Thermochemistry I
December 5 HW#12 Due	Gibbs Free Energy (18.4-5)	Quiz 6 Living Systems (18.7)	Review	LAB QUIZ II Thermochemistry II
December 12 HW#13 Due	Test #3 (Ch 5,6,18) At testing center	No discussion	No class meeting	No lab

Study Guide for Exam 1 (Chapters 1, 2, 3, 4) Be Able To:

CHAP 1

Classify matter as mixtures, pure substances, elements, or compounds.

Perform dimensional analysis calculations/conversions.

Use significant figures and rounding rules properly in mathematical operations.

Give names and symbols for the elements Al, Ag, Ar, As, Au, B, Ba, Be, Bi, Br, C, Ca, Cd, Cl, Co, Cr, Cu, F, Fe, H, He, Hg, I, K, Kr, Li, Mg, Mn, N, Na, Ne, Ni, O, P, Pb, Rn, S, Si, Sn, Sr, U, Xe, and Zn.

Easily move between metric prefixes mega, kilo, centi, milli, micro, nano.

CHAP 2

Understand the law of conservation of mass.

Classify elements as metal, nonmetal, or metalloid.

Use atomic number and mass number to describe isotopes.

Relate atomic mass and percent abundance of isotopes.

Calculate/use MOLES – from mass and from number of particles.

Describe the three main subatomic particles in an atom.

Describe Rutherford's experiment and how it helps develop the theory of the atom.

Differentiate between molecular and ionic compounds.

Name or give formulas for binary inorganic compounds.

Name or give formulas for straight-chain alkanes C1-C10.

Name or give formulas for ionic compounds including those with polyatomic ions.

CHAP 3

Write and balance chemical equations (reactions), including phases

Calculate the molar mass of molecular compounds.

Calculate the formula weight of ionic compounds.

Convert between grams and moles for molecular and ionic compounds.

State the purpose of a mass spectrometer and interpret the mass spectrum of an element.

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Use mole ratios to convert from moles of one substance to moles of another substance.

Use moles and molecular weights to convert from grams of one substance to grams of another substance.

Determine limiting reactant, theoretical yield, and percent yield.

Use percent yield to determine actual yield and amounts of reactants needed

CHAP 4

Predict if a substance is an electrolyte or nonelectrolyte.

Identify solute and solvent in a solution.

Recognize whether an ionic compound is soluble or insoluble in water.

Describe how an ionic solute dissolves in water.

Calculate the molarity of a solution.

Determine the molarity of a solution when a solid is dissolved and when a solution is diluted.

Write net ionic equations for exchange reactions that result in a solid, gas, or water product.

Identify spectator ions.

Recognize strong acids and strong bases by name and formula.

Write dissociation reactions for strong acids and bases.

Write neutralization reactions and use them in acid-base titration calculations

Classify reactions (combination, decomposition, displacement, exchange).

Recognize oxidation-reduction reactions.

Determine oxidation numbers to identify oxidizing agents and reducing agents.

Study Guide for Exam 2 (Chapters 7, 8, 9, 10, 11) Be Able To:

CHAP 7

Convert between wavelength, frequency, and energy for electromagnetic radiation.

Describe the photoelectric effect.

Calculate a deBroglie wavelength of an object.

Assign, recognize, and describe quantum numbers as they relate to an electron in an atom.

Explain Bohr's model of the hydrogen atom.

Explain the process of atomic emission with respect to energy levels of the electrons.

Calculate energy released/absorbed in electronic transitions of the hydrogen atom.

Write the electron configuration of any element.

Characterize an element as diamagnetic or paramagnetic.

CHAP 8

Understand the arrangement of the periodic table.

Describe the following trends in the periodic table: metallic character
atomic radii
ionic radii
ionization energy
electron affinity.

Write the electron configuration for any ion.

Identify isoelectronic atoms and ions.

Characterize an ion as diamagnetic or paramagnetic.

CHAP 9

Differentiate between ionic and covalent bonding.

Relate electronegativity to bond polarity.

Draw Lewis structures.

Predict relative bond length of single, double, and triple bonds.

Recognize possible exceptions to the octet rule.

Calculate formal charges.

Describe and predict resonance.

(continued on next page)

CHAP 10

Predict VSEPR molecular shapes.

Describe the hybridization state of atoms in molecules.

Identify the number of sigma and pi bonds in a molecule.

Predict whether a molecule is polar based on its shape and bond polarity.

CHAP 11

Differentiate gases, liquids, and solids by density, compressibility, and molecular motion.

Describe each of the three intermolecular forces.

Predict which intermolecular force(s) will exist for a given molecule.

Describe the unique properties of water.

Define surface tension and viscosity.

Describe the types of crystals and their properties.

Define amorphous solid.

Define vapor pressure and boiling point.

Use phase diagrams.

Study Guide for Exam III, Chapters 5, 6, 18 Be Able To:

CHAP 5

Describe the properties of all gases.

Explain the Kinetic Molecular Theory as it pertains to gases.

Describe and use Charles, Boyle's and Avogadro's Laws.

Use the Ideal Gas Law.

Perform stoichiometry calculations involving gases.

Calculate partial pressures of gases in a mixture.

Explain why real gases do not conform to the ideal gas law.

CHAP 6

Define the main types of energy.

Explain the first law of thermodynamics.

Explain relationships between (energy and work) and (energy and heat).

Use the terms system and surroundings and explain processes involving work, heat, and energy transfers as well as changes in internal energy.

Use the specific heat capacity to calculate temperature changes and heat changes.

Recognize/label endothermic and exothermic processes.

Define enthalpy.

Calculate ΔH, ΔS, and ΔG for reactions.

Calculate the energy required/released during phase changes.

Define standard conditions.

Explain the use of a calorimeter to determine enthalpy.

Use Hess' Law to calculate enthalpy.

Write the reaction for the standard molar enthalpy of formation of a compound.

CHAP 18

Define spontaneous as it relates to reactions.

Define entropy.

Explain the 2^{nd} and 3^{rd} Laws of Thermodynamics.

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Calculate ΔS for a system, surroundings, and universe.

Explain how ΔG determines spontaneity.

Use the signs of ΔH and ΔS to determine spontaneity.

Explain how ΔG is important to living systems.