CHEMISTRY 3060[1]
Physical Chemistry
FALL 2018

Overview

Instructor: David Farrelly, ML153

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.

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

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)

Grading: There will be 12 15-minute quizzes most weeks starting the second week of classes, graded problem sets (see later for details), and an in-class final exam

Quizzes	100 points
Homework Sets	200 points
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 an ability to use mathematical techniques. It is strongly 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 quite a bit more expensive.

Assignments and 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 lecture material, completed homework assignments, and prior quizzes.

2. Quizzes must be submitted 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.

[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.

Homework Assignments

There will be 10 homework assignments 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 without previous notice. 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 based on the Homework assignments.

You may work problem sets together and I will arrange some times when you can work problems in the room next to my office to facilitate asking questions. The problem sets are designed to be challenging.

Important: 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.

Very Important: Homework assignments should be neat with important steps in the derivation/solution explained. I will make a copy of, and then return any assignments that are not legible or that lack short explanations of what you're doing with an NG grade – you will have 2 business days to submit a legible version which should lead to the same answer – even if incorrect – as the unacceptable original.

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 **very 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 with people often asking me for directions if the door is open).

Exams

There will be a single in-class Final exam based on homework sets. A Practice Final will be supplied but do not assume that the actual Final will be a mirror image of the Practice Test.

Drop Dates

See the USU Fall 2018 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.

Assessment

In order to gauge the effectiveness of the Chemistry 3060 course, several different methods of Assessment will be employed including embedded questions.