Recitation Problems for Week 8, Tuesday

Tuesday Week 8 Recitation

Name (Printed) _____ Section _____

Instructor Signature: _____
Due: Monday October 22 in lecture.

Observing the spectrum of Hydrogen, Helium and Nitrogen using diffraction gratings.

6.P70. Observe the atomic spectrum of Helium using a diffraction grating and a helium discharge tube. Explain the difference between "Energy Levels" and the "Spectral Lines" that you have observed.

6.C10. (a) Sketch the Hydrogen energy levels up to $n = 8$. (b) What are the energies of the first five lines in the Balmer series (ending in the $n = 2$ level)? (c) Which of these lines are visible?

6.P71. Observe the atomic spectrum of Hydrogen using a diffraction grating grating and a hydrogen discharge tube. Note how many spectral lines you see, and what colors they are. Hydrogen gas is usually an H_2 molecule, why do we believe that we have atomic Hydrogen?

6.P72. Observe the the Nitrogen discharge tube using your difraction grating. How does this differ from the spectrum of either Hydrogen or Helium? What are the colors of the observed bands?

6.P73. Observe a glowing filament using your difraction grating. If you use a dimmer switch to dim or brighten the light, what happens to your observed specrum f light?

6.S50. A substance is made up of a number microscopic objects. In the lab, we heat it up to a high temperature, and then observe the photons being emitted from the object. Our detector shows that photons with energies of $E_\gamma = 0.3\,eV$, $0.5\,eV$, $0.8\,eV$, $2.0\,eV$, $2.5\,eV$ and $2.8\,eV$ are being emitted by the substance. (a) You are told that the substance has four bound energy levels. Sketch a possible energy level diagram that would explain the observed photons. (b) You now cool your material down to a very cold temperature, and then expose it to photons in the energy range of $0.25\,eV$ up to $3.0\,eV$. What absorbtion bands do you see? (c) One of your colleagues claims that all systems can be accurately modeled as harmonic oscillators. Is this a good model for the substance that you have?