Physics 2305 1 May, 2000
Study Guide for Exam 4

The final exam will be held in three rooms in Litton Reaves on Saturday, 6 May, at 7:05 pm. You only need to bring (1) a calculator, and (2) a No. 2 pencil. Use the table below to find your assigned room.

Sec.	Litton Reaves	Sec.	Litton Reaves	Sec.	Litton Reaves
4122	1870	4134	1760	4146	1860
4123	1860	4135	1870	4147	1870
4124	1870	4136	1760	4148	1860

Approximately one third of the final exam will cover material not on previous exams: the end of Chapter 19 (sections 19-8 to 19-10) as well as Chapters 20 and 21.

The exam will consist of approximately 14 multiple choice questions, (each worth four to six points, and 3 free-form problems, each worth 10 poins.

As usual, use the reviews and summaries at the end of the chapters to prepare for the exam. Also study problem sets, old quizzes, and previous practice tests. Definitely go over old exams. A good idea is to team up with classmates so that you can see different forms of the old exams. For the new material, some practice questions will be posted on the website by Wednesday.

New material covered:

Chapter 19

$\Delta E_{int} = Q - W$ First Law of Thermodynamics

You should understand the significance of adiabatic, constant-volume, and cyclical processes and free expansions in terms of the First Law.

$Q = nc\Delta T$ Heat in terms of molar specific heat

$W = \int p\, dV$ Work in terms of pressure and volume

In addition, you should give the rest of Chapter 19 a careful review, much of the material there is crucial to applications in Chapters 20 and 21.

Chapter 20

$pV = nRT$ Ideal Gas Law

$v_{rms} = (3RT/M)^{1/2} = (3kT/m)^{1/2}$ rms velocity

$\langle K \rangle = (3/2)\, kT$	Mean kinetic translational energy
$\Delta E_{int} = nC_v \Delta T$	for *any* process
$C_v = (f/2)\, R$	Molar specific heat at constant volume
$C_p = C_v + R$	Molar specific heat at constant pressure

For adiabatic processes, we have two special relations:

pV^{γ} = constant; $\gamma = C_p / C_v$
$TV^{\gamma-1}$ = constant

Pay careful attention to Table 20-5. You should be able to derive the special results for isobaric, isothermal, adiabatic, and isochoric processes.

You will need to memorize the numbers of degrees of freedom for monatomic, diatomic, and polyatomic molecules.

Mean free path and the Maxwell-Boltzmann distribution, while very interesting, will not be on the exam.

Chapter 21

$\Delta S = \int dQ/T$	Entropy
$S = k \ln \Omega$	Entropy in terms of multiplicity of states
$\Delta S \geq 0$ for a closed system	Second Law of Thermodynamics
ε = what you get / what you pay for	know how to apply this
$\varepsilon = 1 - (T_c / T_h)$	Efficiency of an ideal engine
$K = T_c / (T_h - T_c)$	Coeff. of performance, ideal refrigerator

You should understand the consequences of the Second Law.

Check the web site for more information:
http://www.phys.vt.edu/~sloan/teaching/phys2305