# University Chemistry I CHEM1103 (Lecture)
Fall 2020

**Class Time and Location: MW** 12:30 - 1:50, **Room**: S235
**Instructor**: Gaumani Gyanwali – Ph. D.: OSU-Stillwater; MS, BS: Tribhuvan University
**Office Location: S244**
**Office Hours:** Posted on the office door
**Contact Information: Office**: (479)-394-7622, Ext. 1339
**Cell**: (479)-234-8727 **Email**: gyanwali@uarichmountain.edu

**Prerequisite**: Successful completion of 1and a half units of high school algebra, OR a co-requisite MTH203 or Permission of Instructor

**Resources**:
Textbook: Chemistry, Eighth Edition, by Steven S. Zumdahl. Lexington: D. C. Heath and Company, 2010. *ISBN 978-0-547-12532-9*
Required Materials:
1. Calculator capable of roots, exponents, and logarithms.
2. Miscellaneous pens, paper, and pencils.

**Face Mask Policy:** As per the Executive Order from the governor of Arkansas, all students are required to wear a proper face covering that completely covers the nose and mouth while on campus and in class. Masks with holes or masks that do not completely cover nose and mouth are not acceptable. Any student that does not have a proper mask will leave class and be referred to the Vice Chancellor for Student Affairs for possible disciplinary action.

**Food and Drink:** Food and drinks, including water are not allowed in the classroom at any time.

**Course Description**: This course is a 3 credit hours course and is designed to provide the basic chemistry background necessary for science majors such as Physics, Chemistry, Biology, Biochemistry, Pharmacy, Forestry, Medicines, Engineering, etc. The fundamental theories of chemistry including measurements, periodic law, atomic theory, stoichiometry, thermochemistry, nuclear chemistry, chemical reactions, and bonding and structure are covered. Must take the laboratory course CHEM1101 concurrently with this course to have full 4 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.
- 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. The gained knowledge is applicable in upper level chemistry courses.

**Course Objectives:** Upon completion of University Chemistry I, the students should be able to:

1. Make a variety of measurements using the Systeme Internationale (SI) units.
2. Use dimensional analysis to convert units as well as to solve problems in general.
3. Demonstrate a working knowledge modern atomic structure and how it relates to the periodicity demonstrated by the elements on the Periodic Table.
4. Name and write the equations for ionic and covalent compounds, and balance equations involving these compounds.
5. Perform chemical calculations involving the amount of reactant and product.
6. Demonstrate a working knowledge of the different types of chemical reactions.
7. Balance oxidation-reduction equations.
8. Demonstrate a working knowledge of the composition of solutions and the reactions that take place in solution.
9. Mathematically and conceptually demonstrate a working knowledge of gases and the gas laws.
10. Demonstrate a working knowledge of energy changes in chemical reactions including: enthalpy, calorimetry, and Hess's Law.
11. Demonstrate a working knowledge of electron structure including: spectral evidence, the Wave Mechanical Model, and the Aufbau Principle.
12. 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.
13. Describe the phases of matter and the structural and physical properties associated with these phases and the changes between phases.
14. Demonstrate a working knowledge of colligative properties including: boiling point elevation and freezing point depression.
15. Demonstrate a working knowledge of nuclear chemistry including radioactive decay, and nuclear fusion and fission reactions.

**Topical/Unit Outline:**

I. <u>Chemical Foundations:</u>
A. Systeme Internationale
B. Conversion Factors
C. Scientific Notation and Significant Figures
D. Graphing
E. Density
F. Classification of Matter

II. <u>Atoms Molecules and ions:</u>
A. Fundamental chemical laws
B. Early Atomic Models
C. Development of the modern atomic model
D. The periodic Table
E. Naming Simple compounds

III. Atomic Structure and Periodicity:
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

IV. Chemical Reactions
A. Balancing Chemical Reactions
B. Four basic types of chemical reactions
C. Acid Base reactions
D. Oxidation Reduction reactions

V. Stoichiometry:
A. The Mole Concept
B. Molecular mass/weight
C. Determining the formula of a compound
D. Percent composition
E. Stoichiometric calculations
F. Limiting Reactant concept
G. Stoichiometry of Precipitation and acid base reactions
H. Solution Concentration: Molarity

VI. Gases:
A. History of gas laws
B. Ideal gas laws
C. Gas stoichiometry
D. Kinetic Molecular Theory of Gases
E. Real gases

VII. Thermochemistry:
A. Enthalpy and Calorimetry
B. Hess's Law
C. Standard enthalpies of formation

VIII. 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
I. Molecular Orbital Model

IX. Liquids and Solids:
A. Intermolecular forces
B. Liquid and solid states
C. Structure and bonding of metals
D. Vapor pressure and change of state
E. Phase Diagrams

X. Nuclear Chemistry:
A. Radioactive decay
B. Thermodynamic stability of nucleus
C. Nuclear fusion and fission

**Tentative Schedule for Lecture: University Chemistry I**

| Week | Topics/Activities by Book Chapter | Date/Day |
|---|---|---|
| 1 | Discuss syllabus; Pre-test, Chemical Foundations | 8/24 M, 8/26 W |
| 2 | Chemical Foundations<br>Atoms Molecules and Ions | 8/31 M<br>9/2 W |
| 3 | *Labor day holiday, no class*<br>Atoms Molecules and Ions | *9/7 M*<br>9/9 W |
| 4 | Atomic Structure and Periodicity | 9/14 M, 9/16 W |
| 5 | Atomic Structure and Periodicity/Review<br>**Test 1** | 9/21 M<br>**9/23 W** |
| 6 | Chemical Reactions | 9/28 M, 9/30 W |
| 7 | Stoichiometry | 10/5 M, 10/7 W |
| 8 | Stoichiometry/Review<br>**Test 2** | 10/12 M<br>**10/14 W** |
| 9 | Gases | 10/19 M, 10/21 W |
| 10 | Thermochemistry | 10/26 M, 10/28 W |
| 11 | Bonding | 11/2 M, 11/4 W |
| 12 | Bonding/Review<br>**Test 3** | 11/9 M<br>**11/11 W** |
| 13 | Liquids and solids<br>Nuclear Chemistry | 11/16 M<br>11/18 W |
| 14 | Nuclear Chemistry<br>*Thanksgiving break, no class (11/25-11/27)* | 11/23 M<br>*11/25 W* |
| 15 | Review (online)<br>**Test 4 (online)** | 11/30 M<br>**12/2 W** |
| 16 | **Final Exam (online)** | **12/9 W** |

**Course Conduct:** The class will be taught using a combination of lecture using *Powerpoint* presentation, solving in-class questions, demonstrations, group interaction and discussions. Students are strongly encouraged to discuss concepts and examples as opportunities are presented during instructor presentation. It is the student's responsibility to inform the instructor when a concept is confusing or otherwise unclear. Students must answer all the in-class questions before leaving the classroom and discuss with the instructor about any confusing concept right away.

You are encouraged to solve problems forming a study group and actively taking part in discussion. You may seek assistance from Student Support Services (SSS) check the concepts in homework assignments, quizzes, and exam reviews but the instructor is the primary source of right information. You must inform me no later than 1 week after the classes started if you feel that the difficulty level is too high. You cannot pass the course without completing the homeworks. Expect a minimum of 12 hours of work on this class

**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 credit hour calculator attached to end of syllabus.

**Course Requirements/Evaluation (Grading):**

Your grade for this course comes from 4 tests (100 points each) after completion of two or three chapters, one comprehensive final exam given in the finals week (100 points), ten assignments (10 points each), ten quizzes (10 points each).

| | |
|---|---|
| Four tests @100 each | = 300 (lowest one dropped when taken all four) |
| One Final Exam @ 100 | = 100 |
| 10 Quizzes @ 10 each | = 100 |
| 10 Assignments @ 10 each | = 100 |
| **Total points possible** | **= 600** |

The final grade for the course will be determined by dividing the student's total number of points earned by the number of possible points. Grades are assigned on the basis of the following percentage scale, after rounding the calculated percentage to the nearest whole number:

| | |
|---|---|
| 90-100 | **A** |
| 80- 89 | **B** |
| 70- 79 | **C** |
| 60- 69 | **D** |
| 0- 59 | **F** |

**Class Procedures/Student Requirements**:

On-Campus Resources:

1. Your student portal will be populated with the lecture slides for each upcoming chapter. If you wish, you can print the lecture slides of the chapter.
2. You will have in-class practice worksheets to see how the instructor performs the calculations and chemical formulas. Retain those worksheets for future information and knowledge.
3. Student Support Services will have some basic information available about time management, difficulty of the course etc.

tutor.com provides 5 hours of free tutoring online for each UA Rich Mountain student per semester. Johnson Learning Commons has contract with this online site where personal tutors are available 24/7. Create an account and get help personally from home or anywhere if internet access is available. Follow the link to log in www.tutor.com/uarichmountain

Attendance Policy: Absence in this course most often results into failing grades unless covered by immediate action and make-up work. Absence is strictly prohibited unless any

unavoidable circumstances. If notified of the absence, the instructor can send you the work and you can catch up with completed work. It is your full responsibility to complete the missed work and cover the missed chapter.

Assignment Due Dates: Students are expected to submit the assignments and other works on or before the assigned due dates. You will be penalized for the late works depending on the number of days and full point and importance of the works assigned.

Make-up Work Policy**:** Make up work should be competed promptly after the absence. A maximum of one week will be the guideline. Make-up exams are given only in instances of the most unavoidable, serious circumstances. Prior notice of absence from an exam is required. Upon return after an absence the student is expected to be prepared for the days' class activities.

Cell Phone Policy**:** Do not use the cellphone unless allowed by the instructor.

Extra Credit Opportunity: Optimum student involvement in the course as well as course-related activities is highly recommended and rewarded with extra credit. The value of extra credit points varies with the nature of the activity and the application of that activity in the real life as well as relation of the activity with the course. Points that can be received are unlimited. Simple idea is: the more you are involved in real-life science experiences, the more you understand and enjoy it, and you get good grades!!! Some examples of activities (but not limited to) that earn extra credit points include:

a) Complete and submit the end of chapter Exercises for each chapter.
b) Being an active member of the Science Club coordinated by the instructor
c) Organize activities within the Science Club or participate actively in the activities organized by the Club
d) Taking leadership in group study sessions and manage study sessions with peers
e) Organize or be involved in science and technology awareness activities and helping society to improve utilizing science knowledge
f) Actively participating in science-related meetings and conferences on/off campus
g) Any other science related activities and duties beyond the demand of the course deemed worthy of extra credit by the instructor

**Academic Dishonesty**: It is expected that each student shall do his/her own work on class works, quizzes, and exams. 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 state and federal law. Any student with a disability who needs accommodations should contact the Associate Vice-Chancellor for Student Affairs Office, 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 provides transformative education to all learners.* **under review*

| Credit Hour Requirement Calculator | | | | |
|---|---|---|---|---|
| | | | | |
| **Course Information** | | | | |
| Department, Course Number | CHEM1103(Lecture) and CHEM1101(Lab) | | | |
| Course Title | University Chemistry I | | | |
| Credit Hours | 3 + 1 = 4 | | | |
| Mode of Delivery | Traditional | | | |
| Weeks in Part of Term | 15 | | | |
| 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/Recitation | | | 45 | 45 |
| Lab Contact Hours | | | 24 | 24 |
| | **Pages Asg'd** | **Hours/Week** | **Hours/Term** | |
| **Syllabus Items** | | | | |
| Reading | 380 | | | 38 |
| Assignment | | 1 | | 15 |
| Quiz | | 1 | | 15 |
| Researching Lab questions | | 2 | | 30 |
| Reviewing for exams | | | 10 | 10 |
| | | | | 0 |
| | | | | 0 |
| | | | | 0 |
| | | | | 0 |
| | | | | 0 |
| | | | | |
| **Total Hours** | | | | 177 |
| **Required Hours** | | | | 150 |
| **Difference** | | | | Ok + 27 |