CHEM 165 – Introductory Physical Chemistry
Fall 2016, MWF 9:40

Homework

The content in this course is pretty challenging, and cannot be mastered without blood, sweat, and tears as you review the material and do the homework problems. I will assign homework problems on average once per week. They will be fairly short, usually consisting of one or two problems, and are due promptly at the start of the following lecture. I will collect them at 9:45; if you arrive late, your HW will be late as well. These will be graded as follows:

Perfect or almost perfect, both in content and presentation (3 points)

Grade

Your grade for the course will be based on the total number of points you accumulate out of 600, relative to the class average. Thus, there is no meaningful letter grade that can be assigned to

Although I cannot at this time predict the difficulty of the exams and the overall strength of the class, I can say that the average score for the course has usually been around 65%. In a large statistical sample, for this course the average performance falls in the B category. But please note that the average could also be a little lower or higher, depending on the overall performance of the class. This grading scheme is based on the assumption that attendance is perfect, and that students come prepared and are engaged.

Office Hours and Outside Help

My office is Cook A-119. I will be available in my office Monday, Wednesday, and Friday, 10:30-11:30 AM (subject to change). You are welcome to just stop by my office during these times, but it would be even more efficient if you let me know that you will be coming in, and what I can help you with. If these times are not suitable for you, we can also set up an appointment at another, mutually convenient time. I encourage you very strongly to use me to clear up difficulties the material as soon as possible. Obviously, the next lecture will be that much easier to follow.

The only time I will not answer questions is on the day of the exam because I want to discourage
l me at 656-0273, or
use e-mail (*willem.leenstra@uvm.edu*) for quick consultations. You will find that I am exceedingly available. Review sessions may be scheduled if student demand warrants it. Organize it yourselves, and contact me.

Class Notes

My own experience tells me that it is hard to follow the thread of a discussion if you are furiously copying from the blackboard. Instead, I will have available on the web, via Blackboard, copies of my notes after each lecture. This allows you to just listen (or take skeleton notes) and possibly stay engaged easier. If, however, you are the type of student who learns better by taking your own notes, you should of course do so, and then use my notes as a backup.

Blackboard

This course management system will also serve as our course website. On it you will find this Syllabus and also

Responsibilities

Attendance. From the above, it should be very clear that missing a lecture (or spacing out on one) can be extremely detrimental to your continued understanding of the material. Thus, I expect perfect attendance. If you have a valid, serious reason to be absent, you must call me beforehand. It will be up to you to get all the information presented at the missed class.

Preparation. Secondly, I expect you to come prepared for each lecture by having read ahead in if you know what is coming. If I find that

Participation. Finally, I expect you to participate in class by being alert and ready to answer questions. I find it personally insulting to see you spacing out, looking off into space, or

mutual respect. So please make a determined effort to absorb all the information from each lecture.

The prototype for molecular bonding is the hydrogen molecular ion. It is asserted that application of the variational principle leads to the well-known energy level diagram and orbital sketches of second-row diatomics. Bond order and magnetism are explored for these systems. By going to LiH, the concept of hybridization of atomic orbitals comes about naturally without invoking valence bond theory.

Vibrational spectroscopy of real molecules is discussed as an extension of the idealized HO model to that of an anharmonic oscillator. Concepts of selection rules, overtones, and Raman spectroscopy are presented. As well, vibrational spectroscopy provides a convenient model to discuss the Boltzmann population distribution and its effect on energy level populations as seen in so-called hot bands.

Thermodynamics

The ideal gas law is reviewed, and the absolute zero of temperature is shown to be a natural consequence of the law. Deviation from ideality is explored through the van der Waals equation. The modification of the ideal model and its result in a modified equation is a general scientific (and chemistry) principle, and thus a detailed discussion is therefore important as a general subject. The van der Waals interaction is seen to be at the heart of the empirical adjustments to the ideal gas law that need to be made.

The first law of thermodynamics is shown to be no more than an accounting scheme for energy

ues. The
-volume (bomb)
setup. For the more convenient open-air setup, a new quantity, enthalpy, is defined, which will be used in place of internal energy.

Thermochemistry is introduced as simply algebra applied to cyclic chemical processes.

Phase equilibria are introduced phenomenologically via PT graphs. Minimization of Gibbs free energy can also be applied to the graphs, and results in an equation that connects pressure changes to temperature changes, the Clausius-Clapeyron equation. Temperature dependence of enthalpy is worked into the equation to account for deviation from ideality.

The special case of liquid