

CHM 345: Introduction to Analytical Chemistry

Fall 2017

Course Instructor:

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Office Hours: Mondays, Tuesdays and Thursdays 9:00 am – 11:00 am or by appointment. I welcome drop-in visits, but cannot guarantee that I will be available to help you during non-office hours. Simple questions can be answered via email.

Course Prerequisites: CHM 212 & CHM 218 (Minimum Grade of C)

Lectures: WAEC 1101, Tuesday & Thursday 12:30-1:20 pm

Textbook: Quantitative Chemical Analysis, 9th edition, by Daniel C. Harris

ACS Academic Lab Safety Guide (volumes I and II):

<http://www.acs.org/content/acs/en/about/governance/committees/chemicalsafety/chemicalsafety-in-the-classroom.html>

Labs: S-492, Tuesday & Thursday 1:30-3:15 pm

Lab Requirements: Lab goggles and a bound laboratory notebook

Course Description:

Introduction to the basic principles of Analytical Chemistry including traditional wet methods and contemporary instrumental methods of chemical analysis. One of the main objectives of this course is to promote active learning that will be accomplished by having students using “clickers” questions in the classroom.

Course Objectives:

1. To learn how to analyze results through statistical methods.
2. To learn chemical equilibrium, titrations, and basic knowledge of electrochemistry.
3. To develop wet laboratory techniques essential for high precision experimentation.
4. To manipulate and employ separation techniques using real samples.
5. To acquire the ability to operate advanced instrumentation and to interpret results through modern theory.

Course Outcomes:

Student Learning Outcomes	How students will practice each outcome in this course	How student achievement of each outcome will be assessed in this course
Students will use statistical methods to understand error and error propagation for data analysis.	<ul style="list-style-type: none">• lectures and readings• homework• Lab exercises	<ul style="list-style-type: none">• quizzes and final• lab reports• clickers questions
Students will use fundamentals of chemical equilibria to quantify materials in unknown samples.	<ul style="list-style-type: none">• lectures/readings on equilibrium• homework• Lab exercises	<ul style="list-style-type: none">• quizzes and final• lab reports• clicker questions

Students will learn basic concepts of quantum mechanics and spectroscopy to quantify materials in unknown samples.	<ul style="list-style-type: none"> • lectures on quantum mechanics and spectroscopy • homework • Lab exercises 	<ul style="list-style-type: none"> • quizzes and final • lab reports • clicker questions
Students will learn basic separation methods and use them for isolating materials for quantitative analysis	<ul style="list-style-type: none"> • lectures on separation techniques • homework • Lab exercises 	<ul style="list-style-type: none"> • quizzes and final • lab reports • clicker questions
Students will enhance writing skills and strategies.	<ul style="list-style-type: none"> • short essays in homework sets, quizzes, and final exams 	<ul style="list-style-type: none"> • lab reports • lab notebook • tests and quizzes

Attendance:

Attendance for this class is highly recommended. Absences from quizzes and laboratories can only be made-up if the absence falls within one of the categories outlined in the undergraduate catalog. To make-up a quiz or lab, you will need to follow the process for securing an excused absence. All excused absences must be obtained as soon as possible. <http://www.marshall.edu/academic-affairs/policies/>.

Course Policies:

1. Lab reports will not be accepted after their due dates.
2. Graphing calculators, calculators with alphanumeric programming, and calculators on cell phones, PDAs, etc. cannot be used during quizzes/exams. Likewise, sharing of calculators during quizzes/exams is prohibited.
3. During quizzes/exams, all materials necessary will be provided to you except a pencil and calculator. You may not use your own paper, etc.
4. Please turn off cell phones during class, failure to do so may result in dismissal from lecture.
5. Students with disabilities who require special accommodations will be made. www.marshall.edu/disabled.
6. Academic dishonesty will be dealt with as outlined in the undergraduate catalog.
7. Information for drop or withdraw is available on the Academic Calendar <http://www.marshall.edu/calendar/academic/>

Course Content: All course content including lecture notes and laboratory handouts will be posted on MU online. I will send out reminders on Monday of each week about which lecture notes that we will discuss and laboratory experiments that we will conduct that week. You will probably want to bring copies of the lecture notes to class to keep you focused during the lectures.

Grading Scale:

90-100%	A
80-89%	B
70-79%	C
60-69%	D
Below 60%	F

Grading:

Quizzes	35%
Labs	40%
Clicker questions	5%
Final Exam	20%

Quizzes: Quizzes will be given every Tuesday at the end of lecture/beginning of lab. Each quiz will cover material from the previous week's lectures and lab. Your overall average on these quizzes will count for 40% of your grade.

Homework: Each student is to prepare for each class by reading the material covered in the previous class, answering the relevant problems at the end of each chapter, and previewing the material to anticipate the next class lecture. Additional homework problems and readings will be posted on MU online. All homework is for practice only and will not be graded.

Clickers: Clickers will be part of lecture assessment and are required in lecture every day. Course points for clickers' questions will be awarded for participation. There are no make-ups for missed clicker questions. Students can download for free "Poll everywhere" app using a smartphone. Students need to enter my unique username "www.pollev.com/quinonesr" into the join a presentation, then click on *Join*. You need to download this app by the beginning of week 2 or you will not obtain clicker points for the days you do not have the app.



Laboratory Policies

1. Students must complete the lab safety training on MU online prior to entering the laboratory.
2. Goggles are required at all times during lab.
3. Open-toed shoes, shorts, bare midriffs, etc. are not allowed
4. Blatant disregard for standard safety practices will result in dismissal from lab
5. Lab Handouts: Laboratory experimental procedures will be posted on MU online. You will be responsible for reading the material and doing all the assigned work prior to coming to lab each week. I will send out emails each Monday reminding you what material will be covered each week.
6. I have posted on MU online a basic lab guide that will explain how to keep a lab notebook and how to write a complete laboratory report.

University Policies:

By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802. Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment.

Suggested Activities for Success:

1. Read the suggested material from the textbook before and after each lecture.
2. Try to work through every homework problem assigned no matter how difficult.
3. Always attend class and take good notes.
4. Seek help from others, some possibilities:
 - a. Take advantage of office hours.
 - b. Work in small groups on studying for quizzes and the final.
 - c. Participate and practice the clickers questions.

Tentative Schedule:

	Tuesday	Thursday
Week 1 8-22, 8-24	Chapter 0,1,2 Introduction <i>Computer Lab</i>	Chapter 3 Experimental Error <i>Computer Lab</i>
Week 2 8-29, 8-31	Chapter 4 Statistics Lab 1: Balance Exercise & Lab check in	Chapter 27 Gravimetric Analysis Lab 2: Grav. Cl
Week 3 9-5, 9-7	Chapter 5 Calibration Methods Lab 2: Grav. Cl	Chapter 6 Chemical Equilibrium Lab 2: Grav. Cl
Week 4 9-12, 9-14	Chapter 6,7 Chemical Equilibrium Lab 3: Standardization of NaOH	Chapter 8 Activity Lab 3: KHP Unknown
Week 5 9-19, 9-21	Chapter 9 Monoprotic Acids Lab 4: pH Determination	Chapter 10 Polyprotic Equilibrium <i>No Lab</i>
Week 6 9-26, 9-28	Chapter 11 Acid-Base Equilibria Lab 5: Identification of an Unknown Weak Acid	Chapter 11 Lab 5: Identification of an Unknown Weak Acid
Week 7 10-3, 10-5	Chapter 14 Electrochemistry <i>No Lab</i>	Chapter 14,15 Nernst Equation Lab 6: Nernst Equation
Week 8 10-12, 10-12	Chapter 15 Electrodes Lab 6: Nernst Equation	Chapter 18 Intro. Spectroscopy Lab 7: % Fe by Spectrophotometry
Week 9 10-17, 10-19	Chapter 18, 19, 20 Beer's Law and Mixtures Lab 7: % Fe by Spectrophotometry	Chapter 18, 20 Luminescence and Quenching Lab 8: Quinine analysis
Week 10 10-24, 10-26	Chapter 18, 20 Luminescence Lab 8: Quinine analysis	Chapter 18, 20 Vibrational Spec. Lab 9: Transmission IR and NMR Spectroscopy
Week 11 10-31, 11-2	Chapter 18, 20 Vibrational Spec. Lab 9: Transmission IR and NMR Spectroscopy	NMR Spectroscopy Lab 10: Forensic Drug Test (ATR-IR) Lab 11: EPR
Week 12 11-7, 11-9	NMR Spectroscopy Lab 10: Forensic Drug Test (ATR-IR) Lab 11: EPR	Chapter 21 Atomic Spectroscopy Lab 11: SEM and ICP of Ancient Roman Coins
Week 13 11-14, 11-16	Chapter 23 Intro. Chromatography Lab 11: SEM and ICP of Ancient Roman Coins	Chapter 23 Intro. Chromatography Lab 12: GC mixture
Week 14 11-21, 11-23	THANKSGIVING BREAK	
Week 15 11-28, 11-30	Chapter 23 Intro. Chromatography Lab 13: HPLC analysis (checkout)	Chapter 24 Gas Chromatography Lab 13: HPLC analysis
Week 16 12-5, 12-7	Chapter 25 HPLC	Chapter 25 HPLC
Week 17 12-12, 12-14	Final Exam, Tuesday December 12 12:45 – 2:45 pm	

During the semester, students will work in a lab project that will be part of the lab assesment. This will be announced in the class with their own deadlines.

**** This schedule is subject to change. Changes, if necessary, will be announced in class****