**TENNESSEE STATE UNIVERSITY**

**Department of Chemistry**

**CHEM 1120-01: General Chemistry II**

**SPRING 2017**

**Instructor:**

**Office:**

**Phone: (615) 963-5321**

**E-mail:**

**Class location: Boswell Science Complex (CHM 113)**

**Class meets at: M, W (8:00 AM-9:25 AM)**

**Office Hours:**  M, W, (10:00 AM-11:00 AM; 1:00 PM-2:00 PM) andR (1:00 AM-2:00 PM)

**Textbook:** "Chemistry" by Zumdahl and Zumdahl, 9th Ed., Brooks/Cole Publisher

ISBN-10: 1-285-92407-X; ISBN-13: 978-1-285-92407-6

Part of the TSU digital book bundle

**Prerequisite:** CHEM 1110: General Chemistry I

**Course Description:** A study of chemical principles designed for science majors including biology, chemistry, and physics. Topics covered in the course are: chemical kinetics, chemical equilibrium, acid‑base reactions, oxidation‑reduction reactions, chemical thermodynamics, electrochemistry, and solubility equilibria.

**Course Competencies:** Upon completion of the course the student should be able to:

* Understanding of various kinds of intermolecular forces and their relation to physical properties
* Solution concentration
* Calculation of colligative properties; van’t Hoff factor
* An understanding of chemical equilibria as applied to gaseous reactions, acid‑base reactions, and solubility
* An understanding of the various factors that affect the kinetics of reactions and how to utilize the rate law expressions in calculations
* Definition of reaction rate, experimental determination of rate, dependence of rate on concentration
* Change of concentration with time
* Rate law and reaction mechanism
* Applying stoichiometry to equilibrium mixtures
* Writing equilibrium-constant expressions
* Determining equilibrium constant from reaction composition
* Solving equilibrium problems
* Applying LeChâtelier's principle
* Arrhenius and Brönsted-Lowry concept of acids and bases
* Molecular structure and acid strength
* Solutions of strong acids or bases
* pH of solutions
* Acid-base properties of salt solutions
* Buffers and the common-ion effect
* The solubility product constant
* Solubility and precipitation calculations
* Effect of pH on solubility
* Complex ion formation
* An understanding of the principles of chemical thermodynamics
* First law of thermodynamics: enthalpy
* Second Law of Thermodynamics: entropy
* Standard entropies and the third law of thermodynamics
* Free Energy and Spontaneity
* Relating Gibbs free energy to the equilibrium constant
* An understanding of basic principles of electrochemistry
* Oxidation-reduction reactions: review and balancing
* Construction of voltaic cells
* Notation of voltaic cells
* Calculation of cell potential
* Nernst equation; concentration dependence of EMF

**Course Presentation:** Lecture material will be taken from the textbook.

**Evaluation of Course Competencies:**

Three In-class Exams: 50% of the course grade (16.7% per exam)

In-class Quiz:  15% (taken at the beginning of each class)

Homework: 15% of the course grade (each chapter has at least one assignment)

Comprehensive Final Exam: 20% of the course grade

***Exams:*** will reflect chapter competencies. There will be no make-up exams. If an exam is missed due to unavoidable circumstances (with documentation provided), the final exam score will be used in place of the missed exam. This can be done for only one missed chapter exam. Students can always arrange to take an exam prior to the exam day if they know they will be missing the exam. A make-up exam after the date set in this syllabus will not be allowed.

**Note:** It is your responsibility to collect the graded quizzes and exams (at the end of each class, or, from my office). Quiz and exam scores will be uploaded at elearn ([https://elearn.tnstate.edu](https://elearn.tnstate.edu/)) in a timely manner. All the quizzes and exams will be destroyed after the semester is over.

***Reading and Homework Assignments***: Reading assignments will be given immediately prior to the beginning of the next chapter topics. We will begin with chapter 10 and proceed in the order as stated in the lecture schedule. After the first lecture it will be assumed that you have read the appropriate chapter before coming to class. The homework will be assigned on a regular basis. Homework will be assigned, tracked, and graded using the *Owl®* online system. **There is a strong, positive correlation between actively practicing the concepts and problem solving techniques discussed in lecture by completing the homework assignments and doing well in this course.**

***Comprehensive Final Exam:*** A two hour departmental comprehensive final exam will be administered. Questions will be taken from all chapters covering major course competencies. Date, time and location of the final exam will be posted at least two weeks prior to the exam. The final exam is mandatory. **No late finals are allowed and** **no makeup for the final exam is allowed.**

***Participation:*** It is assumed that you want to do the best you can in this class. This means that you want to actively participate in the course. By active participation we mean the following:

* Assignments are completed and, if requested, submitted on time
* You are willing to answer questions put forth by the instructor
* You are willing to ask questions in and out of class
* You arrive to class on time
* Your attention is focused on the material being presented by the instructor

The following behaviors are demonstrative of a lack of class participation:

* Arriving late for or not attending class
* Not handing in assignments on time
* Talking while the instructor or another classmate is speaking
* Being generally disruptive

**Grading Scale:** 90-100 A

 80-89 B

 70-79 C

 60-69 D

 below 60 F

**Schedule of Exams:**

**Attendance and Expectations:**  Students are expected to attend every lecture in its entirety. Students are expected to read and study the material to be discussed **prior** to the lecture.  This includes working on problems and exercises given in the text. Students should review the material discussed until comprehension is acquired and seek assistance when necessary.  **The Chemistry Department Tutorial Center is available to students needing help with chemistry.  The Tutorial Center is located in Rm. 106 (Chem. Bldg.).**

**Policy on Cell Phones in Class:**  **Use of cell phones in class is strictly forbidden**.  Ringers on phones need to be turned off prior to lecture. Cell phones are not acceptable as calculators in class or on quizzes/exams. Only regular scientific calculators, not cell phones, may be used in class.

**Class Participation and Disruptive Behavior:**  Students will receive participation points if they answer questions in class and work problems out on the board.  5 points will be awarded per attempt.  Participation points are bonus points that will help to raise a grade.  Points will not be granted if no attempt at participation is made and points will also be taken off if a students acts in a disruptive manner.  Examples of disruptive behavior include – talking/laughing in class while the professor tries to lecture, trying to use a cell phone, trying to work on assignments other than general chemistry assignments, and being rude.

**Policy on Cheating and Plagiarism:**

In accordance with the university’s policy on academic and classroom misconduct found in the catalog, cheating will not be tolerated in this course and a zero-tolerance policy regarding cheating will be followed throughout the course. A student who is caught cheating or attempting to cheat will be given a zero (F) for that particular assignment/test/quiz for the first offense. If a student is caught cheating a second time, that student will be given an overall grade of “F” for the course. To this end, the following classroom policies will be in effect and enforced.

* Cell phones and any other electronic devices (including smart watches) that connect to wireless networks will not be permitted during any exam or quiz. These devices may not be on your desk during an exam or quiz and must be stored in your bag or purse and/or turned off. Calculators may be used, only if the questions on the exam or quiz warrant their use.
* Once an exam or quiz period has started, you will not be permitted to leave to go to the restroom during the exam period. Please be sure to use the restroom before coming to class. Exceptions will only be made for those with documented medical needs.
* No outside materials may be used during an exam or quiz. Any necessary materials (*i.e.* periodic table, equations & constants, scratch paper, *etc.*) will be provided for you.
* Sunglasses and hats may not be worn during an exam or quiz period.
* The use of headphones and/or earbuds during an exam or quiz is strictly prohibited.
* Duplication or copying of homework assignments will result in a score of zero (F) for each student submitting a copied homework assignment.

**TSU Statement of Disability Policy for Students**

**DISABILITY ACCOMMODATION STATEMENT**

·     TSU is committed to creating inclusive learning environments and providing all students with opportunities to learn and excel in their course of study. Any student with a disability or condition which might interfere with his/her class performance or attendance may arrange for reasonable accommodations by visiting the Office of Disability Services (ODS). ODS is located in Kean Hall, room 131 and can be reached at 963-7400 or [www.tnstate.edu/disabilityservices](https://email.tnstate.edu/owa/redir.aspx?C=xV26y478IUCrsC6EVJGZJwcnpTClzNMIq5oNCo3kutoaujH4Sg3fa1LMIs2C90iK5chRi-kAlnE.&URL=http%3a%2f%2fwww.tnstate.edu%2fdisabilityservices) .  You will be required to speak with ODS staff and provide documentation of the need for an accommodation.  If you qualify for an accommodation you will be provided with a document stating what type of classroom accommodations are to be made by the instructor.  It is your responsibility to give a copy of this document to the instructor **as soon as you receive it**.  Accommodations will only be provided **AFTER** the instructor receives the accommodation instructions from ODS; accommodations are not retroactive.  You must follow this process for each semester that you require accommodations.

**SEXUAL MISCONDUCT, DOMESTIC/DATING VIOLENCE, STALKING**

TSU recognizes the importance of providing an environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic violence, dating violence, and stalking.  If you (or someone you know) has experienced or is experiencing any of these incidents, there are resources to assist you in the areas of accessing health and counseling services, providing academic and housing accommodations, and making referrals for assistance with legal protective orders and more.

Please be aware that most TSU employees, including faculty and instructors, are “responsible employees”, meaning that they are required to report incidents of sexual violence, domestic/dating violence or stalking.   **This means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking, I must report the information to the Title IX Coordinator.**  Although I have to report thesituation, you will still have options about how your situation will be handled, includingwhether or not you wish to pursue a formal complaint.  Our goal is to make sure you areaware of the range of options available to you and have access to the resources youneed.

You are encouraged to contact TSU’s Title IX Coordinator to report any incidents of sexual harassment, sexual violence, domestic/dating violence or stalking.  The Title IX coordinator is located in the Office of Equity and Inclusion, McWherter Administration Building, Ste. 260 and can be reached at 963-7494 or 963-7438.  For more information about Title IX and TSU’s SART or policies and procedures regarding sexual, domestic/dating violence and stalking please visit:  [www.tnstate.edu/equity](https://email.tnstate.edu/owa/redir.aspx?C=xV26y478IUCrsC6EVJGZJwcnpTClzNMIq5oNCo3kutoaujH4Sg3fa1LMIs2C90iK5chRi-kAlnE.&URL=http%3a%2f%2fwww.tnstate.edu%2fequity).

If you wish to speak to someone confidentially, who is not required to report, you can contact the TSU Counseling Center, located in the basement of Wilson Hall, at 963-5611 or TSU Student Health Services, located in the Floyd Payne Campus Center room 304, at 963-5084.  You may also contact the following off campus resources:  Sexual Assault Center of Nashville at 1-800-879-1999 or [www.sacenter.org](https://email.tnstate.edu/owa/redir.aspx?C=xV26y478IUCrsC6EVJGZJwcnpTClzNMIq5oNCo3kutoaujH4Sg3fa1LMIs2C90iK5chRi-kAlnE.&URL=http%3a%2f%2fwww.sacenter.org) or the Tennessee Coalition to End Domestic & Sexual Violence at 615-386-9406 or [www.tncoalition.org](https://email.tnstate.edu/owa/redir.aspx?C=xV26y478IUCrsC6EVJGZJwcnpTClzNMIq5oNCo3kutoaujH4Sg3fa1LMIs2C90iK5chRi-kAlnE.&URL=http%3a%2f%2fwww.tncoalition.org) .

**HARASSMENT & DISCRIMINATION**

Tennessee State University is firmly committed to compliance with all federal, state and local laws that prohibit harassment and discrimination based on race, color, national origin, gender, age, disability, religion, retaliation, veteran status and other protected categories.  TSU will not subject any student to discrimination or harassment and no student shall be excluded from participation in nor denied the benefits of any educational program based on their protected class.  If a student believes they have been discriminated against or harassed because of a protected class, they are encouraged to contact the Office of Equity and Inclusion at McWherter Administration Building, Ste. 260, 615-963-7494 or 963-7438, [www.tnstate.edu/equity](https://email.tnstate.edu/owa/redir.aspx?C=xV26y478IUCrsC6EVJGZJwcnpTClzNMIq5oNCo3kutoaujH4Sg3fa1LMIs2C90iK5chRi-kAlnE.&URL=http%3a%2f%2fwww.tnstate.edu%2fequity).

**Important Dates:**

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| Jan 3 | University Re-opens-8:00 am |
| Jan 9 | Faculty/ Staff Institute |
| Jan 11 | Residence Halls open (New Students) |
| Jan 12 | Freshman Orientation |
| Jan 12 | Residence Halls Open (Returning Students) |
| Jan 16 | Holiday – MLK – No Classes |
| Jan 17 | Classes Begin |
| Jan 17-20 | Late Registration/Schedule Students |
| Feb 28 – Mar 3 | Student Study Week – No Activities Scheduled |
| Mar 6-11 | Mid-term Examination Week-all classes meet as scheduled |
| Mar 13-17 | Spring Break |
| Mar 31 | Last day to withdraw from courses |
| Mar 31 | Last day to withdraw from University-Counseling Center |
| April 3 – Aug 25 | Registration for Summer and Fall 2017 |
| April TBA | Honors Convocation |
| April 24-28 | Student Study Week – No Activities Scheduled |
| April 27 | Last day of class |
| April 29-May 5 | Final examinations for Spring 2016 semester |
| May 5 (Friday) | Graduate Commencement Ceremony, 5:00 p.m., Gentry Center |
| May 6 (Saturday) | Undergraduate Commencement Ceremony – 9:00 a.m., Hale Stadium |
| May 9 | Faculty must have posted all grades via "MyTSU" |

Exam 1: 02/6/2017 (Monday)

Exam 2: 03/22/2017 (Wednesday: after Spring Break)

Exam 3: 04/24/2017 (Monday)

Review for final: 04/26/2017 (Wednesday)

Final Exam: To Be Announced (potentially: May 4th , Thursday at 2:40 PM)

**CHAPTER OUTLINE**

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| Chapter | Description | Pages |
| 10 | **Liquids and Solids*** Intermolecular Forces
* An Introduction to Structure and Types of Solids
* Structure and Bonding in Metals
* Carbon and Silicon: Network Atomic Solids
* Molecular Solids
* Ionic Solids
* Vapor Pressure and Changes of State
* Phase Diagrams
 | 453-509 |
| 11 | **Properties of Solutions*** Solution Composition
* The Energies of Solution Formation
* Factors Affecting Solubility
* The Vapor Pressure of Solutions
* Boiling Point Elevation and Freezing Point Depression
* Osmotic Pressure
* Colligative Properties of Electrolyte Solutions
* Colloids
 | 510-551 |
| 12 | **Chemical Kinetics*** Reaction Rates
* Rate Laws: An Introduction
* Determining the Form of the Rate Law
* The Integrated Rate Law
* Rate Laws: A Summary
* Reaction Mechanisms
* A Model for Chemical Kinetics
* Catalysis
 | 552-605 |
| 13 | **Chemical Equilibrium*** The Equilibrium Condition
* The Equilibrium Constant
* Equilibrium Expressions Involving Pressures
* Heterogeneous Equilibria
* Applications of the Equilibrium Constant
* Solving Equilibrium Problems
* Le Chartelier’s Principle
 | 606-651 |
| 14 | **Acids and Bases** * The Nature of Acids and Bases
* Acid Strength
* The pH Scale
* Calculating the pH of Strong Acid solutions
* Calculating the pH of Weak Acid Solutions
* Bases
* Polyprotic Acids
* Acid-Base Properties of Salts
* The Effect of Structure on Acid-Base Properties
* Acid-Base Priperties of Oxides
* The Lewis Acid-Base Model
* Strategy for Solving Acid-Base Problems
 | 652-710 |
| 15 | **Acid-Base Equilibria*** Solutions of Acids or Bases Containing a Common Ion
* Buffered Solutions
* Buffering Capacity
* Titrations and pH Curves
* Acid-Base Indicators
 | 711-757 |
| 16 | **Solubility and Complex Ion Equilibria*** Solubility equilibria and the Solubilty Product
* Precipitation and Qualitative Analysis
* Equilibria Involving Complex Ions
 | 758-786 |
| 17 | **Spontaneity, Entropy and Free Energy*** Spontaneous Processes and Entropy
* Entropy and the Second Law of Thermodynamics
* The Effect of Temperature on Sponteneity
* Free Energy
* Entropy Changes in Chemical Reactions
* Free Energy and Chemical Reactions
* The Dependence of Free Energy on Pressure
* Free Energy and Equilibrium
* Free Energy and Work
 | 787-831 |
| 18 | **Electrochemistry*** Galvanic Cells
* Standard reduction Potentials
* Cell Potential, Electrical Work, and Free Energy
* Dependence of Cell Potential on Concentration
* Batteries
* Corrosion
* Electrolysis
* Commercial Electrolytic Processes
 | 832-889 |
| 19 | **The Nucleus: A Chemist’s View**Selected topics may be covered if time permits | 890-925[ |