

Thermal Physics Physics 302

Spring '11

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Text: Daniel Schroeder: *Thermal Physics, first edition*
(Addison, Wesley, Longman, 2000).

<u>Week</u>	<u>Week Starting</u>	<u>topic</u>	<u>Chapter</u>	<u>tests</u>
1	1/17/11	review thermodynamics	1	
2	1/24	Ideal Gas	1	
3	1/31	2 state system	2	
4	2/7	2 state system	2	
5	2/14	entropy and heat	3	(Test #1 on 2/16)
6	2/21	chem potential, heat engine	3, 4.1	
7	2/28	free energy	5.1-2	
8	3/7	phase transitions	5.3-4	(Test #2 on 3/9)
	3/14-3/25		Spring Break	
9	3/28	Boltzmann statistics	6	
10	4/4		6	
11	4/11		6	
12	4/18	Fermi & Bose gases	7	(Test #3 on 4/20)
13	4/25		7	
14	5/2		7	

Final Exam on 5/9 at 9am - noon (No Exceptions!)

Grades		
<u>Final %</u>	<u>grade</u>	<u>Breakdown:</u>
100-90	A to A-	60% Tests
90-80	B+ to B- etc.	15% Homework
C-	S	& Quizzes
		25% Final

Physics 302 is an exploration of both the macroscopic description of heat and the laws of thermodynamics and the microscopic (atomic and quantum mechanical) foundation that is called statistical mechanics. Physics 203 developed the basic concepts of heat energy, heat flow, internal energy, ideal gas law, kinetic theory, and the three laws of thermodynamics. We will review and expand on these concepts and then see how they can be developed from a microscopic approach. Because we will be describing HUGE numbers of particles (on the order of 10^{23}), we can assume a completely random process of equally probable states that will result in very specific equilibrium states—hence the name statistical mechanics.

The major goals for the course are for students to:

- Develop an understanding of thermodynamics and statistical mechanics
- Connect these concepts to the models and equations we use to describe nature
- Continue developing the capacity to break down a problem into solvable pieces

I expect you to work more independently in this course than in the 203-205 courses.

You will need to work 2-3 hours out of class for every hour in class. We learn physics by working problems, not by reading about working problems. Understanding physics is a learned skill, like cooking or playing basketball. It takes time, effort, and practice.

When writing your homework solutions, **being able to explain what you have learned is an essential step in the learning process.** Thus, for all homework and exams, your thought process must be clear. **Neatness counts.** When working problems, your steps should be explained using short phrases. Any sketches or graphs should be clearly labeled. Use of *Mathematica* is normally acceptable, but only as a step in the problem solution. The solution still needs to be easily understandable with explanations of your work.

To make your time and effort the most efficient, I suggest the following study procedure:

1. Read the chapter prior to lecture, so that you will know what it's about. I recommend skimming the chapter and writing down an outline of the headings to form a context for the lecture.
2. Listen carefully to the lecture and take notes.
3. Start working problems as soon as they are assigned, going back through the chapter to clarify points as they come up. Instead of glancing over the example problems, **work** them without looking at the answers until you're really stuck.
4. **Think!** Don't just try to fit the problems into an equation or sample problem, think through the question and the physics first.

Rules during class:

- 1) If you have a question then ask. If you don't know how to phrase the question, then ask a more general question (what is the important concept? how does one obtain an equation from the concept? Can you give me a simple example of this concept?) If you have a question, then many others will as well. It is much easier for me to answer a question when it occurs than to try to address it several days later when we may be on a different topic.
- 2) In consideration of your fellow students, please do not eat during class, leave your cell phone on, nor use your computer except to take notes
- 3) You should come to class on time and stay engaged as we explore the concepts and how to apply them.
- 4) I encourage you to see me after class if you have questions.
- 5) It is very important that what you turn in for a grade is your work. If you copy from another student or source and submit it for a grade, then you risk receiving an F in the course. The detailed dos and don'ts for Academic Integrity are on a separate page.

Policy Regarding Conflicts between Academic Responsibilities and Co-curricular/Extra-curricular Activities

The College of Wooster is an academic institution and its fundamental purpose is to stimulate its students to reach the highest standard of intellectual achievement. As an academic institution with this purpose, the College expects students to give the highest priority to their academic responsibilities. When conflicts arise between academic commitments and complementary programs (including athletic, cultural, educational, and volunteer activities), students, faculty, staff, and administrators all share the responsibility of minimizing and resolving them.

It is your responsibility to inform me in writing of conflicts between academic commitments to this course and complementary programs in which you participate as soon as you are aware of them. You are to discuss with me how you might fulfill your academic commitments to our mutual satisfaction without sacrificing the academic integrity and rigor of the course.

Academic Support

The Learning Center (ext. 2595) offers services designed to help students improve their overall academic performance. Sessions are structured to promote principles of effective learning and academic management. Any student on campus may schedule sessions at the Learning Center.

Any student with a documented learning disability needing academic accommodations is requested to speak with Pam Rose, Director of the Learning Center (ext. 2595), and the instructor, as early in the semester as possible. All discussions will remain confidential.

Homework Solutions for Physics 302

Solutions will be posted on the Consort Libraries Electronics Reserve web site. To access the solutions, go to:

<http://eres.library.denison.edu/eres/default.aspx>

Click on "Electronic Reserves & Reserves Pages"

Use one of the methods listed to search (Course number, instructor, etc.)

Click on Woo-Phys302

Type in the Course Password: woophys302

Click "Accept"

This will take you to a list of homework solutions that have been posted so far.