

Chemistry 116: Fundamentals of Chemistry II Fall 2009

Lec. 001, CRN# 80176; Lab 002, CRN# 80177
Lec. 003, CRN# 80178; Lab 004, CRN# 80179

Instructor: Dr. Michelle Richards-Babb
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Office Hours: T, Th (10:00-11:00 AM)
Other times by appointment. Please ask or email.
Chemistry Learning Center (CLC) Help? M,T,W (7-10 PM) in 157 CRL

Lecture: Section 001 (T, Th – 1:00-2:15 PM) Clark Hall Room 101
Section 003 (T, Th - 8:30-9:45 AM) Clark Hall Room 101

Laboratory: Sec. 002 (W - 12:30-3:20 PM)
Sec. 004 (W - 8:30-11:20 AM) Lab rooms to be assigned.
Review Wednesday Aug. 26 (room TBA). Lab begins Wednesday Sept. 2.

Course Pre-requisite: Passing grade in Fundamentals of Chemistry I (Chemistry 115). For chemistry majors, a grade of C or better in Chemistry 115 is required.

Course Objectives: Chemistry 116 is the second semester of a two semester course of study in the fundamental principles of chemistry. The course is appropriate for students who: 1) want a basic knowledge of one of the physical sciences, 2) need to satisfy GEC objective #2B (including the lab requirement), 3) need 116 to satisfy a requirement and/or prerequisite in their major, or 4) intend to enroll in a professional school or program that requires additional study in chemistry (e.g. medicine, pharmacy, etc.).

The objectives of this course are to present the fundamental principles of chemistry upon which subsequent course work is built. Basic topics include, but are not limited to, properties of solutions, kinetics, chemical equilibrium, acid-base and salt equilibria, coordination compounds, thermodynamics, electrochemistry, and nuclear chemistry. Laboratory experiments are designed to support the lecture topics.

Expected Learning Outcomes: Upon successful completion of this course, students should:

- know and correctly use the language of chemistry (nomenclature, terminology, and symbolic representations);
- understand and be able to apply chemical facts, concepts, and models, and be able to use them as a foundation to organize further chemical knowledge and to understand the physical world;
- be able to visualize the structure of matter and its reactions at the atomic and molecular (microscopic) level and comprehend how these lead to the properties and behavior of bulk matter;
- master qualitative and quantitative problem solving skills;
- be able to use their knowledge to analyze and construct solutions for new and unfamiliar problems.
- be able to solve quantitative problems using basic mathematical skills;
- understand the nature and application of natural or physical sciences at a basic level sufficient to:
 - conduct simple experiments
 - generate and analyze real data
 - present data for analysis (e.g. using charts, graphs, tables)
 - perform mathematical calculations appropriate for data analysis

- use abstract reasoning to interpret data
- formulate and test hypotheses with scientific rigor
- understand the complexities of scientific issues sufficient to think critically about the mutual impacts of science, society, natural resources, and the environment.

General Education Curriculum: Through its focus on the study of basic topics in chemistry and the laboratory requirement of conducting simple experiments, this course satisfies the GEC requirements for Scientific Inquiry (objective 2B): *Use quantitative and scientific knowledge effectively.*

Textbook: “Chemistry”, by McMurry and Fay, 5th Ed. and Mastering General Chemistry access code. Required of all students. The textbook package sold at the WVU Book Store or Book Exchange is the most economical way of purchasing both code and text.

Problem Book: “Chemical Problem Solving Using Dimensional Analysis”, by R. Nakon. Recommended by some instructors.

Laboratory Text: “Laboratory Experiments for General Chemistry 116”, by WVU Staff, 4th Ed. Required of all students. Because of the use of fill-in blanks and graphs in the book, each student MUST have a new copy.

Calculators: Only **non-programmable calculators** may be used during quizzes and exams. Scientific calculators (\$8-\$12) that perform all the needed mathematical calculations (including logarithms) are available at the WVU Book Store as well as at various commercial establishments. Programmable calculators will be confiscated at the examination site or the student will not be allowed to take the exam. *Prohibited at exam/quiz sites: Any type of communication or electronic device (cell phones, text messaging devices, ipods, headphones, iflip videos, etc.)*

Seating: Attendance will be checked each lecture. Students may be assigned a particular seat in lecture to simplify the attendance taking process or a WVU ID scanner or clicker system will be used for attendance purposes. More details on the seating policy will be provided by your instructor.

Attendance Policy: Attendance will be used in determining each student’s final grade as shown below. There are no “excused absences”, although minor adjustments may be made for personal emergencies. **Good attendance (2 or fewer absences) will be rewarded by addition of 1% to the final numerical average.**

<u>Attendance</u>	<u>Penalty</u>
1-4	None
5-9	Final letter grade dropped by one.
10-14	Final letter grade dropped by two.
15-19	Final letter grade dropped by three.
> 19	Final letter grade dropped by four.

Graded Online Homework: There will be graded online homeworks (up to three assignments per chapter and a minimum of one per week). It is your responsibility to complete the homeworks by the given deadlines. The online homework and registration can be found at the following website address:

<http://www.masteringgenchem.com>

*Before you can access this homework, you must **register** and then **enroll** in your Mastering course to be included in the instructor’s gradebook. To register, you will need the Mastering General Chemistry access code. You should have obtained this code when you purchased your textbook package. Helpful student resources and Frequently Asked Questions can be found at <http://www.masteringhelp.com>. The attached sheet provides more information about the*

registration process. Be sure to enroll for the correct section using the proper Course ID: **WVUChem116001F09** (1 PM lecture) or **WVUChem116003F09** (8:30 AM lecture).

Exams: Exams will be given outside of lecture and during the first hour of a scheduled laboratory period. The schedule for exams is as follows:

Sept. 16	Exam #1
Oct. 7	Exam #2
Oct. 28	Exam #3
Nov. 18	Exam #4
Dec. 9	Lab Final Exam (in lab)
Tuesday Dec. 15	Final Exam (7-9 PM)

Cell phones are not permitted during exams/quizzes. Covers should be removed from non-programmable calculators before entering the exam/quiz site.

Final Exam: A comprehensive final exam on the material covered in Chemistry 116 is scheduled for **Tuesday, Dec. 15 from 7:00 PM-9:00 PM.**

ANY STUDENT SCORING 40% OR BELOW ON THE FINAL EXAMINATION WILL EARN A GRADE OF "F", REGARDLESS OF HIS/HER OTHER AVERAGES. SIMILARLY, OTHER VERY LOW SCORES COULD RESULT IN A REDUCTION OF ONE LETTER GRADE.

This final exam will be comprehensive and cumulative covering the entire course. Due attention will be given to the cumulative nature of the learning process with emphasis being placed on major topics and concepts. Your study during the semester should be designed for comprehensive and long-term retention of the factual material, principles, and use of these. "Cramming" for individual exams largely defeats the purpose of a college education.

Laboratory Final Exam: A comprehensive laboratory final examination will also be given during the last laboratory period (week of Dec. 7-11). Additional details will be provided at a later date.

Criteria for Evaluating and Grading Work: Hourly exams (20 questions) and final exam (50 questions) are multiple choice and questions will be marked as correct or incorrect. Weekly online homework is instantaneously graded and students receive immediate feedback and scores. Exam and online homework scores will be given as percentage correct out of total. Laboratory unknowns will be compared to known values. For quantitative unknowns, the closer the student's numerical answer to the known value, the higher the unknown score.

Make-Ups: Make-up exams and labs will only be given for students with *legitimate* absences (university business, serious illness, medical/family emergencies, etc.). A documented excuse is especially useful in the case of exam/laboratory makeups. The instructor should be informed of the absence as soon as possible. Prior knowledge especially in the case of absences due to university business is appreciated.

Late Work Policy: Late laboratory homework (pre-lab/post lab questions) will be penalized by a deduction of 10% per day. Each student may request and receive one online homework extension per semester.

Calculation of Final Letter Grade: The object is to give you the best possible grade which can be justified by your achievement in the course. Final grades in the class will be determined from lecture (75%) and laboratory (25%) components together. **Maximum numerical averages for each letter grade are: 0-59%**

F, 60-69% D, 70-79% C, 80-89% B, and 90-100% A.

While individual exams may vary in relative difficulty, experience with our classes in the past has shown that **final numerical averages** in the sixty range will earn a student a grade of “D”, averages in the seventy range will earn a “C”, averages in the eighty range will earn a “B” and averages above ninety will earn a grade of “A”.

In general, the hourly exam average is the best indicator of your performance. In order to determine how you are doing in the class at any given time, calculate your hourly exam average and compare it to the class average. If your hourly exam average is much higher than the class average, you are doing “A” or “B” work. If your average is close to the class average, you are doing “C” work. If your average is well below the class average, you are doing “D” or “F” work.

Final numerical averages will be calculated as shown below:

Hourly Exams (4)	40%	(10% each)
Online Hmwk. Avg.	10%	
Final Exam	25%	
<u>Lab. Avg.</u>	<u>25%</u>	
Final Num. Avg.	100%	

The **Laboratory Average** (worth 25% of final numerical average) is calculated as follows:

Unknown Average	65%	(Lowest unknown grade dropped.)
Lab Final Exam	25%	
Lab Hmwk & TA Eval.	10%	

NOTE: The lowest unknown grade from a completed lab will be dropped. A zero due to an absence from lab will not be dropped. There is only one scheduled make-up laboratory. Any student missing three or more scheduled laboratory periods will fail the course.

Problems and Questions: At the end of each chapter in the text and in the problem book are numerous questions and problems. Specific problems related to the material covered in lecture will be assigned as other homework. Although these problem assignments will not be collected and graded, they should help you understand the various concepts in lecture and thereby **prepare you for the examinations.** Answers to many of these problems can be found in the back of your textbook and problem book.

Academic Integrity: *The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code at <http://www.arc.wvu.edu/rightsa.html>. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the nature. [adopted 2-11-08]*

Social Justice Statement: *West Virginia University is committed to social justice. I concur with that commitment and expect to maintain a positive learning environment based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran’s status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration.*

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Disability Services (293-6700).

Chemistry 116: Fundamentals of Chemistry II
Approximate Lecture Syllabus

Fall 2009

Text: "Chemistry" by McMurry and Fay, 5th Ed.

<u>Day</u>	<u>Date</u>	<u>Chapter</u>	<u>Text Pages</u>	<u>Topics</u>
T	Aug 25	3, 4	84-90; 107-116	Review: Electrolytes, Conc., Net Ionic Eqn
		11	399-409	Solutions and Conc. Units
Th	Aug 27	11	409-431	Factors Affect. Solubility & Colligative Properties
T	Sept 1	11	413-431	Colligative Properties (cont)
Th	Sept 3	12	439-451	Kinetics: Rate Law and Reaction Order
T	Sept 8	12	451-461	Kinetics: Integrated Form of Rate Law
Th	Sept 10	12	461-470	Int. Form of Rate Law (cont) & Mechanisms
T	Sept 15*	12	471-486	Mechanisms (cont) & Arrhenius Eqn.
Th	Sept 17	13	497-509	Chemical Equilibrium, K_c and K_p
T	Sept 22	13	509-516	Reaction Quotient and Eq. Conc. Problems
Th	Sept 24	13	516-533	Le'Chatelier's Principle
T	Sept 29	14	543-549; 576-583	Acids/Bases, Dissociation of Water, and pH Scale
			549-554	
Th	Oct 1	14	555-570	pH & % Ioniz. Strong/Weak Acids/Bases
T	Oct 6*	15	571-576	Hydrolysis of Salts
Th	Oct 8	15	593-600	Common Ion Effect & Buffers.
T	Oct 13	15	601-607	Buffers and Neutralization
Th	Oct 15	15	607-618	Titration and Titration Curves
T	Oct 20	15	607-618	Titration Curves and Indicators
Th	Oct 22	15	618-622	Solubility Product (K_{sp})
T	Oct 27*	15	622-629; 629-635	Factors that Affect Sol. & Pptn, and Ion Product (IP)
Th	Oct 29	15	629-635	Qualitative Analysis and Problems
T	Nov 3	16	647-661	Intro to Thermodynamics: Enthalpy & Entropy
Th	Nov 5	16	662-678	Thermodynamics: Free Energy (G) and Equil.
T	Nov 10	16	687-694	Thermo. (cont) and Intro to Electrochemistry
Th	Nov 12	17	694-701	Cell Potential and Std. Red. Potentials
T	Nov 17*	17	701-708	Nernst Eqn and K_{eq}
Th	Nov 19	17	708-725	Batteries and Electrolysis
T	Dec 1	22	903-911	Intro. To Nuclear Chemistry
Th	Dec 3	22	911-931	Nuclear Chemistry
T	Dec 8	20	827-831; 844-846	Coordination Compounds (if time permits)
			849-855	
Th	Dec 10	-----	-----	REVIEW (for Final Exam)

FINAL EXAMINATION, TUESDAY DECEMBER 15 (7-9 PM)

Chemistry 116 Laboratory Schedule

Fall 2009

If you want to leave lab at a reasonable time each day, read the Experiment before coming to lab. For safety reasons, all students must leave lab at the specified time. This means that you should begin cleaning up 10 minutes before the end of your lab period. If you have not completed the entire experiment, ask your TA or instructor about the best course of action.

Day	Date	Experiment
W	Aug 26	Laboratory lecture (specifics will be discussed in lecture)
W	Sept 2	*Check-In and Worksheets: Appendices A and B (tt for Exp. 1)
W	Sept 9	<u>Exp #1</u> : Identification of Anions
W	Sept 16	* EXAM #1 and <u>Exp #2</u> : Chemical Reaction Rates, (tt for Exp. 7)
W	Sept 23	<u>Exp #7</u> : Amphoterism and Ammonia Complexes
W	Sept 30	* <u>Exp #3</u> : Reversible Reactions and Equilibrium, (tt for Exp. 8)
W	Oct 7	EXAM #2 and <u>Exp #8</u> : Group I Qualitative Analysis
W	Oct 14	* <u>Exp #4</u> : The Common Ion Effect and Equilibrium (2tt, marked Exp. 5 & Exp. 6)
W	Oct 21	* <u>Exp #5</u> : Indicators and Their Use (Do experimental parts A and B and fill in the table for Part C) and <u>Exp #6</u> : Generation of a Titration Curve (tt for Exp. 9)
W	Oct 28	* EXAM #3 and <u>Exp #9</u> : Group II Qualitative Analysis (tt for Exp. 10). If needed, the Exp #9 unknown can be completed during the make-up lab.
W	Nov 4	* <u>Exp #10</u> : Group III Qualitative Analysis (2tt, marked Exp. 11 & Exp. 12)
W	Nov 11	* <u>Exps #11 and 12</u> : Groups IV and V Qualitative Analyses, (tt for Exp. 13)
W	Nov 18	* EXAM #4 and <u>Exp #13</u> : Analysis of Simple Water Soluble Salt (tt for make-up lab)
W	Dec 2	Make-Up Lab (for students with excused absences and those needing to complete unknown Group analyses)
W	Dec 9	Lab Final Exam and Check Out

* A clean, dry test tube should be placed in the rack during the laboratory period where (tt) is shown. This is for the unknown sample to be handed out for the following lab.

NOTE: There is a laboratory fee of \$80 payable with your tuition. The laboratory fee is not refundable after the first week of classes. A charge for excessive breakage may also be levied. **IF YOU DROP THIS COURSE, YOU MUST CHECK-OUT OF YOUR LABORATORY DESK.**

Chemistry 115/116 Laboratory

Laboratory Fee: There is a laboratory fee of \$80 payable with your tuition. The laboratory fee is not refundable after the first week of classes. A charge for excessive breakage may also be levied. **IF YOU DROP THE COURSE, YOU MUST CHECK-OUT OF YOUR LABORATORY DESK.**

Laboratory Conduct: There is no smoking in the building. Each student is to do his/her own work in a quiet, efficient manner. The work area is to be kept clean and orderly. At the end of the laboratory period, the work area/sink should be clean and all common equipment should be returned to the common equipment containers. The gas jets should be checked to ensure that they have been turned off. The student should inspect the desk area to ensure that no apparatus has been left out.

Laboratory Safety: Read the safety regulations carefully and adhere to them rigorously at all times for your own well-being and that of your fellow students. **YOU MUST WEAR SAFETY GOGGLES (NOT SUNGLASSES OR CONTACTS) WHENEVER YOU ARE IN THE LABORATORY.** **Covered shoes (not sandals or open toe/heel shoes) are to be worn at all times in the laboratory. Long pants or long skirts are to be worn instead of shorts.** Old jeans, a T-shirt and sneakers are the best laboratory attire. Portable radios, walkman, etc. are prohibited in the laboratory. If you must make/take a telephone call, exit the laboratory room. **NO FOOD OR DRINK IS PERMITTED IN THE LABORATORY.**

Laboratory Absences: Students should attend all laboratory sessions. Students absent because of severe illness or university business will be given one make-up lab at the end of the semester. **A documented excuse is required to make-up a laboratory.** This excuse should be given to the instructor in charge and not to the TA. **Since the laboratory experience is an integral part of the course, students absent from three or more scheduled laboratory periods will fail the course.**

Preliminary Work: Before coming to the laboratory, you should read through the experiment carefully. Make a list of all precautions to be observed and plan the best way to do the experiment beforehand.

Desk Locks: You will be given a combination lock for your desk. You are responsible for the equipment in your desk. It is your responsibility to open and lock your own desk.

Unknowns: Only one attempt will be allowed for each unknown. Check any calculations carefully before you hand in your result. These results should be handed in at the end of the period. If you have not completed the experiment, notify your teaching assistant.

Special note: Students who are pregnant, or suspect that they may be pregnant, should inform the instructor and Ms. Barbara Foster, Safety Director, Clark 217, in person prior to attending the laboratory

Academic dishonesty, as defined in Article III Section B of the WVU Student Conduct Code will be dealt with according to University policy as described in Article IV.