

**Syllabus**

**Chemistry 220**

**3 Credits**

**Fall 2017**

“There is no such thing as luck; there is only adequate or inadequate preparation to cope with a statistical universe.”  
R. A. Heinlein

LECTURES: MWF 12:10 Troy G005

INSTRUCTORS: Prof. Brian Clowers  
OFFICE: Fulmer 532  
PHONE: 335-4300  
EMAIL: brian.clowers@wsu.edu  
OFFICE HOURS: Monday 10-11 am or by appt.

Zac Gotlib  
OFFICE: Fulmer 318  
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OFFICE Hours: Tuesday 9-10 am or by appointment

COURE MATERIALS: Quantitative Chemical Analysis, Daniel C. Harris, 8th edition - REQUIRED<sup>1</sup>  
On-line access to Sapling Learning Materials for this course - REQUIRED

STUDENT LEARNING OUTCOMES: The overall goal of CHEM 220 is to provide students an opportunity to develop an understanding of quantitative chemical analysis and demonstrate proficiency in its application. Development of knowledge in the following concepts of analytical chemistry will serve as the foundations for assessment:

1. Types of analytical methods, and appropriate applications of those methods for specific analytical needs, including differentiation between molecular and atomic spectroscopy.
  - a. Topics: Chapters 8-21
  - b. Assessments: All HW, Quizzes, and Exams
2. The technical basis for quantitative analysis, including precision, accuracy, limits of detection, limits of quantification, estimates of uncertainty, error analysis, calibration curves, and other statistical methods.
  - a. Topics: Chapters 2, 3, and 4
  - b. Assessments: HW 1-3, Quizzes: 1 & 2, Exam 1
3. Solution chemistry: Explain solution conditions and resultant solution speciation through an understanding of solution activities and systematic treatment of equilibria.
  - a. Topics: Chapters 6-16, 3, and 4
  - b. Assessments: HW 4-10, Quizzes: 3-10, All Exams
5. Applications of solution chemistry concepts to explain analytical methods, including titrations, chromatography, and spectrophotometry.
  - a. Topics: Chapters 8-20
  - b. Assessments: HW 4-13, Quizzes: 4-11, Exams 2 and 3

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<sup>1</sup> The 7<sup>th</sup> Edition will suffice if the 8<sup>th</sup> or 9<sup>th</sup> editions are not available.

6. Redox chemistry: Explain the Nernst equation and relate it to electroanalytical methods, including potentiometry and redox titrations.
  - a. Topics: Chapters 14 and 17
  - b. Assessments: HW 7-8, Quiz 7, Exam 2
  
7. Spectrophotometry: Apply Beer's Law in spectrophotometric analysis, and the limits of Beer's Law.
  - a. Topics: Chapters 18-20
  - b. Assessments: HW 9-12, Quizzes: 8-9, Exam 2
  
8. Chromatography: Explain and apply the theory of analytical separations.
  - a. Topics: Chapters 23-24
  - b. Assessments: HW 11-13, Quizzes: 11 & 12, Exam 3

LECTURE ATTENDANCE: I do not take attendance in lecture but I STRONGLY ENCOURAGE you to attend every class, be engaged, take notes, and ask questions.

INTERNET: Blackboard is used (learn.wsu.edu) for many things, including making announcements, sending emails, and posting accompanying material for both lectures and labs. Your NID and password will log you into this site. In addition, we will be using an on-line homework system described in more detail below. This homework system *is separate* from Blackboard. I will occasionally make contact with you through Blackboard, either in the format of announcements or emails. You are responsible for checking Blackboard and your WSU email regularly!

GRADING:

HOMEWORK:	200 points	(13 total assignments, best 10 counted)
QUIZZES:	100 points	(11 total quizzes, best 10 counted, 1 make-up)
EXAM 1:	100 points	(50 minutes, during normal class period)
EXAM 2:	100 points	(50 minutes, during normal class period)
<u>EXAM 3:</u>	<u>100 points</u>	<u>(50 minutes, during final exam period)</u>
TOTAL:	600 points	

GRADE RANGES:

552 : A	540: A-	528: B+	492: B
480: B-	468: C+	432: C	420: C-
408: D+	372: D	360: D-	Below 360: F

Your grade is based on the amount of learning you have achieved as measured by the points you have earned—note this is in contrast to the notion that instructors “give” grades. Note that grades are not based directly on the amount of time and effort you expend in studying or how many classes you attend, but rather, on how well you perform. Some students feel they deserve high grade because they work hard or attended every class. However, high grades are not an entitlement *due to hard work or attendance alone*, but are awarded based on high achievement in the course which includes hard work and attendance. In accordance with the university’s guidelines for grading as stated in the WSU Catalog, I use the following meanings of the main letter grades:

- Student work demonstrates consistently excellent scholastic performance; thorough comprehension; ability to correlate the material with other ideas, to communicate and to deal effectively with course concepts and new material; reliability in attendance and attention to assignments.
- Student work demonstrates superior scholastic performance overall, reliability in attendance, and attention to assignments; may demonstrate excellence but be less consistent than the work of an A student.
- Student work demonstrates satisfactory performance overall, as well as reliability in attendance, and attention to assignments.
- Student work demonstrates minimal, barely passing performance overall; limited knowledge of subject matter.
- Student work demonstrates unsatisfactory performance and comprehension or unfulfilled requirements. The grade is failing.

**ACADEMIC DIFFICULTY:** If you have difficulty understanding the material or if your exam performance is not up to your expectations, make an appointment with me. I will try to help you, and I may be able to offer suggestions to improve your retention of the material. Some suggestions will be offered in class, but I may be able to offer some advice unique to your situation. Please do not wait until the term is halfway over before you seek assistance.

**EXAMS:** All exams will be held in Troy G005, and are expected to take no more than the normal 50 minute class. If requested, review sessions will be held on the Friday before the exam during our normal class time. You will need a pencil and calculator for all exams and quizzes, which is your responsibility to bring. No notes or books are allowed during exams and quizzes. If you are unable to take a scheduled exam, you will be required to provide documentation as per your reason for missing the exam. If the missed exam is due to a scheduled academic reason, you will be allowed to take the exam at an earlier time, scheduled on a case-specific basis. If you miss an exam for any other reason, you will take a make-up exam which will be different from the scheduled exam. It is to your benefit to show all of your work on exams and quizzes. If no work is shown and the answer is wrong, no partial credit may be assigned.

The following statement applies to both exams and quizzes: You are expected to provide appropriate units for each numerical answer. All rules for significant figures apply to final answers, but wait until the end of a calculation before rounding your answer to the final form with appropriate significant figures.

**EXAM REVIEW:** I will offer brief study guides for each exam. These study guides will include information from both the lectures, text, homework, and quizzes (hint, hint) that I feel is important to understand for the exam. **NOTE:** These are meant as GUIDES for STUDYING and not simply a list of everything on the exam. This means that there may be things on the study guides that are NOT on the exam and things that are on the exam that are NOT on the study guide. To do your very best on exams, you should 1) read the text and/or supplementary material, 2) attend class, 3) pay attention to lecture, 4) take good

notes, 5) ask for clarification when needed, 6) study regularly and often (as opposed to cramming right before the exam), 7) complete the homework assignments, as well as 8) complete the study guide. At a minimum you should spend at least 6 hours a week on this class to fully develop an understanding of the material.

**QUIZZES:** Quizzes will be typically held on Mondays throughout the semester. These will consist of short answer questions/calculations. 11 quizzes will be given throughout the semester, scored out of 10 points each. You will be graded out of your top 10 of 11 quizzes, dropping your lowest score. A make-up quiz will be available at the end of the semester for those in need of points (see extra credit).

**HOMEWORK:** Homework will typically be assigned most Wednesdays, and are due the next Wed. 13 assignments will be made, the highest scores on 10 of those assignments will be used to calculate your grade. However, the quiz and exam content will be drawn from all 13 assignments as the year progresses.

We will be using an on-line homework system from Sapling Learning. Instructions for setting up your on-line account with Sapling are:

1. Go to <http://www.saplinglearning.com/login>
2. If you already have a Sapling Learning account, log in, then skip to step 5.
3. If you have a Facebook account, you can use it to quickly create a Sapling Learning account. Click "create account" located under the username box, then click "Login with Facebook". The form will auto-fill with information from your Facebook account (you may need to log into Facebook in the popup window first). Choose a password and fill in the remaining information, accept the site policy agreement, and click "Create my new account". You can then skip to step 5.
4. Otherwise, click "create account" located under the username box. Supply the requested information and click "Create my new account". Check your email (and spam inbox) for a message from Sapling Learning and click on the link provided in that email to confirm your account.
5. Find your course in the expandable list (sorted by subject, term, and instructor) and click the title link.
6. Select your payment options and follow the remaining instructions.

Additional Sapling Login and Support resources can be found via the following links:

<https://community.macmillan.com/docs/DOC-5972-sapling-learning-registering-for-courses>  
<https://community.macmillan.com/community/digital-product-support/college-students-support-community>

If the online system becomes unavailable, written homework from Harris may be assigned.

**EXTRA CREDIT:** Opportunities for extra credit will be available at the end of the semester for students who require a few extra points to improve their overall class average. Up to 20 extra points can be earned through completion of cumulative homework material made available on Sapling. An additional 10 point maximum can be earned by completing a make-up quiz whose grade will replace the lowest quiz score.

**CALCULATORS:** You are expected to have and be able to use a scientific calculator. Graphing calculators are allowed and encouraged, but not required. The use of any stored information/programs in a programmable calculator will be considered cheating (see ACADEMIC INTEGRITY section). Smartphones, tablets, PDAs, laptop computers, and/or cell phones with calculators are not allowed during exams. Any other electronic devices used during the exams or quizzes that are not a basic calculator need to be approved prior to use.

**ACADEMIC INTEGRITY:** Cheating or plagiarism of any form will not be tolerated. Cheating includes, but is not limited to: copying work or allowing your work to be copied; use of unauthorized material at exams, any communication between students during an exam, and actively looking at another student's paper during an exam. All incidences of cheating may be reported to the Office of Student Affairs. The first incidence of cheating will result in a score of zero for that assignment or exam, a second incident of cheating will result in an F for the course and possible dismissal from the University. Definitions and the processes to be used for handling complaints related to academic dishonesty are presented at <http://conduct.wsu.edu/AI>.

**ACCOMMODATIONS:** Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations **MUST** be approved through the Access Center. For more information contact a Disability Specialist at 509-335-3417, <http://accesscenter.wsu.edu>, or [Access.Center@wsu.edu](mailto:Access.Center@wsu.edu). Accommodations are also available for students whose course activities fall on days that are objectionable because of religious beliefs. Request for accommodations must be made least two weeks before the accommodation is required.

**SAFETY:** Washington State University is committed to enhancing the safety of the students, faculty, staff, and visitors to the Pullman campus. It is highly recommended that you review the Campus Safety Plan (<http://safetyplan.wsu.edu/>) and visit the Office of Emergency Management web site (<http://oem.wsu.edu/>) for a comprehensive listing of university policies, procedures, statistics, and information related to campus safety, emergency management, and the health and welfare of the campus community. The campus-wide alert system is at <http://alert.wsu.edu/> .

**INSTRUCTOR AVAILABILITY:** I am available to meet with students face-to-face during my office hours or by appointment and by email and/or phone. With the exception of the times that I teach, unreasonable days/times (such as the weekends or the middle of the night), and some regularly scheduled work-related or personal activities, I'm available to accommodate your schedule. If you need to contact me by email, use exercise reason and do not expect a response regarding a Monday class when your e-mail was sent at 11:33 pm on Sunday. Given the volume of my inbox it could take up to three academic days to respond to your email. If you don't hear from me in this timeframe, send me a respectful reminder. Sometimes you can drop by my office to chat. If my door is closed, even if I'm in my office, it usually means I'm busy and not to disturb me. If my door is open, on the other hand, feel free to stop in.

WITHDRAWING FROM CHEM 220: The WSU Catalog specifies the details of the WSU withdrawal policy, as indicated below. See the course schedule for withdrawal dates.

#### 68. WITHDRAWAL FROM A COURSE

An undergraduate or professional student may withdraw from a course after the 30th day of the regular term up through the end of the 13th week with these provisions:

- (a) At the end of each term, the number of withdrawals will be counted for undergraduate and professional students. Once four withdrawals have been used, no further withdrawals will be allowed in subsequent terms. Withdrawals that result from the cancellation of enrollment will not be counted. (For those entering WSU in fall 1998 through summer 2004, once six withdrawals have been used, no further withdrawals will be allowed in subsequent terms.)
- (b) After the withdrawal limit is reached, an undergraduate or professional student may, in exceptional circumstances, submit a petition through the Registrar's Office for an exception to the withdrawal limit. See Rule 57.
- (c) If a grade has been entered for a course, the grade may not be changed to a withdrawal without the instructor's consent.
- (d) Withdrawals do not reduce tuition charges or the total official hours of enrollment.
- (e) For academic calendars that vary from the regular 15-week term, a prorated schedule will be used to determine the withdrawal deadline.
- (f) The grade shall be marked W, and payment of the service fee shall be mandatory.

MID-TERM GRADES: During the 2011-2012 school year, the Associated Students of Washington State University (ASWSU – your student government) successfully appealed to the WSU Faculty Senate to institute a policy in which instructors are required to submit mid-term grades for all students, not just Freshmen and transfer students. Here's the policy:

88. MIDTERM GRADE SUBMITTAL. Midterm grades will be submitted for students enrolled in undergraduate courses by 5:00 p.m. on the Wednesday of the eighth week of the fall and spring semesters. For courses that are letter graded, midterm grades may reflect the full range of letter grades (A-F) or may use the C or F grade only. The instructor's syllabus will specify which type of midterm grade will be given to assess progress. For midterm grades, C and F are defined as follows: A C midterm grade is given to any student who is making satisfactory progress. An F midterm grade is given to any student whose progress is not acceptable and who needs to discuss his/her progress with the instructor. The assessment should not be interpreted as a formal grade, but rather as an indication of the student's progress to date. Midterm grades are advisory and do not appear on the student's permanent record, the WSU transcript.

In this class, I will be using the C/F grading at mid-term. If you receive a C, you're performing satisfactorily in the course (i.e., you're receiving a C- or better). If you receive an F, you're performing unsatisfactorily in the course (i.e., you're receiving a D+ or worse).

CLASS EXPECTATIONS: I expect that you'll attend every class, participate fully in activities and lecture material, come prepared by reading your textbook(s) and do your homework.

I appreciate your full attention in class. Like you, I have a life outside of school and I often take time away from my family to make sure your educational needs are met. While I am genuinely interested in the topic of this class, I sometimes find it hard to be excited when students arrive late or leave early, text or Facebook during class, chat or pass notes, sleep, etc. Perhaps paradoxically, I find it MORE respectful for you to choose NOT to come to class if you'd rather not be there.

You are responsible for the material in the text and you should read the material before class. Information presented in class may come from the text or additional sources, thus you will be responsible for the material presented in lecture. If you miss a class, you should obtain notes from a fellow student. Important announcements will be made at the beginning of class, so you should be in class on time. You are responsible for obtaining any missed information. Please be respectful of other students and your instructor by not disrupting class, including coming to class late or leaving early.

**LECTURE NOTES:** Lecture material will be presented in class. Slides or lecture notes will not be provided to you in any other way. To obtain material from which to study, you should plan to attend class and take notes. On occasion, I will post supplementary materials in Angel. It is your responsibility to access these materials before class. I will teach as though you have these materials, so be prepared by accessing, downloading, and/or printing them before class.

**Schedule****Chemistry 220****Fall 2017**

Date	Day	Chapter	HW Assigned	HW Due	Quiz	
8/21/2017	Mon	2	1			
8/23/2017	Wed	3	2		1	
8/25/2017	Fri	3/4		1		
8/28/2017	Mon	4				
8/30/2017	Wed	4/5	3	2	2	
9/1/2017	Fri	5				
9/4/2017	Mon	<b>Labor Day</b>				
9/6/2017	Wed	6	4	3	3	
9/8/2017	Fri	6				
9/11/2017	Mon	7				
9/13/2017	Wed	7	5	4	4	
9/15/2017	Fri	7/8				
9/18/2017	Mon	8		5		
9/20/2017	Wed	8	6			
9/22/2017	Fri	-----EXAM 1-----				
9/25/2017	Mon	9				
9/27/2017	Wed	9/10	7	6	5	
9/29/2017	Fri	10/11				
10/2/2017	Mon	11				
10/4/2017	Wed	11&13	8	7	6	
10/6/2017	Fri	13				
10/9/2017	Mon	14	-----Pre-Recorded Lectures-----			
10/11/2017	Wed	14				
10/13/2017	Fri	14/15				
10/16/2017	Mon	15/16	9			
10/18/2017	Wed	16		8	7	
10/20/2017	Fri	16				
10/23/2017	Mon	17		9		
10/25/2017	Wed	17	10			
10/27/2017	Fri	-----EXAM 2-----				
10/30/2017	Mon	18				
11/1/2017	Wed	18/19	11	10	8	
11/3/2017	Fri	18/19				
11/6/2017	Mon	19				
11/8/2017	Wed	20	12	11	9	
11/10/2017	Fri	<b>Veterans' Day</b>				
11/13/2017	Mon	<b>No Class</b>				
11/15/2017	Wed	23	13	12	10	
11/17/2017	Fri	23				
11/20/2017	Mon	<b>Thanksgiving Break</b>				
11/22/2017	Wed					
11/24/2017	Fri					
11/27/2017	Mon	24/25				
11/29/2017	Wed	22	14	13	11	
12/1/2017	Fri	22				
12/4/2017	Mon	22				
12/6/2017	Wed	22		14	<b>Make-up</b>	
12/8/2017	Fri	Review				
12/13/2017	Wed	-----EXAM 3-----				