UNIVERSITY CHEMISTRY I CHEM1103 (LECTURE) FALL 2022

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
Email: gyanwali@uarichmountain.edu

Prerequisite: Successful completion of 1 and ½ 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.

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

II. Atoms Molecules and ions:
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	8/22 M, 8/24 W
2	Atoms Molecules and Ions	8/29 M, 8/31 W
3	*Labor Day holiday, no class* Atomic Structure and Periodicity	*9/5 M* 9/7 W
4	Atomic Structure and Periodicity / Review	9/12 M, 9/14 W
5	**Test 1** Chemical Reactions	**9/19 M** 9/21 W
6	Chemical Reactions/Stoichiometry	9/26 M, 9/28 W
7	Stoichiometry	10/3 M, 10/5 W
8	*Instructor at a conference, no class* Review	*10/10 M* 10/12 W
9	**Test 2** Gases	**10/17 M** 10/19 W
10	Gases/Thermochemistry	10/24 M, 10/26 W
11	Thermochemistry/Liquids and solids/Review	10/31 M, 11/2 W
12	**Test 3** Bonding	**11/7 M** 11/9 W
13	Bonding	11/14 M, 11/16 W
14	*Thanksgiving break, no class*	*11/21 M – 11/25 W*
15	Nuclear Chemistry Presentation (morning), Nuclear chemistry/Review	11/28 M 11/30 W (9:30 and 12:30)
16	**Test 4**	**12/5 M**
17	**Final Exam**	**12/12 M**

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 the confusing concept right away with the instructor.

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 and exam reviews but the instructor is the primary source of 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 Blackboard assignments after properly studying. 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 10 assignments (on average of 40 points each, 400 points, 40% of the overall grade), 4 semester tests (100 points each, 300 total points after one least score dropped,

30% of the overall grade), 1 comprehensive final exam given in the finals week (125 points, 12.5% of the overall grade), 1 research review and presentation (125 points, 12.5% of the overall grade), and from class participation and attendance (50 points, 5% of the overall grade).

Category	**Total points possible**	**Percentage of overall grade**
10 Assignments* + Bonus work	400	40%
4 Semester tests (1 dropped)	300	30%
1 Final exam	125	12.5%
1 Research and presentation	125	12.5%
1 Participation and attendance	50	5%
All semester grades	**1000**	**100%**

*Total points for an individual assignment may change based on the weightage of the chapter

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: Absence in this course most often results into failing grades unless covered by immediate action and make-up work. Absences and poor class participation will count against the 50-point Class Participation and Attendance category of your grade and 5% of the overall course grades.

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, and most probably on a paper sheet. 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**:** Every time you use the cell phone during class, you will get a minus point for the Class Participation and Attendance category of your 5% course grade. Strictly bring a calculator and use it instead of a cellphone for calculation.

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.

Title IX and Discrimination Policy: UA Rich Mountain adheres to a policy that enables all individuals regardless of race, color, gender, national origin, age, religion, sexual orientation, veteran's status, or disability, to work and study in an environment unfettered by discriminatory behavior or acts. Harassment of an individual or group will not be condoned, and any person (student, faculty, of staff member) who violates this policy will be subject to disciplinary action.

Harassment that is considered discriminatory includes actions or conduct (verbal, graphic, gestural, or written) directed against any person or group with the intent to demean or create a hostile or threatening environment. It is not the intent of this policy to infringe upon or limit educational, scholarly, or artistic expression. Any person who believes he or she has been discriminated against should contact the Title IX Coordinator to obtain assistance and information concerning the filing of a complaint.

Face mask policy: Students are encouraged but not required to wear face masks in class and public spaces.

Attendance Policy: For attendance purposes, a student who is displaying symptoms of illness must email: contact.tracing@uarichmountain.edu to determine next steps for an excused absence related to COVID or flu. Contacting an instructor **DOES NOT** start this process or guarantee an excused absence.

Food and Drink: Food and drinks, except water in a closed container, are not allowed in the classroom.

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.

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			
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