INSTRUCTOR: Dr. Will Wickun; 657-2027 or wwickun@msubillings.edu

OFFICE HOURS: SCI 215: MWF 0930 - 1130, any time my door is open, or (BEST!) by appointment


COURSE DESCRIPTION: Continuation of first year course for science majors/minors, pre-engineering, and allied health students. (Not intended for pre-nursing!) The course introduces the fundamental concepts of chemistry, including molecular geometry, atomic orbital hybridization, intermolecular forces, solutions, kinetics and equilibria, acid-base chemistry, and electrochemistry. Corequisite: Chem 119.

Course Outline:

**Date**  | **Section(s)**  | **Topic**  | **Homework Set**
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19 Jan  | 9.4 – 9.6 | Lewis structures, formal charge, resonance | #1: 21,23,29,31,33
21 | 9.7 – 9.8 | Exceptions to octet rule, bond energies | #2: 35-38,41,43,47,49
24 | 10.1 – 10.2 | Molecular geometry, dipole moments | #3: 7,9,11,17,19,21
26 | 10.3 – 10.4 | Valence bond theory, hybridization | #4: 31,33,35
28 | 10.4 | Hybridization involving multiple bond | #5: 37,39,41
31 Jan | 12.1 – 12.2 | Kinetic theory, intermolecular forces | #6: 7,9,11,13,15,17,19

**EXAMINATION #1**

02 Feb | --- | | 
04 Feb | 12.3 – 12.5 | Liquid state, crystals, bonding in solids | #7: 25,28,29,36-38,43
07 | 12.6 – 12.7 | Phase changes, phase diagrams | #8: 55,56,58,72,78,80,84,86
09 | 13.1 – 13.3 | Types of solutions, process, concentration | #9: 2,4,5,6,9,11,13,15,19,21
11 | 13.4 – 13.5 | Effect of temperature and pressure | #10: 23,24,29,30,35
14 | 13.6 | Colligative properties | #11: 49,63,68,69,71,73,75,79
16 | --- | | Catch-up day

**EXAMINATION #2**

18 Feb | --- | | 
21 Feb | President’s Day – No classes | | 
23 | 14.1 - 14.2 | Rate of a reaction, the rate laws | #12: 1,3,6-11,13,14,17,19
25 | 14.3 | Relation between concentration and time | #13: 21,22,23,25
28 | 14.4 | Activation energy, temperature dependence | #14: 27-31,35,37
02 Mar | 14.5 - 14.6 | Mechanisms, catalysis | #15: 39-46,49-54,56
04 | 15.1 - 15.2 | Equilibrium, equilibrium constant | #16: 1,5,6,7,9
05 – 13 Mar | Spring Break!! | | 
14 | 15.3 | What does the equilibrium constant tell us? | #17: 11,15,31,33,35
16 | 15.4 | Factors affecting chemical equilibrium | #18: 37,39,40,41,47,49
18 Mar | --- | | Catch-up day

**EXAMINATION #3**

21 Mar | --- | | 
23 | 16.1 – 16.3 | Bronsted theory, properties of water, pH | #19: 1,3,5,7,10,12-14,15,19,23
**Easter Break!!**

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<thead>
<tr>
<th>Date</th>
<th>Section(s)</th>
<th>Topic</th>
<th>Homework Set</th>
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<tbody>
<tr>
<td>28</td>
<td>16.4 – 16.5</td>
<td>Strength of acids/bases, weak acids</td>
<td>#20: 25, 26, 37, 41, 45</td>
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<td>30</td>
<td>16.6 – 16.7</td>
<td>Weak bases, conjugate acids &amp; bases</td>
<td>#21: 54, 55, 57</td>
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<td>01 Apr</td>
<td>16.8 – 16.10</td>
<td>Salts, Lewis theory</td>
<td>#22: 59, 62, 65, 67, 71, 73</td>
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<td>04</td>
<td>17.1 – 17.2</td>
<td>Buffer solutions</td>
<td>#23: 1-3, 5, 9, 16</td>
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<td>06</td>
<td>17.3 – 17.4</td>
<td>Acid-base titrations, acid-base indicators</td>
<td>#24: 17, 21, 22, 24, 25</td>
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<td>08</td>
<td>17.5 – 17.6</td>
<td>Solubility equilibria, common ion effect</td>
<td>#25: 27, 29, 31, 33, 39, 43, 45, 47</td>
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<td>11</td>
<td>---</td>
<td>Catch-up day</td>
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<td>13</td>
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<td><strong>EXAMINATION #4</strong></td>
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<td>15</td>
<td>18.1 – 18.2</td>
<td>The three laws, spontaneous processes</td>
<td>#27: 1-5</td>
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<td>18</td>
<td>18.3</td>
<td>The second law</td>
<td>#28: 7-10, 11, 13</td>
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<td>20</td>
<td>18.4</td>
<td>Gibbs free energy</td>
<td>#29: 15, 16, 17, 19</td>
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<td>22</td>
<td>18.5 – 18.6</td>
<td>Gibbs energy and chemical equilibrium</td>
<td>#30: 23, 25, 27, 29, 31</td>
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<td>25</td>
<td>19.1 – 19.3</td>
<td>Redox reactions, cells, std potentials</td>
<td>#31: 1, 3-6, 10, 13, 15</td>
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<tr>
<td>27</td>
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<td>Review for final</td>
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<td>29 Apr</td>
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<td><strong>University Day – No classes</strong></td>
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**DISCLAIMER:** This syllabus *may* be changed without advanced notice, however, if it is, I will notify you immediately.

**HOUR EXAMS:** For your planning purposes (and mine), the four exams will be administered on the dates specified above.

**MAKE-UP EXAMS:** An unauthorized absence from an exam will result in a grade of zero unless you have a signed excuse from an MD, a law enforcement agent, or your next-of-kin. Get the point? There are valid reasons to miss an exam, but not many. In the event of an excused absence for a valid reason (e.g. athletic team travel, serious illness, death in the family, etc.), it is your responsibility to inform me BEFORE the exam and make up the work prior to the absence if at all possible. Be aware that make-up exams are always much more rigorous than the original exam!

**QUIZZES:** A number of short (10 minute) quizzes will be administered during the semester. They will cover recently assigned reading, or alternatively, you may be asked to submit a single problem from the assigned homework. The quizzes are intended to keep you abreast of the course work. Your two lowest quiz grades will be dropped - therefore there are no make-up quizzes or extra-credit assignments in this course.

**HOMEWORK:** The homework sets will be collected at the beginning (0810) of class daily and graded. **PLEASE NOTE:** *Homework papers that are ripped out of spiral notebooks, mutilated, not stapled (when necessary), or illegible will not be accepted or graded!* If you don’t care enough to submit a neat paper, we won’t care to grade it. Your homework average, normalized to 100 points, will replace your lowest exam grade. Failure to complete these problems, however, will certainly lead to poor performance on exams and quizzes.

**OPTIONAL FINAL EXAM:** Scheduled for 1200 – 1350 Monday 2 May 05
EXTRA CREDIT WORK: The four hour exams, the quizzes, and the final exam provide necessary and sufficient opportunities for successful completion of this course. (i.e., there is no “extra credit” work.)

GRADING:

<table>
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<th>Component</th>
<th>Points</th>
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<tr>
<td>4 Hour Exams</td>
<td>400</td>
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<tr>
<td>Homework (replaces lowest exam score)</td>
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<tr>
<td>Pop Quizzes (lowest 2 dropped)</td>
<td>50</td>
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<tr>
<td>Optional Final Exam (replaces next lowest exam score)</td>
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Final grades will be determined on the basis of a total of 450 points and MAY be adjusted at my prerogative.

TENTATIVE SCALE:

- 450 - 405 A
- 404 - 360 B
- 359 - 315 C
- 314 - 270 D
- 269 - 0 F

OUTCOMES ASSESSMENT: The course is lecture-based, therefore, Outcomes Assessment will be determined entirely upon the hour exams, quizzes, and final exam grade.

POLICY ON ACADEMIC HONESTY: It is your responsibility to familiarize yourself with the Student Affairs Handbook. In particular, you should understand Part X, B.1 (Academic Misconduct). All students are expected to adhere to the highest standards of academic honesty and refrain from any action that is dishonorable or unethical. In all examinations, quizzes, and lab reports, students are expected to submit their own work entirely. Cheating or alleged cheating on an exam or quiz in this class will result in a grade of zero (failure) for the exam or quiz involved.

SUGGESTIONS FOR STUDYING AND LEARNING CHEMISTRY

1. Keep up with your study day to day. If you fall behind, it’s very difficult, if not impossible, to catch up. PERSEVERENCE is the key to success!

2. Skim topics **before** they are covered in each lecture. Sure, it may seem like a pain, but you want to learn the material, don’t you?

3. Take good lecture notes. Using lecture notes in conjunction with the text will be the best way to determine which material to study.

4. After lecture, carefully read the topics covered in class. As a self-test, if you can’t verbally describe a concept to your classmate, **you simply don’t know it**.

5. Attempt all assigned homework problems. You will not fully learn by only watching me work a problem in class. As with learning to ride a bicycle or a horse, you have to get in the saddle and maybe even fall off a few times.
6. Spending more than 15-20 minutes on a single homework problem is rarely effective unless the problem is particularly challenging. What to do? Get the most “bang” for your tuition “buck” - seek assistance from me, your primary resource! 😊