

Physics 206b

Homework Assignment I *due August 24, 2007*

There are a few things you should know about homework in this class. Homework will typically be assigned once per week. All homework will be due one week after the day on which it is assigned unless stated otherwise. **Please** staple your pages together. Juggling two or three hundred pages becomes impossible unless each person's homework exists as a unit. Folding a corner is worse than no staple at all. (I will throw away all but the first page of multipage submissions unless stapled appropriately. The grade will be based on the first page only.) Also, write your name on your submission—this seems obvious, but I've had *lots* of "mystery homeworks."

The assigned questions will be drawn from the topics being discussed during the time in which the homework is being done by you, so if you don't know how to do a problem on Monday, wait until Tuesday or Wednesday before worrying. If we run behind and we don't manage to cover sufficient material for you to do all problems on an assignment, I will announce in class which problems will be moved to the following week's assignment. This happens pretty often.

A premium is placed in this class on reasoning. Even if your answer is wrong, if it is well-reasoned it will earn nearly full-credit. Answers given without the reasoning used to obtain those answers are automatically wrong. This is not a class about facts, it is a class about thinking about facts.

Since grading the assignments in this class is a far greater task than can be managed by either the Teaching Assistant or the Professor in the allotted time, assignments will be graded via a sampling method: Not all problems will be graded. Instead, several will be selected and only those will be graded. In addition, credit will be given simply for having *attempted* all of the problems on an assignment. (This is the same scheme as was used in 206a last Spring, for those of you who were in that class.) I do realize that this system risks penalizing someone who just happens to get unlucky in the problems they choose to skip. Should you fall into this statistically-unlikely hazard, bring it to my attention at the end of the semester and some appropriate adjustment will be made. Despite the fact that not all problems will be graded, please do all of the assigned problems (you must attempt all problems in order to get full credit), there is a definite relationship between time spent on homework and exam performance. And above all: **DON'T PANIC!** Help can be gotten during office-hours. In fact, I strongly recommend doing additional problems—beyond those assigned by me. Giving yourself the extra push will also give you an extra edge!

Now, back to our show.

1. A pendulum is constructed out of a very thin rod of copper with a bob at the end with a mass of 2 kg. When the pendulum is initially built, its temperature is 290 K and it has a period of one second. If it is warmed up to a temperature of 310 K, what will its period be?
2. For the pendulum described in the previous problem, how many cycles will the pendulum go through in 24 hours at the higher temperature? If the pendulum is used as the heart of a clock, what time will the clock display after 24 hours at the higher temperature if it read 3:00 p.m. at the instant the temperature was increased?

- 3 . A cube of aluminum that is 5 cm on each side is placed in 1 liter of water at 10°C in a graduated cylinder. The water is warmed up slowly, so that the aluminum remains in equilibrium with it, to a temperature of 90°C . What volume is indicated on the graduated cylinder at the higher temperature? (Ignore thermal expansion of the cylinder.)
- 4 . At 24°C a steel nut is threaded onto a brass bolt. The bolt has a diameter of $\frac{1}{4}$ inch. The nut is slightly loose, with a diameter 10 microns larger than that of the bolt. Assuming the nut and bolt always have the same temperature as each other, at what temperature will the nut be tight?