CHEMISTRY 114 **GENERAL CHEMISTRY** Dr. A. H. Martin

SPRING, 2012 Office: HOSCI. 224
Office Hours M W F 9:00 - 10:00 AM Office phone 861-1433
(or by appointment) Home phone: 610-837-7294
email: martin@moravian.edu (not after 9 PM please)

LECTURE TEXT

T. L. Brown, H. E. LeMay, B. E. Bursten, C. J. Murphy and P. M. Woodward, *Chemistry: The Central Science, 12th Ed.*, Pearson Education, Inc., Upper Saddle River, NJ, 2012.

RECOMMENDED SUPPORT TEXT (Optional)

R. Wilson, *Solutions to Exercises in Chemistry the Central Science, 12th Ed.*, Pearson Education, Inc., Upper Saddle River, NJ, 2012. (This book contains the solutions to all of the end of the chapter problems in the lecture text.)

Blackboard Site:
Chem114.S12 General Chemistry
Code: Martin

COURSE DESCRIPTION

The material covered in this course will be an extension of that covered in Chem 113 (Fall 2011), i.e. Chapters 1 – 11 of the lecture text. A general understanding of the material from the first semester will be assumed. This course is organized in such a fashion that the text and classes should supplement each other. Students are also encouraged to consult other General Chemistry texts in the library or the Chemistry Periodical Room (HOSCI - 221). **The instructor is usually available most of the time during the day, when he is not in class, for private or group help sessions.**

COURSE OBJECTIVES

Upon completion of this course a student should be able to do, but not limited to, the following:

- Be able to convert between different concentration units
- Understand and be able to explain the solution process and the energies of the steps involved
- Understand colligative properties of solutions and be able to use them to solve problems
- Determine the rate law of a chemical reaction from experimental data.
- Propose a mechanism for a reaction from a given rate law and determine the rate law for a reaction from a proposed reaction mechanism.
- Explain the nature of the equilibrium process
- Write the equilibrium constant expression for a given equation
- Determine the equilibrium constant or equilibrium concentrations from given information
- Understand and be able to apply LaChatelier's Principle

- Understand the Bronsted-Lowery and Lewis Acid-Base Theories
- Understand pH
- Be able to do calculations involving weak acids or weak bases
- Understand salt hydrolysis and be able to determine the pH of salt solutions
- Understand Bronsted-Lowery acid strength on the basis of molecular structure
- Explain how buffers work and be able to calculate the pH of buffer solutions
- Be able to calculate the pH along a titration curve
- Understand solubility equilibria including the things which effect these equilibria and basic calculations
- Understand and be able to explain basic thermodynamics
- Understand and be able to explain entropy and free energy
- Understand and be able to use the relationship between free energy and equilibria
- Balance oxidation-reduction reactions equations using the half-life method
- Understand the operation and calculations of voltaic cells
- Understand the operation and calculations of electrochemical cells
- Understand the basic modes of nuclear decay
- Be able write nuclear equations
- Understand the patterns of nuclear stability and nuclear decay
- Explain nuclear fission, nuclear fusion, and the operation of nuclear reactors

ATTENDANCE

A student is required to attend all regular class and laboratory meetings. If a class is missed, it is the responsibility of the student to obtain the given material on his own time. If an hourly exam is missed, for a **VALID REASON ACCOMPANIED BY A WRITTEN EXCUSE ONLY**, the student should arrange a make–up time with the instructor as soon as possible after the exam. If this is not done within a reasonable period of time a grade of zero will be assigned for the exam. If a laboratory is missed, arrangements should be made to make up the laboratory with in one week of the student's return to classes. Arrangements for laboratory make-up should be made with the laboratory coordinator Dr. David Langhus (HOSCI 225, Ext. 1434, email langhus@cs.moravian.edu) within one week of the students return to school.

COURSE GRADE

Hour Exams (4) 40%
Laboratory 20%
Problem Session .....…....15%
Homework 5%
Final Examination .....…...20%

Your minimum letter grade will be determined as follows, when the % represents your final average calculated as described above.

A	93% and up	C	73 to 76%
A–	90 to 92%	C–	70 to 72%
B+	87 to 89%	D+	67 to 69%
B	83 to 86%	D	63 to 66%

B–	80 to 82%	D–	60 to 62%
C+	77 to 79%	F	Below 60%

LECTURE–DISCUSSION CLASSES

The lecture–discussion periods, M W F 7:50 to 8:40 AM, are the time during which new material in the course will be introduced and discussed. Attendance at all these classes is required as absence generally results in a poorer than expected showing on the work in the course. Hence, **ATTENDANCE WILL BE TAKEN AT ALL CLASSES**. Students who consistently miss class are subject to possible lowering of their grade from the scale above.

GRADED HOMEWORK

At the end of many lectures, periods the instructor will give a brief assignment based on that day's lecture. These assignments will be due at the next lecture period. These assignments will be collected on occasion and the grade from these assignments will constitute the homework portion of the grade. **NOTE: TO GET CREDIT FOR A COLLECTED HOMEWORK ASSIGNMENT THE STUDENT MUST BE PRESENT AT THE LECTURE DURING WHICH THE ASSIGNMENT WAS COLLECTED. NO LATE ASSIGNMENTS WILL BE ACCEPTED. ALL ASSIGNMENTS NOT TURNED IN WILL BE ASSIGNED A GRADE OF ZERO, UNLESS A WRITTEN EXCUSE FOR ABSENCE FROM THE LECTURE IS PROVIDED**. The solutions to these problems will be posted on the course Blackboard site.

NON-GRADED HOMEWORK

There are two types of non-graded homework in this course. The first type is the end of the chapter problems listed for each class in the tentative lecture schedule section of this syllabus. You should work these problems in order to get a better understanding of the material covered in this course. The answers to these problems are found in the solutions manual listed above. The second type is supplementary problem sheets handed out by the instructor. The answers to these problems sheets will be posted on the course Blackboard site. These problems provide additional reinforcement of the material covered in this course. It is advisable to attempt to work the problems yourself before looking at the solution. Simply trying to memorize how the problem is solved generally does not lead to a good understanding of the material and thus lower test scores.

PROBLEM SESSIONS

The problem session portion of the grade will be based on a 15-20 minute quiz given at the end of each problem session period, except those on weeks directly preceding an hourly examination. The material to be covered by the quiz will be announced in lecture prior to the quiz. **NO MAKE UP QUIZZES WILL BE GIVEN** and any unexcused missed quizzes will be assigned the grade of zero. At the end of the semester, the score on the lowest quiz will be dropped before the problem session average is computed. The solutions to these quizzes will be posted on the course Blackboard site shortly after the quizzes are given.

The initial part of the problem session period will be used to answer any questions that have arisen regarding either the lecture material or the assigned problems. In addition, review exercises on the assigned material will be conducted.

HELP SESSIONS

The instructor will be available for group help sessions at **4:15 PM** on **Wednesday** in room **HOSCI - 207** These help sessions will be used to review and drill on student raised questions with the exact format depending on the number of students present. Attendance at these help sessions is optional. **ADDITIONAL HELP SESSIONS** either private or group can be arranged at any time by consulting the instructor.

EXAMINATIONS

There will be four (4) one–hour examinations given during the lecture period of the course on the following **FRIDAYS**: **Feb. 10**, **Feb. 24**, **Mar. 23**, and **Apr. 20**. You should mark these dates on your calendar to aid in avoiding conflicts with examinations in other courses. The specific material to be covered on each exam will be announced by the instructor prior to the exam. The answer key to the previous two year's hourly examinations will be posted on the course Blackboard site for further study. While these examinations will give you some indication of the type and nature of the questions asked, you need to study all of the material covered on the examination to get the best possible grade on the examination.

FINAL EXAMINATION

A comprehensive final examination will be given on **Friday, May 4 at 8:30 AM** in the **HOSCI 204 (DANA)**.

ACADEMIC HONESTY

Collaboration between students is viewed by the instructor as a valid means of reviewing the material. However, since collected assignments are to evaluate the student's mastery of the material, there should be **NO EVIDENCE OF COLLABORATION ON LABORATORY REPORTS, HOMEWORK ASSIGNMENTS, QUIZZES, AND EXAMINATIONS**. If collaboration on a graded assignment is observed it will be viewed as a breach of academic honesty and will be penalized accordingly. For the first offense the grade of zero will be assigned to ALL parties involved for the assignment and reported to the Dean of the College as required by the Academic Honesty Policy of the College.

Students who wish to request accommodations in this class for a disability should contact the Assistant Director of Learning Services for Disability Support, 1307 Main St, (Ext. 1510). These accommodations cannot be provided until authorization is received from the Learning Services Office.

TENTATIVE LECTURE SCHEDULE

Day	Date	Topic	Text Ref.	Assigned Problems
Mon.	Jan. 16	Introduction, Solution Process,	13.1	13.2, 13.3, 13.14, 13,15, 13.16
Wed.	Jan. 18	Solubility	13.2 - 13.3	13.5, 13.7, 13.27, 13.28, 13.29, 13.30, 13.31, 13.33, 13.34, 13.91
Thur.	Jan. 19	Solution Concentration Units (in PS)	13.4	13.41, 13.42, 13.43, 13.44, 13.45, 13.46
Fri.	Jan. 20	Solution Concentration Units	13.4	13.47, 13.48, 13.51, 13.55, 13.56, 13.58, 13.98
Mon.	Jan. 23	Colligative Properties	13.5	13.10, 13.63, 13.65, 13.69, 13.70. 13.71, 13.72, 13.73, 13.74, 13.76, 13.77, 13.79, 13.80, 13.81, 13.82, 13.104, 13.112
Wed.	Jan. 25	Reaction Rates	14.1- 14.2	14.1, 14.2, 14.23, 14.24
Fri.	Jan. 27	Concentration Effects, Integrated Rate Laws	14.3- 14.4	14.3, 14.5, 14.6, 14.27, 14.28, 14.29, 14.30, 14.33, 14.34, 14.35, 14.36, 14.39, 14.40, 14.41, 14.98, 14.100, 14.102, 14.104
Mon.	Jan. 30	Temperature Effects, Rxn. Mechanisms	14.5 - 14.6	14.9, 14.12, 14.15, 14.53, 14.57, 14.58, 14.61, 14.62, 14.70, 14.71, 14.72, 14.73, 14.74, 14.77, 14.78, 14.79, 14.80, 14.112
Wed.	Feb. 1	Catalysts, Chemical Equilibrium	14.7, 15.1	14.11, 14.81, 14.85, 14.86, 14.113
Fri.	Feb. 3	Equilibrium Constants, Equilibrium Calculations	15.2 - 15.6	15.2, 15.3, 15.4, 15.7, 15.8, 15.9, 15.14, 15.15, 15.16, 15.17, 15.18, 15.23, 15.32, 15.33, 15.34, 15.37, 15.38, 15.70, 15.75, 15.76, 15.81, 15.82, 15.83, 15.84
Mon.	Feb. 6	Equilibrium Calculations, LaChatelier's Principle	15.6 – 15.7	15.10, 15.11, 15.43, 15.45, 15.46, 15.49, 15.50, 15.51, 15.52, 15.57, 15.61, 15.62, 15.63, 15.64, 15.67, 15.86,
Wed.	Feb. 8	Acids- bases, Conj. Acid-Base Pairs, Acid Strength	16.1 - 16.2	16.2, 16.15, 16.16, 16.17, 16.18, 16.19, 16.20, 16.25, 16.26, 16.101
Fri.	Feb. 10	**Exam 1**	----------	
Mon.	Feb. 13	pH, Strong Acids, Strong Bases, Weak Acids	16.3 - 16.5	16.4, 16.28, 16.29, 16.30. 16.35, 16.36, 16.37, 16.38, 16.41, 16.42, 16.43, 16.44, 16.45, 16.47,16.48, 16.107
Wed.	Feb. 15	Weak Acids, Weak Bases	16.6 - 16.7	16.49, 16.50, 16.51, 16.52, 16.53, 16.54, 16.55, 16.56, 16.59, 16.60, 16.61, 16.62, 16.63, 16.69, 16.70, 16.71, 16.72, 16.73, 16.74, 16.75, 16.76, 16.110
Fri.	Feb. 17	Polyprotic Acids-Bases, pK_a & pK_b,	16.8	16.67, 16.78, 16.79, 16.80
Mon.	Feb. 20	Salt Hydrolysis	16.9	16.8, 16.81, 18.82, 16.83, 16.84, 16.111
Wed.	Feb. 22	Acid Base Strength vs Structure, Lewis A-B Theory	16.10-16.11	16.9, 16.10, 16.87, 16.88, 16.89, 16.90, 16.91, 16.92, 16.97, 16.98, 16.99, 16.100, 16.114
Fri.	Feb. 24	**Exam 2**	----------	
Mon.	Feb. 27	Common Ion Effect	17.1	17.1, 17.14, 17.15, 17.16
Wed.	Feb, 29	Buffers	17.2	17.3, 17.20, 17.21, 17.22, 17.23, 17.24, 17.25, 17.26, 17.82
Fri.	Mar. 2	Buffers	17.2	17.27, 17.28, 17.29, 17.31, 17.32, 17.83, 17.86
		Spring Break		

Day	Date	Topic	Text Ref.	
Mon.	Mar. 12	Titration Curves	17.3	17.7, 17.33, 17.34, 17.37, 17.38, 17.41, 17.42, 17.43, 17.44, 17.45, 17.46, 17.47, 17.48, 17.88, 17.89, 17.91
Wed.	Mar. 14	Ksp, Common Ion Effect	17.4	17.49, 17.50, 17.51, 17.55, 17.56, 17.57, 17.58, 17.96, 17.98, 17.100
Fri.	Mar. 16	Precipitation Criteria	17.5	17.59, 17.60
Mon.	Mar. 19	Dissolving Precipitates, Qual. Analysis	17.5 – 17.6	17.8, 17.11, 17.61, 17.62, 17.67, 17.68, 17.69, 17.70, 17.71, 17.73
Wed	Mar. 21	Reaction Spontaneity, Entropy	19.1 - 19.4	19.4, 19.6, 19.11, 19.12, 19.29, 19.35, 19.38, 19.37, 19.38, 19.41, 19.42, 19.43, 19.44, 19.47, 19.48, 19.50, 19.53, 19.54, 19.87, 19.88, 19.89
Fri.	Mar. 23	**Exam 3**	----------	
Mon.	Mar. 26	Free Energy	19.5	19.57, 19.58, 19.59, 19.60, 19.61, 19.62, 19.63, 19.64, 19.97, 19.98,
Wed.	Mar. 28	Temperature Effects, Equilibrium	19.6 - 19.7	19.7, 19.8, 19.65, 19.66,19.71, 19.72, 19.81, 19.82
Fri.	Mar. 30	Redox Rxns, Balancing Redox Rxns	20.1 – 20.2	20.13, 20.14, 20.19, 20.20, 20.21, 20.22
Mon.	Apr. 2	More Balancing Redox Equations,	20.1 – 20.2	20.23, 20.24, 20.97, 20.98, **20.99**
Wed.	Apr. 4	Voltaic Cells	20.3	20.3, 20.27, 20.28
Fri.	Apr. 6	**No Class – Easter Break**		
Mon.	Apr. 9	**No Class – Easter Break**		
Wed.	Apr. 11	Cell Potentials, Cell Spontaneity	20.4 - 20.5	20.4, 20.5, 20.6, 20.7, 20.8, 20.30, 20.35, 20.36, 20.37, 20.38, 20.39, 20.40, 20.41, 20.42, 20.43. 20.44, 20.45, 20.46, 20.49, 20.50, 20.51, 20.53, 20.54, 20.55, 20.56, 20.58, 20.100
Fri.	Apr. 13	Nernst Equation, Batteries	20.6 - 20.7	20.10, 20.61, 20.62, 20.63, 20.64, 20.65, 20.66, 20.67, 20.68, 20.71, 20.73, 20.74, 20.102,
Mon.	Apr. 16	Electrolysis	20.9	20.11, 20.91, 20.92
Wed.	Apr. 18	Nuclear Radioactivity	21.1	21.9, 21.10, 21.11, 21.12, 21.13, 21.14
Fri.	Apr. 20	**Exam 4**	----------	
Mon.	Apr. 23	Nuclear Stability, Rate of Decay	21.2 - 21.5	21.1, 21.2, 21.4, 21.17. 21.18, 21.19, 21.20, 21.24, 21.27, 21.28. 21.29, 21.30, 21.35, 21.73
Wed.	Apr. 25	Nuclear Energy	21.6 - 21.8	21.6, 21.55, 21.56, 21.57, 21.58, 21.59, 21.60
Fri.	Apr. 27	Biological Effects of Radiation	21.9	21.66

DATES OF IMPORTANCE

Jan. 23	Last Day for Course Changes
Feb. 24	Midsemester
Mar. 5 – 9	Spring Break
Mar. 30	Last Day to Withdraw
Apr. 6 - 9	Easter Break