Syllabi and Statement of Dr. Christina Bauer, Associate Professor and Chair of Chemistry at Whittier College, Tue, Oct 13, 2020 at 9:44 AM via Email correspondence

1. In what ways do you feel that the transition to online learning has impacted your teaching methods and materials, be they positive or negative?

I am generally feeling positive about the transition to online learning. I was in the process of flipping my courses and adopting free online texts for some of my courses in order to make the material more accessible and inclusive. Further, I have been changing my course assessments from typical examinations to take home analyses. Again, COVID hastened my work on this, but much of it was necessary to provide an educational experience for students regardless. Before COVID, I felt alone at times as not many in the sciences (at most schools, not just ours) were pursuing such ideas and their was resistance from students and colleagues alike. As the emergency of COVID planning forces us to move online, many started to see some of the advantages of being online.

The reality is that we still need to be in-person to create the meaningful connections we all look for. But, we need to make much better use of our time when we are together. Is a lecture really worth it? Some commuter students fight traffic just to come in and take notes for a simple lecture, for example. We can provide some of the material online for initial presentation of the material, and use the in-person meetings for much deeper discussions and analysis. This (in my opinion) is what students need to be successful, especially in modern times.

2. How have you had to change your syllabus in order to accommodate these changes?

Every aspect of the syllabus was altered, except for the departmental goals. Interestingly, I think I am now closer to reaching these goals with the online, modular experience than I was before.

3. What are the challenges that your department has faced during the pandemic?

Laboratory courses are the biggest challenge for us. There are some aspects, like demonstrating a laboratory technique, that can be performed well via video and students can be better prepared for the labs. This is also something that I was hoping to do in the near future, but COVID has led us to begin the creation of a video archive that can be utilized in the future. However, there are some elements that cannot be delivered remotely no matter what efforts we make. We can ask students to use materials at home or in their kitchen, but they do not generally have access to the necessary equipment. Further, safely working with more hazardous materials is an important skill that we are unable to provide remotely. We hope to keep our accreditation with the American Chemical Society, so are cognizant of how our laboratory experiences align.

CHEM 321A PHYSICAL CHEMISTRY I Bauer FALL 2019

Class Schedule: Lectures: T, Th SLC 420 9:00-10:50 am

Safety: **Note about the classroom – because we are scheduled in a laboratory room, it is important that we remain safe. Please wear close-toed shoes to class and do not eat or drink inside the laboratory room.

Instructor: Dr. Christina Bauer, SLC 344, cbauer@whittier.edu, (562) 907-4200 x4420

Office Hours: Tuesday 1:30-3:30 PM, Wednesday 10 AM-noon. I also have an open door policy and can meet by appointment.

Course Materials:

1. Course Composition Book, written by me, posted to Moodle.
2. Peter Atkins, Julio de Paula, *Physical Chemistry*, 10th ed. Note that this text is also used for Physical Chemistry II and Biophysical Chemistry.
3. Scientific Calculator

Prerequisites: This course has significant mathematical components, including calculus. Therefore, *MATH141B* or higher is required. Please let me know early on if you are concerned with the mathematical portions as I can help you to get more comfortable. It is important that you have a good grasp of basic physics, so either *PHYS 135A/B* –or- *PHYS150/180* are required. Finally, concepts of equilibrium and organic chemistry are to be discussed in more detail than in previous chemistry courses, so *CHEM220A/B* and *CHEM 231B* are prerequisites.

Course Description: This course focuses on chemical thermodynamics, kinetic theory, and chemical kinetics. Our goal will be to discuss many of the important unifying concepts in chemistry, derive the related equations from first principles, and mathematically define chemical systems. Many of the concepts we cover will be familiar to you from a general standpoint, and you will develop a much deeper understanding that can be applied to new systems in this course. We will approach this material rigorously and define the ideal and real systems in many cases, identifying the assumptions that are necessary.

Course Goal: The overall goal of this course is to learn how to apply physical models to chemical systems and describe this mathematically. We will adhere to the goals of the chemistry department as a whole.

Departmental learning outcomes: The Whittier College chemistry department provides a supportive environment for students to understand and appreciate chemistry in the modern world, to prepare students with the foundation for related fields such as medicine, and to prepare students to become professional chemists. The department emphasizes student learning through collaborative learning experiences that focus on developing critical thinking skills and the use of modern instrumentation in our classes.

Specifically, we strive to:

1. Provide a sense of community within the department that generates a supportive environment for student learning. Students will
    a. Work collaboratively with one another on homework assignments, in laboratory work, and in studying for exams to build community, increase student learning, and reflect the current practice in science.
    b. Meet with faculty in their offices and in other locations around campus to discuss course work, research, academic interests and other departmental related interests.
2. Develop students' critical thinking and problem solving skills. Students will

a. Break problems down into its component parts;
b. Identity the key physical and chemical principles and the appropriate data needed to solve the problem;
c. Recognize if the result is reasonable or not.

3. Prepare students with a solid foundation in chemistry so that they will be successful as professional chemists, health professionals, teachers, or whatever career they chose in their future.

Attendance: Attendance is required. It is unlikely to be successful in this class without regular attendance. There is no grading penalty for missing class, but it will likely be reflected in your other grades.

Grading:

Homework and in-class assignments – 15% - *No late homework will be accepted* as I will grade the problems on the same day and we will go over any common mistakes if necessary in the following days. Practice is crucial to mastering chemistry! Always be clear and write neatly on tests and homework assignments so your thought processes can be followed and partial credit can be awarded. In the event that an assignment includes graphing, please print out a copy of the graph with appropriate labels. A graph without axes is meaningless!

Presentation – 10% - Each student will give a brief presentation on a topic from a general chemistry perspective. A sign-up sheet will be given out for you to sign up for your topic of choice. One of the best tools for learning is to teach it to someone else. Viewing the topic from the instructor viewpoint will provide you with a unique perspective on the material. Plan approximately 5-10 minutes, you can use Powerpoint or any type of presentation media, write on the board exclusively, possibly provide handouts, or any combination of methods. The topic should be aimed at the general chemistry level and explain any phenomenon. You will be graded on material content, accuracy, and clarity.

3 Exams – 60% - weighted in your favor. Highest score 25%, Mid-score 20%, Lowest score 15%. Brief study guides will be given out approximately one week before exams. If you miss an exam, please meet with me as soon as possible to arrange a make-up exam and provide a doctor's note for your absence.

Exam	Exam I: Ch. 1 – 2	Exam 2 – Ch. 3-5	Exam 3 – Ch. 6, Kinetics
Tentative Date	Sept. 26	Oct. 31	Dec. 3

Final Exam – 15% - Comprehensive over the course, **DAY 1** (Dec. 10th) 8 AM to 10 AM

Grading Scale:

A 100-93.00	B+	89.99-87.00	C+	79.99-77.00	D	69.99-60.00	F 59.99
A- 92.99-90.00	B	86.99-83.00	C	76.99-73.00			
	B-	82.99-80.00	C-	72.99-70.00			

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Academic Honesty: Academic dishonesty is unacceptable on all levels. This includes, but is not limited to, plagiarism and cheating or copying on homework, quizzes or exams. The penalty for Academic Dishonesty will range from a **failing grade on the assignment to a failing grade in the course depending on the severity of the incident**. All incidents of cheating or plagiarism **must and will** be reported to the Dean of Students. Please read the Whittier College Academic Honesty Policy at:

http://www.whittier.edu/Academics/AcademicRequirementsPoliciesAndProcedures/AcademicHonesty_policy.pdf

Tentative Course Schedule:

Week	Tuesday	Thursday
1		**9/5** Introduction Phase Differences, Gases *Reading: Foundation A-Matter*
2	**9/10** Ideal and Non-ideal Gases Equations of State *Reading: Ch. 1A, 1C*	**9/12** First law of thermodynamics Thermochemistry, work & heat, calorimetry Enthalpy *Reading: Ch. 2A-C* ***Hmwk 1***due
3	**9/17** Boltzmann distribution and heat capacities State functions, Exact differentials *Reading: 2D, Mathematical Background 109-111, Foundation B3*	**9/19** Joule Thompson effect Adiabatic transitions *Reading: Ch. 2D, 2E*
4	**9/24** Catch up and review for Exam 1 ***Hmwk 2***due	**9/26** ***EXAM 1***
5	**10/1** Carnot Cycle and Second law of thermodynamics *Reading: Ch. 3A*	**10/3** Third Law of Thermodynamics Free Energy – Gibbs and Helmholtz *Reading: Ch. 3B,C*
6	**10/8** Combined First and Second Laws *Reading Ch. 3D*	**10/10** Phase Diagrams Chemical Potential Thermodynamics of phase transitions *Reading Ch. 4A,B* ***Hmwk 3***due

7	**10/15** Plotting Phase Diagrams Thermodynamics of Mixtures *Reading: Ch. 5A*	**10/17** Mixtures cont'd Colligative properties *Reading: Ch. 5A-B* ***Hmwk 4***due
8	**10/22** Composition Diagrams Fractional Distillation *Reading: Ch. 5C up to pg. 208*	**10/24** Catch up and review for Exam 2 ***Hmwk 5***due
9	**10/29** Chemical Equilibrium Le Chatelier *Reading: Ch. 6A,B*	**10/31** ***EXAM 2***
10	**11/5** Electrochemistry *Reading: Ch. 6C,D*	**11/7** Kinetic Model of Gases Maxwell-Boltzmann distribution *Reading: Ch. 1B* ***Hmwk 6***due
11	**11/12** Rate Laws Integrated rate laws *Reading: Ch. 20A, B*	**11/14** Arrhenius Reaction Mechanisms *Reading: Ch. 20D,E*
12	**11/19** Reaction Mechanisms *Reading: Ch. 20E,F.1* ***Hmwk 7***due	**11/21** Collision Theory *Reading: Ch. 21 A*
13	**11/26** Rolling the Dice activity Review for Exam 3 ***Hmwk 8***due	**11/28** No Class Thanksgiving Break
14	**12/3** ****EXAM 3*****	**12/5** Transition state theory Course wrap up Review for final *Reading: Ch. 21C*
15	****Final Exam: Tuesday 12/10/2019, 8:00 a.m. – 10:00 a.m.****	

"Everybody is a genius. But if you judge a fish by its ability to climb a tree, it will live its whole life believing it is stupid." -Albert Einstein

CHEM 321A **PHYSICAL CHEMISTRY I** **Bauer FALL 2020**

Class Schedule: Lectures/group work: M, W, F at 9:30-10:45 am. Asynchronous material provided on a weekly basis. I've provided a schedule for topics that should be covered each day.

Instructor: Dr. Christina Bauer, cbauer@whittier.edu, (562) 907-4200 x4420

Office Hours: Sign up on Calendly, 1:30-2:30pm M-F, or suggest a different time if needed.

Sites I will be using	
1. Calendly for appointments	https://calendly.com/cbauer-chem/20min
2. Zoom for lectures/meetings	Meeting ID: 929 0733 7227 Passcode: CHEM321A https://whittier-edu.zoom.us/j/92907337227?pwd=bnlpZkRGVHZETGw0VmpuRkZvOWRsdz09
3. Chat group on Slack - required for participation	https://join.slack.com/t/whittierpchemi/shared_invite/zt-go10692c-WNSEV_MhTotsjNPXX73TSw
4. Post to Moodle/assessments on Moodle	https://cms.whittier.edu/course/view.php?id=24138
5. Gradescope– upload written work	https://www.gradescope.com/courses/169819

Course Materials:

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3. Scientific Calculator

Prerequisites: This course has significant mathematical components, including calculus. Therefore, *MATH141B* or higher is required. Please let me know early on if you are concerned with the mathematical portions as I can help you to get more comfortable. It is important that you have a good grasp of basic physics, so either *PHYS 135A/B* –or- *PHYS150/180* are required. Finally, concepts of equilibrium and organic chemistry are to be discussed in more detail than in previous chemistry courses, so *CHEM220A/B* and *CHEM 231B* are prerequisites.

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3. Prepare students with a solid foundation in chemistry so that they will be successful as professional chemists, health professionals, teachers, or whatever career they chose in their future.

Attendance: It is unlikely to be successful in this class without regular attendance and therefore, attendance is required. Of course, life happens, so if you miss one of the 19 synchronous class sessions, you can simply complete the exercises that we completed that day for attendance points. Please ask questions on the course Slack site. Please also see the COVID-19 Code of Conduct prepared for Whittier College students that details the necessary steps to take if there is a COVID-19-related disruption to your studies. In particular, students are asked for notification immediately upon receiving a positive test result.

https://www.whittier.edu/covid19/conduct

Grading:

Grades	%
Hmwk (6)	20%
Slack participation	10%
Class attendance (up to 2 unexcused absences)	10%
Class participation	10%
Group work	5%
Assessments	45%

Grading Scale:

A	100-93.00	B+	89.99-87.00	C+	79.99-77.00	D	69.99-60.00	F	59.99
A-	92.99-90.00	B	86.99-83.00	C	76.99-73.00				
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Tentative Course Schedule:

	Week 1			Week 2
Monday	*26-Oct*	What is PChem/Ideal Gases Pgs.1-8 W**	*2-Nov*	Differentials/heat capacity Pgs. 27-31, Topic 2A.4, Prologue, 2D.1-2D.3
Tuesday	*27-Oct*	Calculations and Real Gases, Pgs. 8-13 W, Topic 1A	*3-Nov*	Enthalpy 32-33, Topic 2B, 2C.3
Wednesday	*28-Oct*	Gases-Real, Pgs. 13-16 W, Topic 1C	***4-Nov***	**Assessment 1/Review (pgs. 19 and 39 W)**
Thursday	*29-Oct*	Thermochemistry/Laws of Thermo/state functions, Pgs. 20-24 W, Topic 2A.1, 2C.1, 2C.2	*5-Nov*	Adiabatic Changes, 34-36 W, Topic 2E
Friday*	*30-Oct*	Internal energy, heat, and work, Pgs. 24-26 W, Topic 2A.2, 2A.3	*6-Nov*	Carnot Cycle/2nd Law Thermo Pgs. 41-45 W, Topic 3A

*Homework due each Friday

**W refers to workbook, Topics refer to textbook

Week 3	Week 4

Monday	*9-Nov*	2nd Law of Thermo/Calculations, pgs. 45-48 W, Topic 3B	***16-Nov***	**Assessment 2/Review**
Tuesday	*10-Nov*	3rd Law of Thermo/Free Energy, Pgs. 48-50 W, Topic 3C	*17-Nov*	Chemical potential and phases pgs. 58-60 W, Topic 4A
Wednesday	*11-Nov*	Exact Differentials/Combined Laws Pgs. 51-54 W, Topc 3D.1	*18-Nov*	Phase transitions pgs. 60-64 W, Topic 4B
Thursday	*12-Nov*	Use of Maxwell relations; Gibbs-Helmholtz, and chemical potential 54-55 W, Topic 3E	*19-Nov*	Physical mixtures /open systems, pgs. 66-71 W, Topic 5A.1, 5A.2
Friday*	*13-Nov*	Calculations of Free Energy/Review	*20-Nov*	Calculations of mixing/Raoult's Law Pgs. 71-76 W, Topic 5A.3, 5B.1

	Week 5		**Week 6**	
Monday	*23-Nov*	Raoult's Law 2 Volatiles/Distillation Pgs. 76-80 W, Topic 5C.1-5C.3	*30-Nov*	Chemical Mixtures/Equilibrium shifts, Pgs. 88-91 W, Topic 6A, 6B
Tuesday	*24-Nov*	Colligative Properties Pgs. 81-85 W, Topic 5B.2	*1-Dec*	Electrochemistry, Pgs. 92-97 W, Topic 6C, 6D.2c
Wednesday		*Thanksgiving*	***2-Dec***	**Assessment 3/Review**
Thursday		*Thanksgiving*	*3-Dec*	Kinetics -Speed/ Pgs. 100-105 W Topic 1B.1
Friday		*Thanksgiving*	*4-Dec*	Collisions/effusion, Pgs. 106-107 W, Topic 1B.2

	Week 7	
Monday	*7-Dec*	Rate laws/integrated rate laws Pgs. 108-111 W, Topic 17A, 17B
Tuesday	*8-Dec*	Mechanisms Pgs. 111-116 W, 17E
Wednesday	*9-Dec*	Rate constants/Collision Theory Pgs. 117-119 W, Topic 18A.1
Thursday	*10-Dec*	Wrap up
Friday*	***11-Dec***	**Assessment 4/Review**

Exams: We are not having traditional, timed exams in this course. Rather than pressuring students to regurgitate information in an uncomfortable and short time frame, I'd rather you continue to learn and apply your knowledge while taking an Assessment. You will be given a set of questions and 24 hours to complete the exam. If you have any problems with the exam, please let me know immediately. Typically, we will have a class session, then I will make the exam available at 10:45 am, due the next day at this same time. Please use Gradescope to upload your exams.

Class Structure:

Each day, students will be asked to read along in the notes while watching a short video. You will be asked to pause and consider a question on occasion in the video, please follow along as there is an evil master plan to get you thinking and really learning how to problem solve. Please also read the related pages in the textbook. Once the basics of chemistry and problem-solving are mastered, science becomes a lot easier to tackle and the fear factor drops. That is what I am really trying to do in this class – show you the mechanics behind the curtain.

"Everybody is a genius. But if you judge a fish by its ability to climb a tree, it will live its whole life believing it is stupid." -Albert Einstein