I. Course Overview: What’s the point?

Thermodynamics is the study of the energy of the chemical processes that surround us. We will explore how the laws of thermodynamics affect chemical reactions and the states of matter. We will then move on to studying kinetics, i.e. the rate of chemical reactions. Once we understand why the world is moving toward a more chaotic, but lower energy, state, we will grasp how those trends change how quickly a reaction takes place. This course will give you insight into many of the physical properties that you’ve been introduced to in earlier classes.

One of the goals of the course is to help you bridge the space between being a science student and becoming a scientist. Much of the lab work, as well as some of the lectures, will focus on thinking creatively to identify the problems in front of us and how to solve those problems.

The laboratory component of the course is structured to introduce you to some of the types of problems physical chemists work on and the techniques often used in the field.

II. Student Responsibilities

A. Ethics

No member of this class shall take unfair advantage of another member.

Everyone will abide by the Gustavus Adolphus Honor Code.

B. Mastery of material

1. Attendance

   Attendance in this course is necessary to grasp the material. There will be a checklist passed around during each class period. Checking someone else’s name off when they are absent is a violation of the honor code. If you miss 5-10 class meetings, your grade will be dropped by a full letter. If you miss more than 10 class periods, you will be required to meet with me to discuss receiving credit for the course.

   I understand that emergencies and long illnesses occur which can keep people from attending class for an extended time period. If these events occur, you are responsible for informing me AS SOON AS POSSIBLE. E-mail will most often suffice. I have no intention of invading your privacy, but please provide me with as much information as you are comfortable so that I can provide you with as much support as possible.

2. Homework

   Homework sets will be due on Wednesday at 5 PM outside my office. Pre-lab questions are due at 5 PM on Friday, again outside my office. Lab questions/reports will be due at your normal lab time (prior to the start of that day’s experiment). Usually lab questions and reports will be due the week following the completion of the experiment, but that schedule may
be modified so as to balance the lecture/lab workload.

Discussion questions will not be accepted late, except in case of illness (must discuss with me [e-mail is fine] prior to that class session). Discussion questions must be completed on your own and cannot be discussed with other students (current or former). You are more than welcome, and encouraged, to come and discuss them with me.

“Problem” questions will tend to be more quantitative in nature. You may discuss these problems with other students, but all work turned in must be your own. If you choose to purchase the solution manual or solution sets on-line you may only use these as a guide. Copying from any solution set (from previous courses or published material) is considered an honor code violation. Your answers to “problem questions” will be accepted late, but 10% of the points you receive will be deducted for each day that the set is late. Again, illness will most often be an exception to this policy, assuming you are in constant/reasonable communication with me.

Notes: In quantitative work, please cross out your “mistakes” with a single line. For me to best help you learn the material, it’s good for me to know how you approach your problems.

3. Exams

There will be three exams and the final exam. Two of the exams will be in class and the midterm will be a take-home exam. The dates of the exams are listed on the attached calendar. All exams will be cumulative, so anything we’ve talked about OR has been covered in the reading is fair game.

All exam work must be your own.

Use of outside materials will be specified at each exam. If outside materials are permitted, no solution sets (from other courses, this course or published material) may ever be used on an exam.

4. Projects

At the end of the term, each of you will hand in a project about a research method in physical chemistry. This project can take many forms, and we will have a more detailed discussion about it within the next week or so.

C. Communication


If you have a physical, psychiatric/emotional, medical or learning disability that may have an effect on your ability to complete assigned course work, please let me know. I will provide assistance and accommodations upon receiving verification from Laurie Bickett in the Academic Advising Center.

It is the policy of Gustavus Adolphus College to provide for the needs of enrolled students who have disabilities. In so doing, a number of individuals and departments cooperate to ensure equality of opportunity and maximal participation in the College's educational programs. Students requesting accommodations for their disability must have documentation of the disability on file in the Academic Advising Center. Appropriate accommodations are decided on an individual basis, and are based on a clear need for such accommodations.
2. Illness

If an illness prevents you from completing an assignment on time, please inform me as soon as possible. More details are given above in the “Homework” section.

III. Course Topics

A. Gases and Molecular Interactions
B. Energy and State Functions
C. Laws of Thermodynamics
D. Equilibria
   1. Thermodynamic Equilibrium
   2. Chemical Equilibrium
   3. Phase diagrams
   4. Colligative Properties
   5. Phase transitions
   6. Activity
E. Electrochemistry
F. Kinetics
G. Extra topics

IV. Laboratory Work

The laboratory work in this course is critical for your understanding of thermodynamics and kinetics. The work for the lab section must be taken as seriously as problem sets and exams. Exams will cover material from the experiments and the necessary reading for the experiments.

Attendance at lab is mandatory. If you are too ill to come to lab, you must call my office at x7321, (leave a message if I am not there) and inform me of this fact.

Closed toe shoes MUST be worn in lab at all times. If you come in wearing sandals I will send you back to your room to change. For certain experiments, I may require other wardrobe safety measures, such as wearing glasses instead of contact lenses and/or long pants.

V. Grading Scheme

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two In Class Exams</td>
<td>2 x 100 points</td>
</tr>
<tr>
<td>One Take Home Midterm</td>
<td>1 x 150 points</td>
</tr>
<tr>
<td>One Final</td>
<td>1 x 200 points</td>
</tr>
<tr>
<td>Nine Graded Problem Sets</td>
<td>90 points</td>
</tr>
<tr>
<td>One Final Project</td>
<td>1 x 200 points</td>
</tr>
<tr>
<td>Laboratory Work</td>
<td></td>
</tr>
<tr>
<td>- Pre-lab Questions</td>
<td>70 points</td>
</tr>
<tr>
<td>- Lab Notebook</td>
<td>70 points</td>
</tr>
<tr>
<td>- Experiment Write-Ups</td>
<td>140 points</td>
</tr>
<tr>
<td>Totals</td>
<td>1120 points</td>
</tr>
</tbody>
</table>

I generally DO NOT use a curve when assigning letter grades.
VI. Other Notes

There will be a general pattern to our work in 371. Monday sessions will consist of a half-hour of Q & A for your problem sets and a short lecture. On Wednesdays, you will hand in your problem sets, and your pre-lab questions are due on Fridays. On Fridays, I will hand out an outline of what material we are going to cover the following week and what reading you are responsible for.

Although there is no formal grading of participation, it’s highly recommended that you ask questions and try to actively understand the material as we discuss it in class. A qualitative interpretation of your participation can help your grade if you are on the edge two grades.

There may occasionally be pop quizzes. These quizzes will be reviewed by me or gone over in class but will not be graded. They are solely to help you see your strengths and determine where you may need a bit more work.

You should feel free to stop by my office outside of office hours if that is what you need to do. To ensure that I am available when you need me, it may be in your best interest to schedule a meeting time.

All exams will cover material from both lecture and lab. There will be 10 problem sets, but your lowest grade will be dropped.

**Extra Credit Opportunity:** Throughout the term, as you watch TV and see movies, you’ll encounter interesting explanations of thermodynamics and kinetics. If you see an explanation of some material we’ve covered in class in a TV show or movie, you will receive 10 points if you write up the explanation. You’ll need to include the TV show/movie name, the date and time the show was aired for TV shows, a description of the situation, what about the description was correct, what was simplified, and what was incorrect. Each student may only had in one example, and the deadline for turning in the write-up for extra points is the last day our class meets, December 14th.