CHEMISTRY 3060[1]
Physical Chemistry
FALL 2019

Overview

Instructor: David Farrelly, ML153, 797-1608

Email: david.farrelly@usu.edu (please put CHEM3060 somewhere in subject header) or use Course Mail.

Time and Location: MWF 9:30am - 10:20am, Merrill-Cazier Library 405.

	Tuesday	11:30 - 12:20	
Office Hours:	Wednesday	10:30 - 11:20	Drop in anytime (preferred) or by appointment.
	Thursday	11:30 - 12:20.	

Textbook: *Thermodynamics, Statistical Thermodynamics and Kinetics* by Thomas Engel and Philip Reid (Pearson). Any edition (or any variant including *Physical Chemistry* by the same authors).

Material: Chapters 1 - 11, 16-19 (selected parts of the last few chapters)

Lectures: There will be 2-3 in-class lectures each week. In weeks having only 2 lectures the 3rd lecture will be available as a pre-recorded lecture online at the CHEM3060 Canvas page. The extra slot will generally be used as a problem solving sessions.
Grading: There will be *unannounced* weekly 15-minute quizzes starting the second week of classes, graded problem sets (see later for details), 3 in-class midterm exams and a take-home Open World final which will consist of several longer, homework-like, problems. These will count toward the grade as follows.

Quizzes 100 points
Problem Sets 200 points
Take-home Final 200 points

Final grades will be assigned based on the actual distribution of scores obtained by the class rather than being based on predetermined cutoffs.

Exams: The dates for the midterm exams will be decided in class. The final will be a take-home Open World test and its due date will be decided in class.

Mathematics: Physical chemistry requires strong mathematical ability. It is, therefore, suggested - but not required - that you obtain a book with a title similar to: *Mathematics for the Physical Sciences.* Examples include *Mathematical Methods for Scientists and Engineers* by McQuarrie and *Applied Mathematics for Physical Chemistry* by Barrante. McQuarrie's book is excellent and much more thorough than Barrante but it is also significantly more expensive.

Quizzes

Quizzes

There will be a 15 min quiz most weeks.

1. Quizzes will consist of five short questions each of which will be graded 0, 1 or 2. The material will be anything covered up to that point in the semester - including Problem Sets and previous Quizzes.

[1] In accordance with the Americans with Disabilities Act, reasonable accomodation will be provided for all persons with disabilities in order to ensure equal participation in this course.

2. Quizzes should be done in an Examination Blue Book.

3. If you miss a quiz for any reason then make arrangements with me to make it up at my discretion.

Problem Sets

Problem Sets will be assigned roughly every two weeks and their due date will be announced in advance. However, ONLY one problem out of the problem set will be handed in for grading. The particular problem will be selected at random in class on the due date. If you miss that class I will ask you to hand in a different problem (in person) within two days (you won't know which problem until you are actually ready to hand in your homework). The Final exam will be modeled on the Problem Sets.

You may work problem sets together and I will arrange some times when you can work problems together in W226 and I will be available for questions during these occasions. The problem sets are designed to be challenging.

If you fail to hand in a problem within two days of the due date you will score 0 on that problem set. However, to have future problem sets graded you will still have to hand in any missed problems before (or at) the next due date. I will make exceptions for emergencies etc. at my discretion.

Problem set solutions should be neat with all steps in the derivation/solution explained. I will make a copy of, and then return ungraded, any assignments that are not legible or that lack short explanations of what you're doing – you will have 2 business days to submit a legible version which should lead to the same (even if incorrect) answer as the unacceptable original. Because the Final will be based on the Problem Sets it is important that you understand the solution to every problem and that your solution will be comprehensible to you when you come to do the Final.

Office Hours

You can ask anything about lectures, homeworks, quizzes etc. If you don't understand something but don't know what to ask then that is acceptable too. You are welcome and encouraged to come individually or with other members of the class in a small group whenever you want. Do not wait for regular office hours if you have a question. But please understand if, on occasion, I cannot deal with you on the spot. I prefer to be very informal with office visits so don't hesitate to knock HARD on my door (which I tend to keep closed because there is heavy traffic in the hallway).

Exams

There are no midterms in this class. The Final will be Open World and will be available for several days (to be determined); Open World means that you can use any resources you like –and especially your worked solutions to problem sets – except for interactive communication with other people. (including email etc).

Drop Dates

See the current Schedule of Classes (SoC) for all official dates.

Physical Chemistry Learning Objectives

1. Apply the basic concepts of calculus to concepts in chemistry.

2. Manipulate the gas laws to describe real and ideal gas behavior.

3. Discuss the Three Laws of Thermodynamics and their development.

4. Use the Maxwell equations and other thermodynamic relations to compute thermodynamic quantities from thermodynamic data tables.

5. Be able to derive relationships between thermodynamic quantities.

6. Interpret phase diagrams and discuss phase equilibria in terms of chemical potential.
7. Explain the origin of Keq and its relation to fugacity and activity; apply these concepts to ideal and real solutions of electrolytes and non- electrolytes and to colligative properties.
8. Apply the principles of electrochemistry to conductance, voltaic, and electrolytic systems.
9. Provide a physical basis for Debye-Huckel theory.
10. List the methods for arriving at a plausible mechanism and/or rate law based on kinetic information.
11. Apply the steady-state hypothesis to obtain rate equations.
12. Explain the basic principles of photochemical and radiation-chemical reactions.

More general goals of the physical chemistry program are that the student is able to:

1. Demonstrate competency in written and oral communication including using mathematics.
2. Relate the microscopic and macroscopic properties of matter to each other.
3. Apply thermodynamic, kinetic and quantum methods and concepts to all areas of chemistry and biochemistry.
4. Explain what the main areas of research in physical chemistry are and why research is being done in these areas.
5. Make either oral or written criticisms of research articles in physical chemistry.
6. Design real or gedanken experiments or simulations to test hypotheses.