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CHEMISTRY 1120 / GENERAL CHEMISTRY II

Term
CRN #
Lecture:
Lab:

Professor:
Office Hours:
Office Phone:
E-mail:

Credit Hours: 4

Prerequisites: Completion of CHEM 1110 with a “C” or better.

Catalog Description: This course is a study of solutions, acid-base concepts, chemical kinetics and equilibrium, ionic equilibria of weak electrolytes, thermodynamics, oxidation-reduction reactions, and nuclear chemistry.


Register for Sapling Learning online homework system.


Lab Requirements: A lab coat and safety goggles/glasses are required for the laboratory portion of this course. A separate syllabus will be provided for the laboratory portion of this course.

Supplemental Materials: Scientific Calculator

Group for Whom the Class is Intended:
This course is intended for students pursuing degrees and programs in the allied health field of study and the Tennessee Transfer pathway in chemistry.
Program Learning Outcomes:
After completing the requirements of CHEM 1120, students will be able to:
1) Conduct an experiment, collect and analyze data, and interpret results in a laboratory setting.
2) Analyze, test, and evaluate a scientific hypothesis.
3) Use basic scientific language and processes, and be able to distinguish between scientific and non-scientific explanations.
4) Identify unifying principles and repeatable patterns in nature, the values of natural diversity, and apply them to problems or issues of a scientific nature.
5) Analyze and discuss the impact of scientific discovery on human thought and behavior.

Student Learning Outcomes:
By the end of the course, students will be able to:
1. Define normal boiling point, vapor pressure, surface tension, and viscosity of a liquid.
2. Describe and classify the intermolecular forces present in a given substance as hydrogen bonding, ion-dipole, dipole-dipole, and dispersion.
3. Explain how intermolecular forces affect some physical properties of compounds.
4. Calculate amount of heat or temperature change associated with the phase change of a substance.
5. Read a phase diagram and identify phase boundaries, triple point and critical point.
6. Utilize temperature-pressure data to determine the phase of a substance.
7. Perform calculations with the Clausius-Clapeyron equation.
8. Compare and contrast typical properties of ionic, covalent, molecular and metallic solids.
9. Calculate density or atomic radius of an atom knowing the type of unit cell for the given element.
10. Describe the different kinds of packing in crystalline solids.
11. Define solubility, saturated solution, unsaturated solution, and supersaturated solution.
12. Discuss the energetics associated with the formation of a solution.
13. Calculate and interconvert between units of concentration: molarity, molality, mass percent, and mole fraction.
15. Give explanations and perform calculations concerning the colligative properties of solutions: vapor-pressure lowering, freezing-point depression, boiling-point elevation, and osmotic pressure.
16. Compare and contrast hypotonic, hypertonic and isotonic solutions.
17. Describe the collision theory and factors that affect reaction rates.
18. Relate instantaneous reaction rates of reactants and products using stoichiometric coefficients.
19. Determine the rate law, rate constant and instantaneous rates, and order of a reaction from experimental data.
20. Differentiate between and perform calculations with zeroth-, first-, and second-order integrated rate laws.
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21. Define half-life and calculate time from relevant data.
22. Define reaction mechanism, rate-determining step, intermediate and catalyst.
23. Use mechanistic information to find the rate law for a given reaction.
24. Define reversible process and equilibrium.
25. Write equilibrium expressions for homogeneous and heterogeneous reactions.
27. Use an equilibrium constant to predict the extent with which a reaction will occur.
28. Calculate equilibrium or initial concentrations/pressures, $K_c$, and/or $K_p$ using an ICE table.
29. Use LeChâtelier’s principle to determine how a reaction at equilibrium will shift under the following stresses: addition or removal of a reactant or product, change in temperature, increase or decrease in pressure or volume, and addition of a catalyst.
30. Calculate the reaction quotient and predict the direction a reaction will shift when comparing it to the equilibrium constant.
31. Define and identify conjugate acid and conjugate base pairs.
32. Use $K_a$ and $K_b$ values to determine acid and base strength respectively.
33. Calculate pH and concentrations of the hydronium ion and hydroxide ion in a given solution.
34. Compare strengths of conjugate acid-base pairs.
35. Set up an ICE table and use $K_a$ (weak acid) or $K_b$ (weak base) values to determine the pH of solution.
36. Understand the relationship between $K_w$, $K_a$, and $K_b$.
37. Classify a salt solution as being neutral, acidic or basic.
38. Calculate the pH of a salt solution.
39. Describe the factors that affect acid strength.
40. Compare and contrast the Arrhenius, Brønsted-Lowry, and Lewis definitions of an acid and base.
41. Illustrate the common ion effect.
42. Define buffer and buffer capacity.
43. Calculate the pH of a buffer solution using the Henderson-Hasselbalch equation.
44. Analyze $pK_a$ values to select a buffer with a specific pH range.
45. Calculate the pH throughout a titration using acids and bases that are strong or weak.
46. Distinguish between endpoint and equivalence point.
47. Choose an appropriate indicator for a given titration.
48. Write a solubility product expression and calculate $K_{sp}$.
49. Use $K_{sp}$ values to determine molar solubility and predict if a precipitate will form from given concentrations.
50. Qualify the factors that affect the solubility of slightly soluble compounds.
51. Illustrate the separation of ions by selective precipitation for qualitative analysis.
52. Differentiate between a spontaneous and a non-spontaneous process, citing examples of each.
53. Define entropy and Gibb’s free energy.
54. Discuss the second and third laws of thermodynamics.
55. Calculate entropy changes for a system and how the sign determines spontaneity.
56. Calculate standard entropy changes and standard free energy of formation for a reaction.
57. Use $\Delta H$ and $\Delta S$ to determine $\Delta G$ and establish whether a process is spontaneous.
58. Describe the relationship between chemical equilibrium and free energy.
59. Define galvanic cell, electrolytic cell, anode, cathode, salt bridge, and concentration cell.
60. Calculate standard cell potentials from standard reduction potentials.
61. Distinguish the relationships and interconvert between $\Delta G$, $K$, and $E^{\circ}_{\text{cell}}$.
62. Use the Nernst equation to determine the potential of a cell under non-standard conditions.
63. Differentiate between the different types of batteries and fuel cells.
64. Identify the commercial applications of electrolysis.
65. Distinguish between organic and inorganic compounds.
66. Write chemical, molecular, and structural formulas for organic molecules.
67. Draw isomers of a given compound including constitutional, stereochemical, geometrical.
68. Classify the different functional groups.
69. Name simple alkanes, alkenes, alkynes, alcohols, ethers, aromatics, amines, aldehydes, ketones, carboxylic acids, amides, and esters.
70. Identify common reactions among the different kinds of organic molecules.
71. Consider different types of synthetic polymers.

**Student Objectives:**
Throughout the course, students will have the opportunity:
1). To attend all lectures and to attend and participate in all labs
2). To spend time outside class for independent study
3). To diligently study both text and notes
4). To seek outside help from the instructor as needed
5). To demonstrate a working knowledge of chemistry to be assessed by lecture and lab exams

**Attendance Policy:** Regular attendance is essential to successfully navigate the rigors of this course. Roll will be called at the beginning of class. If you are tardy for a class it is your responsibility to let the instructor know after class has ended.

**General Classroom Policies:**
- Courtesy to one another is expected at all times.
- Be on time, as lecture and lab begin on time.
- No food, drink, or children are permitted in classrooms or labs.
- Cell phones should be turned off or be set on vibrate prior to entering classroom.
- Prepared notes will NOT be provided to students. If you miss a day of class, please get a copy of the notes from a fellow student.
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- Unless special permission has been given by student services, I do not allow students to tape either my lectures or my labs.
- Exams will be corrected and returned to you within one week after the exam. I will NOT grade exams the same day, or in the presence of students. Do not call or come to my office for grades prior to the next regular class session after an exam.

Exam policies:

- **There will be four exams, three in lecture and one in lab.** Each lecture exam is worth 100 points and the lab final is worth 150 points. Exam dates will be announced during scheduled lecture and lab meetings. Your laboratory instructor will provide a separate course outline.
- **YOU MAY MAKE UP ONLY ONE LECTURE EXAM.** You must make up the exam within one week of the missed exam during office hours. Any student missing a second or third exam will receive a zero for those exams.
- **The final exam is comprehensive. It is worth 200 points. There are no make-ups allowed for the final.**

**Major Assignments and Method for Calculating the Final Grade:**

Points Breakdown:
- 500 points (Four Lecture Exams and Comprehensive Final)
- 250 points (Lab Reports and Exam)
- 100 points (Quizzes)
- 150 points (Homework)
- 1000 points (750 from lecture & 250 from lab)

**Grading Policies:**

Grading Scale:
- A = 90% - 100% or 900 – 1000 points
- B = 80% - 90% or 800 – 899 points
- C = 70% - 80% or 700 – 799 points
- D = 60% - 70% or 600 – 699 points

**Note:** If your average is 89.4, your grade will be a B. If your average is 79.4, your grade will be a C. If your average is 69.4, your grade will be a D. If your average is 59.4, your grade will be a F.

Course Policies:

**Academic Misconduct Policy:**
Plagiarism, cheating, and other forms of academic dishonesty are prohibited. Students guilty of academic misconduct, either directly or indirectly, through participation or
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assistance, are immediately responsible to the instructor of the class. Based on their professional judgment, instructors have the authority to impose the following academic sanctions: (a) require the student to repeat the assignment for full or partial credit; (b) assign a zero, an F, or any other grade appropriate for the assignment or examination; (c) assign an F for the course. In addition, disciplinary sanctions may be imposed through the regular institutional procedures. For more information, see MSCC Policy 3:02:00:03.

Classroom Misconduct Policy:
The instructor has the primary responsibility for maintenance of academic integrity and controlling classroom behavior, and can order temporary removal or exclusion from the classroom of any student engaged in disruptive conduct or conduct that violates the general rules and regulations of the institution for each class session during which the conduct occurs. Extended or permanent exclusion from the classroom, beyond the session in which the conduct occurred, or further disciplinary action can be effected only through appropriate procedures of the institution.

Disruptive behavior in the classroom may be defined as, but not limited to, behavior that obstructs or disrupts the learning environment (e.g., offensive language, harassment of students and professors, repeated outbursts from a student which disrupt the flow of instruction or prevent concentration on the subject taught, failure to cooperate in maintaining classroom decorum, etc.), text messaging, and the continued use of any electronic or other noise or light emitting device which disturbs others (e.g., disturbing noises from beepers, cell phones, palm pilots, lap-top computers, games, etc.). For more information, see MSCC Policy 3:02:00:03.

Class Cancelation Policy:
If class is cancelled for any reason, you will be notified via our D2L page and will be told there how to prepare for the next class period. For these reasons, students are advised to take advantage of the Motlow Rave system in order to receive text messages when class is canceled. For more information, see https://www.getrave.com/login/mscc.

Emergency Procedures Policy:
In case of a medical emergency we will immediately dial 9-911 and report the nature of the medical emergency to emergency response personnel. We will try to stay with the person(s) in need and maintain a calm atmosphere. We will talk to the person as much as possible until response personnel arrive on campus, and we will have someone go outside to meet emergency personnel and direct them to the appropriate location. In the event of an emergency (drill or actual), a signal will be sent. Based on that signal, students will follow the procedures below for that specific type of emergency:

Loud warbling sound throughout Building (FIRE)
Collect purses and coats and proceed immediately out of your room and exit through the closest emergency exit. Proceed to the Designated Assembly Area closing windows and doors as you exit. Remain there until the "All Clear" Signal.
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is given by an Emergency Management Team member. (Instructors- Provide your Designated Assembly Area, and its location to students)

**Tornado Siren (SEVERE WEATHER):**
Proceed to the closest designated severe weather shelter on the 1st floor and proceed all the way into the shelter. Crouch down on the floor with your head between your knees facing away from the outside walls. Remain there until the "All Clear" Signal is given. (Instructors- Provide the recommended room number or hallway location to students)

**Air Horn (1 Long Blast) and Face to Face All Clear (INTRUDER/HOSTAGE):**
Ensure door is closed, locked and lights turned off. If your door will not lock, move some tables and chairs in front of the door quickly. Move immediately to the rear of the room away from the door and sit on the floor- out of sight if possible. Remain calm and quiet and do not respond to any inquiries at the door unless you have been given the "All Clear" and a member of law enforcement or your campus Emergency Management Team member makes face-to-face contact at your door.

**Classroom Locked-door Policy:**
In order to adhere to MSCC Emergency Preparedness Policy and to facilitate effective classroom management, the classroom door will remain closed and locked for the duration of the class period.

**Educational Technology:**

**Accessing Campus Computers or the MSCC Library from off Campus:**
Your Username format is your First Initial, Last Name and Month and Day Birthday in the Format of MMDD. Example: Marcia Smith born on April 11, 1992 - Username: msmith0411. Your Pin will be the numeric pin you created when you initially applied to Motlow College.

**Using D2L:**
For help with D2L including how to submit materials to a Dropbox, see this page: [http://www.mscc.edu/techtube.aspx](http://www.mscc.edu/techtube.aspx)

**Technical Support/Assistance:**
Students having problems logging into a course, timing out of a course, using course web site tools, or any other technical problems, should contact the MSCC Technology Help Desk at 931-393-1510 or toll free 1-800-654-4877, Ext. #1510 (or d2lhelp@mscc.edu)
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**Disability Services/Accommodations:**
Motlow College is committed to meeting the needs of qualified students with disabilities by providing equal access to educational opportunities, programs, and activities in the most integrated setting appropriate. This commitment is consistent with the College’s obligations under Section 504 of the Rehabilitation Act of 1973 and the American with Disabilities Act of 1990 (ADA). Together, these laws prohibit discrimination against qualified persons with disabilities. To this end, the Director of Disability Services for Motlow College coordinates services and serves as an advocate and liaison for students with disabilities attending Motlow College. Contact the Director of Disability Services here: [http://www.mscc.edu/disability/index.aspx](http://www.mscc.edu/disability/index.aspx).

Students with disabilities who would need assistance in an emergency evacuation should self-disclose that need to the instructor no later than the second day of class or second group meeting.

**Confidentiality of Student Records:**
The education records of current and former students at Motlow State Community College are maintained as confidential records pursuant to The Family Educational Rights and Privacy Act (FERPA) of 1974 as amended. For further information, see MSCC Policy No. 3:02:03:00.

**Student Success:**

**Tutoring:**
MSCC Instructors can guide students to specific resources regarding Tutoring in their discipline. In particular, students may find help with Math and Essay Writing via each campus’ Learning Support labs. Students should contact the labs on their campus to schedule appointments for help. For additional help, see the Student Success page: [http://www.mscc.edu/student_success/index.aspx](http://www.mscc.edu/student_success/index.aspx).

**Academic Advisement:**
MSCC Instructors can guide students to specific resources regarding Advisement. For additional help, see the Academic Advisement page: [http://www.mscc.edu/advisement/index.aspx](http://www.mscc.edu/advisement/index.aspx).

**Tentative Class Schedule:**

<table>
<thead>
<tr>
<th>LECTURE TOPICS</th>
<th>READING IN TEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquids, Solids, and Phase Changes</td>
<td>Chapter 10</td>
</tr>
<tr>
<td>Solutions and Their Properties</td>
<td>Chapter 11</td>
</tr>
</tbody>
</table>

**EXAM I**
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- Chemical Kinetics Chapter 12
- Chemical Equilibrium Chapter 13

EXAM II

- Aqueous Equilibria: Acids and Bases Chapter 14
- Applications of Aqueous Equilibria Chapter 15

EXAM III

- Thermodynamics: Entropy, Free Energy, and Equilibrium Chapter 16
- Electrochemistry Chapter 17
- Organic Chemistry Chapter 22

EXAM IV

Miscellany: Please check your FALL 2014 Schedule of Classes for information about dates for refunds, withdrawals, and other deadlines that may pertain.

ALWAYS SEE AN ADVISOR BEFORE REGISTERING FOR CLASSES. Any member of the faculty can and will act as your advisor.

*Please talk to me if you are experiencing difficulty or need help.