WALTERS STATE COMMUNITY COLLEGE
Summer Course Syllabus

Course: CHEM 1120 – General Chemistry II
Semester: Fall 2014, Spring 2015, Summer 2015
Instructors:
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Course Supervisor: Dr. Jeff T. Horner, Dean of Natural Science, Office 125 NSCI
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Office Hours: Office hours are posted on instructor’s office door
FAX: 423-318-2762
Divisional Secretary: 423-585-6865

Required Textbook:
Additional Materials: Scientific calculator (required); Access to online computer connection.

Catalog Course Description:
General Chemistry II is a study of fundamental concepts and properties of selected elements and compounds. Topics covered are: Review of chemical bonding II: molecular geometry and molecular orbitals; intermolecular forces and liquids and solids; physical properties of solutions; chemical kinetics; chemical equilibrium; acids and bases; general properties; acid-base equilibria; solubility equilibria; entropy, free energy, and equilibrium; nuclear chemistry; organic chemistry. Topics including electrochemistry; metallurgy and the chemistry of metals; nonmetallic elements and their compounds; transition of metal chemistry and coordination; polymers and industrial chemistry will be covered time permitting. Prerequisite(s): A letter grade of “C” or better in CHEM 1110; Pre/Corequisite: CHEM 1121 - 3 semester credits

Course Outcomes:
The subject content for the core is shown as learning outcomes which are available on Walters State eLearn page for this course and library.ws.edu/mChemistry.

Upon completion of this course students will be able to communicate skills related to the following topics:

1. **Organic Chemistry** – discuss molecular orbital theory, describe basic organic functional groups and reactivity, identify compounds using IUPAC nomenclature, distinguish between different stereoisomers, etc.
2. **Solutions** – discuss the implications of intermolecular forces on physical properties of solutions, qualitatively and quantitatively describe the concentration of a solution, explain colligative properties, etc.
3. **Chemical Kinetics** – determine the experimental rate law of a reaction, discuss factors effecting reaction rate, determine the order of a reaction and use corresponding rate laws to solve problems, calculate concentrations or rate constants using the integrate rate laws or half-life equation, etc.
4. **Chemical Equilibria** – calculate the equilibrium constant or concentration, describe the implications of LeChatelier’s Principle, calculate the position of the equilibrium, etc.

5. **Chemistry of Acids and Bases** – describe basic physical and chemical properties, calculate pH and concentrations of an acid/base equilibria, analyze the effect of a buffer on the pH of a solution, analyze a buffer system using the Henderson-Hasselbach equation, etc.

6. **Solubility Equilibria** – explain the implications of the reaction quotient, calculate the $K_{sp}$ or molar solubility, explain how a common ion alters the molar solubility, relate molar solubility to other concentration units, etc.

7. **Thermodynamics** – describe the factors that affect entropy and free energy from a qualitative and quantitative view, explain the relationship between thermodynamics and the equilibrium constant, etc.

**General Education Course Designation:** Natural Science (3 semester hours)

**Instructional and Evaluation Methods:**
Lectures and discussion: You are expected to attend class, pay attention, and participate actively in discussions by answering questions, asking questions, and making comments. You will get more out of the lecture if you have read the material in the textbook ahead of time. Always bring your book with you to lecture. Learning Outcomes for students can be found in the Walters State eLearn for this course.

Reading: The textbook provides a good general introduction to the field of Chemistry. Most of the topics that are approached in the class are covered by the book. Thus, it will serve to augment lecture and to provide material for discussion. In addition, readings in the book will support the material that you will be studying in labs. The book includes many things which will help you understand the material and study for the tests, including a list of key concepts, chapter summaries, review questions, quizzes, and a list of key terms.

**Expectations**
Satisfactory performance in college courses generally asks for two hours of study outside of class for each hour in class. This estimate applies to an "average" student expecting an "adequate" (C) grade. Students aiming higher or those with academic problems should expect to spend more effort than the minimum. Should you procrastinate, not read ahead of time, or expect to cram everything on last days before exams this course may not be for you.

**The Student Can Expect from the teacher:**
1. Email response within 24 hours during the normal work week. Holidays and vacations excepted.
2. Email during the weekend will be answered on Monday.
3. Exams to be graded and returned in a timely manner.
4. Enthusiasm for the subject and encouragement to help you when you need it.
5. A fair grading system, with feedback.
6. Learning that ties concepts into the real world around us.
7. Respect for you as a learner.

**Exams and Grading:**
Chemistry exams will emphasize factual knowledge and assess the achievement of the Learning Outcomes. Short answer, essay, diagrams and multiple choice questions may be used. Exams focus on what happens in class as supplemented and amplified by textbook readings.
Evaluation:
Fall and Spring Courses:
Exams/Homework/Quizzes/Assignments = 75%
Comprehensive Final Exam = 25%

Summer Courses:
Exams/Homework/Quizzes/Assignments = 100%

A description of how the professor will divide the exams/homework/quizzes/assignments will be provided to all students on the first day of class.

Academic Dishonesty Policy:
Any student who violates the college’s academic integrity policy will automatically receive a “0” for that assignment or exam.

Grading Scale:
90 - 100% = A
80 - 89% = B
70 - 79% = C
60 - 69% = D
0 - 59% = F

Extra Credit:
Each professor has the option to offer the opportunity to earn up to 40 additional points through the semester. Examples include, but are not limited to, bonus questions on exams, in class quizzes, attending a scientific event, etc. The instructor’s policy will be explained in detail on the first day of class. In no instance will credit be provided for any activity not related to the scope of the course. The aim of the class is to get a solid understanding of chemistry so that grades reflect our abilities to communicate the material and not a supplementary assignment or task. All students, especially those that feel they are struggling with the material, are strongly encouraged to use office hours, send emails, make appointments for extra help, etc. throughout the semester.

Missed Exam Policy:
Students who are absent on the day of an exam must provide a documentable excuse before a make up exam will be given. The missed exam must be made up before the next lecture exam.

Course Ground Rules

All students attending Walters State Community College, regardless of the time, location, or format of the class, must abide by the rules and regulations outlined in the current Walters State Catalog/Student Handbook and the current Walters State Timetable of Classes. The Catalog/Student Handbook and the Timetable of Classes are online at: http://ws.edu

Students must attend the first day of on-ground class or contact the instructor prior to the first class. Failure to do this may result in being dropped from the class. Excessive absences may substantially lower the course grade.

Students enrolled in web courses must follow the course attendance policy defined for online attendance during the first week of class and throughout the term. Failure to do this may result in
being dropped from the class during week one OR may result in the accrual of absences which may negatively impact the student’s grade in the course.

Plagiarism, cheating, and other forms of academic dishonesty are prohibited. The minimum penalty for cheating is a “0” (zero) on the examination or assignment. Academic dishonesty may result in an “F” for the course. Additional information can be found in the WSCC Catalog/Student Handbook at: http://ws.edu.

Students with disabilities must register with Student Support Services each semester in the Student Services Building, Room U134 (phone 423-585-6892) if they need any special facilities, services, or consideration.

Students in need of tutoring assistance are encouraged to contact the Office of Student Tutoring located as follows:
- Morristown Campus - Student Services Building Room L107 – (423) 585-6920
- Greeneville Campus – Room 420 - (423) 798-7982
- Sevierville Campus - Marshall-Maples Hall Room 118 – (865) 286-2787
- Claiborne Campus – Room 123A (423) 851-4761

Specific tutoring assistance in mathematics and writing is available in-person and online as follows:
- Morristown Campus – English Learning Lab – HUM 120 – (423) 585-6970
  - https://www.ws.edu/academics/humanities/writing-lab
- Morristown Campus – Mathematics Lab – MBSS 222 - (423) 585-6872
  - http://ws.edu/academics/mathematics/learning-lab

Students who need assistance with computing and technology issues should contact the IET Helpdesk by phone at Morristown: 423-318-2742 Greeneville: 423-798-8186 or Sevierville: 865-286-2789 or on-line access at: http://helpdesk.ws.edu/.

Students receiving any type of financial aid or scholarship should contact the Financial Aid Office before making any changes to their schedule. Schedule changes without prior approval may result in loss of award for the current term and future terms.

Students who have not paid fees on time and/or are not correctly registered for this class and whose names do not appear on official class rolls generated by the Walters State student information system (StarNET) will not be allowed to remain in class or receive credit for this course.

Electronic devices must not disrupt the instructional process or college-sponsored academic activity. Use of electronic devices is prohibited unless use of the device is relevant to the activity and use is sanctioned by the faculty member in charge. Electronic devices that are not relevant to the activity or sanctioned by the faculty member in charge should be set so that they will not produce an audible sound during classroom instruction or other college-sponsored academic activity.

For information related to the cancellation of classes due to inclement weather, please check the college’s Web site at www.ws.edu or call the college’s student information line, 1-800-225-4770, option 1; InfoConnect, (423) 581-1233, option 1045; the Sevier County Campus, (865) 774-5800, option 7; or the Greeneville/Greene County Campus (423) 798-7940, option 4. Also, please monitor local TV and radio stations for weather-related announcements. For additional information on this policy see the college catalog at: http://ws.edu

Dual Enrollment students attending on a high school campus should refer to the high school inclement weather cancellations.

In the event of a pandemic or other college-declared critical event that impacts the college’s ability to proceed with academic course activities as planned, the college reserves the right to alter this course plan. In the event of a pandemic or other event, please refer to the college’s home web page, www.ws.edu or call InfoConnect, (423) 581-1233 for further information.
Regular class attendance is a student's obligation for any course regardless of format. (See the Walters State Catalog/Student Handbook) If a student misses class, it is his or her responsibility to contact the instructor regarding missed assignments and/or activities and to be prepared for the next class assignment.

All forms of student Financial Aid may be jeopardized or lost due to the lack of Satisfactory Academic Progress in one or multiple courses. Lack of Satisfactory Academic Progress may negatively impact a student's degree/certificate completion pace and further jeopardize Financial Aid eligibility.

Students are required to supply a #2 pencil for each lecture exam.

The wearing of hats and caps in class is not allowed! Students will be asked to remove their hats and caps.

STAY AWAKE IN CLASS. Your mere presence in class is not sufficient—you must be able to actively process the information presented! Sleeping in class is disruptive in two ways: the student who is snoozing is not interested and not participating in the classroom discussion; secondly, sleeping in class is considered to be disrespectful to the teacher and other students. The penalty for sleeping in class may range from the student being requested to leave the class with a following conference with the instructor, to notification of the Vice-President of Academic Affairs (in the cases of habitual sleepers). If you have a medical condition that prevents you from staying awake in class, please discuss this with the instructor.

CLASSROOM COURTESY. Being in a college environment it is expected that classroom courtesy will be given to your instructor and classmates in limiting unnecessary talking and communication during class lecture or student presentation. An Academic Misconduct Form will be filed for those who have difficulty following this policy and disrupt class.

Alternative Teaching Plan
In the event of a pandemic or other college declared critical event, the lead faculty member for this course will use eLearn to communicate with the students. If the lead faculty member is affected by this event, another member from the teaching team will assume instruction for the course. The course will continue utilizing an online format of instruction and testing.

ATTENTION: The Natural Science faculty members are concerned with proper academic advising of students in ALL Pre-Professional programs. It is our explicit desire to help you with any advising problems you may encounter.

The last day to drop a course or withdraw from the college-full term for Fall 2014 term is November 5, 2014.

The last day to drop a course or withdraw from the college-full term for Spring 2015 term is April 2, 2015.
A. Organic Chemistry
Content:
- Hybridization and Bonding of Carbon
- Hydrocarbons
- Function Groups
- Optical Isomers
Learning Outcomes:
Students should be able to:
1. describe the uniqueness of carbon.
2. describe the hybridization of carbon atoms.
3. describe sigma and pi molecular orbitals in carbon compounds.
4. name simple organic molecules.
5. write molecular formula, Lewis structure, condensed formula, structured formula and bond-line formula for organic compounds.
6. identify common organic function groups.
7. identify primary, secondary and tertiary substituted carbons.
8. identify chiral centers.
9. describe stereoisomers
10. explain optical activity.

B. Solutions
Content:
- Solution Process
- Units of Concentration
- Factors Affecting Solubility
Learning Outcomes:
Students should be able to:
1. describe solutions made by dissolving solids, liquid or gases in solids, liquid or gases.
2. calculate concentration of solutions to include molarity, molality, percent, mole fraction and parts per million.
3. describe the effects of temperature and pressure on solubility.
4. calculate solution of gases using Henry’s Law.

C. Colligative Properties
Content:
- Vapor Pressure Lowering
- Boiling Point Elevation
- Freezing Point Lowering
- Osmotic Pressure
- van’t Hoff Factor
Learning Outcomes:
Students should be able to:
1. explain vapor pressure and normal boiling point.
2. do vapor pressure calculations with Raoul’t Law.
3. do calculations of freezing point depression of solutions.
4. do calculations of boiling point elevation of solution.
5. do calculations of osmotic pressure of solutions.
6. calculate molar masses using each of the colligative properties.
7. use the van’t Hoff factor in solutions containing ions.

D. Chemical Kinetics

Content:
- Definition of Reaction Rate
- Experimental Determination of Rate
- Dependence of Rate on Concentration
- Change of Concentration with Time
- Temperature and Rate
- Collision and Transition-State Theories
- Arrhenius Equation
- Elementary Reactions
- Mechanisms
- Catalysis

Learning Outcomes:
Students should be able to:
1. describe the rates of chemical reaction.
2. describe factors which effects the rates of chemical reactions.
3. use experimental data to develop the equation for the rate law.
4. describe the reaction order of each component in a chemical reaction and the overall order of reaction.
5. use integrated rate equations to calculate concentration as a function of time for 1st and 2nd order reaction.
6. do calculations of half-lives for 1st and 2nd order reactions.
7. describe the energy of activation and how it is effected by temperature.
8. describe the microscopic view of reaction rates based on collision theory and transition state theory.
9. do calculations with the Arrhenius equation.
10. explain mechanisms and elementary reactions.
11. explain how a catalyst alters the rate of a chemical reaction.

E. Chemical Equilibria

Content:
- Chemical Equilibria – Dynamic Equilibria
- The Equilibrium Constant
- Homogeneous – Heterogeneous Equilibrium
- The Reaction Quotient
- Le Chatelier’s Principle
- The Haber Process

Learning Outcomes:
Students should be able to:
1. discuss chemical systems at equilibrium and the law of mass action.
2. write expressions for the equilibrium constant.
3. explain how homogeneous and heterogeneous equilibria differ.
4. manipulate equilibrium expression.
5. convert $K_p$ to $K_c$.
6. calculate with equilibrium constants and concentrations.
7. do calculations with the reaction quotient when not at equilibrium.
8. describe how temperature, pressure and concentration effect systems at equilibrium – the LeChatelier’s principle.
9. explain what effect a catalyst has on a system at equilibrium.
10. explain how each of the topics discussed in chemical equilibrium was used by Haber to develop a process for the manufacture of ammonia and the profound impact this process had on 20th and 21st century history.

F. Chemistry of Acids, Bases and Buffers
Content:
- Brønsted Concept of Acids and Bases
- The Hydronium Ion and Water Autoionization
- Relative Strengths of Acids and Bases
- pH Scale
- Acid Dissociation Constant and Base Dissociation Constants
- Lewis Concept of Acid and Bases
- pH of Salt Solutions
- The Common Ion Effect
- Buffer Solutions
- Henderson-Hasselbalch Equation

Learning Outcomes:
Students should be able to:
1. describe acids and bases.
2. describe the autoionization of water, the hydronium ion, development of the pH and pOH Scale.
3. describe weak acids, strong acids, weak bases and strong bases.
4. describe the relative strengths of acids and their conjugate bases.
5. do calculations with $K_a$'s and $K_b$'s.
6. explain Lewis’s concept of acids and bases.
7. calculate the pH of aqueous salt solutions.
8. do calculations with the common ion effect.
9. describe buffer solutions.
10. calculate the pH of salt solutions using the Henderson-Hasselbalch equation.

G. Solubility Equilibria
Content:
- The Solubility Product Constant
- Solubility and the Common-Ion Effect
- Precipitation Calculations
- Effect of pH on Solubility

Learning Outcomes:
Students should be able to:
1. write expressions for the solubility product constant $K_{sp}$.
2. calculate the solubility of sparingly soluble solutes given the $K_{sp}$.
3. calculate the $K_{sp}$ given a proper concentration variable.
4. calculate solubilities involving a common ion.
5. use the product quotient, $Q$, to do precipitation calculations.
6. explain the effect of pH on solubility.

H. Thermodynamics
Content:
- Spontaneous Process
- Entropy and the Second Law of Thermodynamics
- Gibbs Free Energy
- Thermodynamics and the Equilibrium Constant
- Thermodynamics and Time

Learning Outcomes:
Students should be able to:
1. describe the difference between the informations provided by kinetics and thermodynamics.
2. understand that entropy is a measure of matter and energy dispersal.
3. predict the sign of the entropy change for a reaction on change of state.
4. calculate the enthalpy change for a chemical reaction or change of state.
5. describe exothermic and endothermic changes.
6. calculate the entropy change for a chemical reaction or a change of state.
7. use enthalpy and entropy changes to predict whether a reaction is product favored or reactant favored.
8. understand the connection between entropy and enthalpy changes for a reaction and the Gibbs free energy change.
9. calculate the change in free energy for a reaction from the enthalpy and entropy change or from standard free energy of formation of reactants and products.
10. describe the relationship between the free energy change for a reaction and its equilibrium constant.
11. describe the three laws of thermodynamics.

I. Nuclear Chemistry
Content:
- Nature of Radioactivity
- Nuclear Reactions
- Stability of Atomic Nuclei
- Rates of Disintegration Reactions
- Artificial Nuclear Reactions
- Nuclear Fusion
- Radiation Effects
- Applications of Radioactivity

Learning Outcomes:
Students should be able to:
1. characterize the three major types of radiation observed in natural radioactive decay.
2. write balanced equations for nuclear reactions.
3. predict whether an unstable isotope will decay by alpha, beta or positron emission or by electron capture.
4. calculate the half-life of a radioactive isotope from the activity of a sample, or use the half-life to find the time required for an isotope to decay to a particular activity.
5. describe nuclear chain reactions, nuclear fissions and nuclear fusions.
6. describe the units used to measure radiation.
7. relate some uses of radioisotopes.

J. Electrochemistry
Content:
- Oxidation-Reduction Reactions
- Galvanic Cells
- Standard Reduction Potentials
- Batteries
- Corrosion
- Electrolysis

Learning Outcomes:
Students should be able to:
1. define and use the terms battery, electrochemical cell, fuel cell, electrolysis, electrode, electrolyte, salt bridge, anode and cathode.
2. balance equations for oxidation-reduction reactions in acidic or basic solutions using the half-reactions method.
3. explain the workings of an electrochemical cell.
4. use the Nernst equation to calculate the cell potential under nonstandard conditions.
5. understand reactions involving corrosion and how it can be inhibited with cathodic protections.
6. characterize the reactions occurring on electrolysis of an aqueous solution of an electrolyte.