# Course Syllabus
# University Chemistry II (CHEM 1123)
# Spring 2021

**Class Time and Location:** MTWRF 9:30-10:20; Mena High School room 312

**Instructor Name:** Mr. Rodney Rowland

**Office Location:** Mena High School room 312

**Office Hours:** 12:45-1:35 MTWRF

**Office Phone and Email**: 479-394-1144; rodney.rowland@menaschools.org

**Prerequisite:** Successful completion of CHM 1103 with at least a "C" grade.

**Resources:** 1) Textbook: Chemistry, Eighth Edition, by Steven S. Zumdahl. Lexington: D. C. Heath and Company, 2010. *ISBN 978-0-547-12532-9*

**Course Description:** This course is three credit hours and is designed to build upon the concepts covered in CHEM 1103. The fundamental theories of chemistry taught in this course include thermochemistry, bonding theory, kinetics, equilibrium, acid-base theory, and electrochemistry. Laboratory course CHEM 1121L must be taken concurrently with this course to earn four credit hours.

**Program Outcomes:** The knowledge and critical thinking skills acquired in the general education component enable students to analyze problems, to arrive at intelligent conclusions, and to make reasoned choices in their professional and personal lives. Students will also:

- Use analytical and reasoning skills to solve practical problems based on structure-property relationship
- Develop critical thinking and research skills based on basic laws of nature and chemistry

**Rationale:** Through the study of chemistry, problem solving experiences, and laboratory activity, the student develops an understanding of matter and the laws that explain the interactions between matters, including the energy changes involved.

**Course Objectives:** Upon completion of University Chemistry II, the student should be able to:

1. Determine the order of reaction with respect to each reactant.

2. Determine the overall order of a reaction and the rate constant, along with units.

3. Demonstrate a working knowledge of chemical equilibrium.

4. Determine the equilibrium constant for a chemical system at equilibrium.

5. Determine equilibrium concentrations of reactants and products given the initial concentrations and equilibrium constant.

6. Differentiate between an acid and a base using multiple definitions.

7. Determine the pH of a solution of a strong/weak acid or base.

8. Demonstrate a working knowledge of buffer systems and calculate the buffering capacity of a system.

9. Demonstrate a working understanding of parts of an electrochemical cell.

10. Determine the potential of a galvanic cell.

11. Determine the amount of metal that can be electroplated using an electrolytic cell.

12. Demonstrate a working knowledge of electron structure including: spectral evidence, the Wave Mechanical Model, and the Aufbau Principle.

13. Demonstrate a working knowledge of Chemical bonding including: ionic and covalent bonding, bond polarity, Localized Electron Model, Lewis structures, resonance, VSEPR Model, Molecular Orbital Model.

14. Describe the phases of matter and the structural and physical properties associated with these phases and the changes between phases.

15. Demonstrate a working knowledge of energy changes in chemical reactions including: enthalpy, calorimetry, and Hess's Law.

**Topical/Unit Outline:**

I. Thermochemistry:
- A. Enthalpy and Calorimetry
- B. Hess's Law
- C. Standard enthalpies of formation
- D. Entropy
- E. Gibbs' Free Energy

II. Bonding:
- A. Electronegativity
- B. Ionic and Covalent Bonds
- C. Bond polarity
- D. Localized electron bonding model
- E. Lewis structures
- F. Resonance
- G. VSEPR model
- H. Hybridization

III. Atomic Structure and Periodicity/Nuclear Reactions:

A. Atomic spectrum
B. Wave Mechanical Model of the Atom
C. Quantum numbers
D. Orbital shape and energy
E. Pauli and Aufbau Principles
F. Periodicity and electronic configuration
G. Nuclear Stability and Radioactive Decay
H. Kinetics of Radioactive Decay
I. Thermodynamic Stability of the Nucleus

IV. Chemical Kinetics/Equilibrium:
A. Reaction Rates
B. Rate Laws
C. Integrated Rate Law
D. Reaction Mechanisms
E. Catylsis
F. Equilibrium Condition
G. Equilibrium Constant
H. Heterogeneous Equilibria
I. Le Chatlier's Principle
J. Solubility Product

V. Acid-Base Chemistry and Equilibria:
A. Nature of Acids and Bases
B. The pH Scale
C. Calculating pH of Strong/Weak Acids
D. Polyprotic Acids
E. Acid-Base Properties of Salts
F. The Lewis Acid-Base Model
G. Common Ion Effect
H. Buffers and Buffering Capacity
I. Titrations and pH Curves
J. Indicators

VI. Electrochemistry
A. Galvanic Cells
B. Standard Reduction Potentials
C. Cell Potential, Electrical Work, and Free Energy
D. Dependence of Potential on Concentration
E. Batteries
F. Electrolysis

During the semester, due to unforeseen circumstances, it may be necessary to add to or delete contents from this document. This will only be done with adequate notification to the students affected.

**Course Conduct:** The class will be taught using a combination of lecture (guided notes), solving in-class questions, demonstrations, group discussions, and activities. Students are strongly encouraged to discuss concepts and examples as opportunities are presented during instructor presentation.

**UA-Rich Mountain Credit Hour Calculator:** For every course credit hour, you should expect to spend at least three clock hours per week of concentrated attention on course-related work, including but not limited to time attending class, as well as out-of-class time spent completing homework, seeking help from instructor or tutors, preparing for upcoming quizzes/tests/exam, reviewing material, problem solving, and organizing your notebook. For a four hour course, a typical student should expect to spend at least twelve hours per week dedicated to this course. This includes the time spent in class. Please see the credit hour calculator information attached to end of syllabus.

**Course Requirements/Evaluation:** Students will have one to two homework assignments to complete per week of class. Students will also have multiple choice/open response quizzes after the completion of a chapter or major topic. Exams will be administered after the completion of a unit (normally two chapters). The following is how much weight each category carries toward the final grade by percentage.

Exams: 35%
Quizzes: 25%
Homework assignments: 26%
Final Exam: 14%

Final grades will be assigned on the basis of standard grading percentage scale:
90-100 **A**
80- 89 **B**
70- 79 **C**
60- 69 **D**
0- 59 **F**

**Class Procedures/Student Requirements:**

**Attendance Policy:** Regular attendance and punctuality are expected. It is the responsibility of the student to initiate arrangements for all missed activities. If an absence is a planned absence the student is expected to make arrangements for making up work prior to the absence. More than six absences will be considered excessive and, along with work not made up, may adversely affect the grade for the course. In case of extended illness, or other circumstances, the student must contact the instructor if a WP is desired. If the instructor is not notified a failing grade will be assigned for the course.

**Cell Phone Policy:** Students will follow the policy outlined in the MHS student handbook.

**Make-up work policy:** Make up work should be competed promptly after the absence. Students will adhere to the MHS student handbook for make-up work deadlines.

**Assignment due dates:** Students are expected to submit the assignments and other works on or before the assigned due dates.

**Academic Dishonesty**: It is expected that each student shall do his/her own work on class works, quizzes, exams, and lab reports. Cheating, copying other's answers, writing other's statement without citing their reference are all considered plagiarism and are penalized from allowing no point in that particular unit up to dismissal from the whole course, depending on the severity of the offense.

**Disability Policy**: It is the policy of UA-Rich Mountain to accommodate students with disabilities, pursuant to federal law, state law. Any student with a disability who needs accommodations should contact the Associate Vice President for Student Affairs Office at 394-7622 ext. 1460.

**Arkansas Clean Air Act:** In compliance with the Arkansas Clean Air Act, UA-Rich Mountain is a smoke and tobacco free facility. Students and guests are to refrain from the use of all tobacco products while on campus.

**Student Misconduct:** Students committing misconduct are subject to disciplinary sanction(s) and/or restrictions. Misconduct or prohibited behavior includes, but is not limited to, endangerment, harassment, disruption, sexual misconduct, illegal drugs and/or alcohol, fire or safety issues, gambling, property violations, computer violations, or other violations as listed in the UA-Rich Mountain catalog.

**UA-Rich Mountain Mission:** UA-Rich Mountain exists to provide all citizens of the Ouachita Mountain Region with exemplary educational and enrichment opportunities to improve the quality of life and standard of living.

| Week # | Proposed Schedule of Topics/Activities |
|---|---|
| 1 | Discuss syllabus; Thermochemistry |
| 2 | Thermochemistry, Quiz #1, Thermodynamics |
| 3 | Thermodynamics |
| 4 | Exam #1; Atomic Structure |
| 5 | Atomic Structure, Quiz #2 |
| 6 | Chemical Bonding |
| 7 | Chemical Bonding |
| 8 | Exam 2; Kinetics |
| 9 | Kinetics |
| 10 | Quiz #3, General Equilibrium |
| 11 | General Equilibrium |
| 12 | Spring Break (March 22-26) |
| 13 | Exam #3; Acid-Base |
| 14 | Acid-Base |
| 15 | Acid-Base. Quiz #4 |
| 16 | Buffers and Titrations |
| 17 | Buffers and Titrations, Exam #4 |
| 18 | Electrochemistry |

# Credit Hour Requirement Calculator

**Instructor: Mr. Rowland**

**Course Information**

| | | |
|---|---|---|
| Department, Course Number | CHEM 1123 and CHEM 1121L | |
| Course Title | University Chemistry I and Lab | |
| Credit Hours | 4 | |
| Mode of Delivery | Traditional | |
| Weeks in Part of Term | 18 | |
| Level of Reading Material | Advanced/Scientific/Technical (2) | 2 |
| Reading Level of Students | Average Student (2) | 2 |
| Average Pages per Hour | 10 | |

*Enter either week or term, not both*

| **Contact Hours** | | **Hours/Week** | **Hours/Term** | **Total Hours** |
|---|---|---|---|---|
| Lecture/Lab | | | 80 | 80 |

| **Syllabus Items** | **Pages Asg'd** | **Hours/Week** | **Hours/Term** | |
|---|---|---|---|---|
| Reading | 350 | | | 35 |
| Assignment | | 2 | | 18 |
| Researching Lab questions | | 1 | | 18 |
| Reviewing for exams | | | 15 | 15 |
| | | | | 0 |
| | | | | 0 |
| | | | | 0 |
| | | | | 0 |
| | | | | 0 |

| | |
|---|---|
| **Total Hours** | 166 |
| **Required Hours** | 150 |
| **Difference** | Ok + 16 |