Example Questions for Exam #1
PHY361

- The exam will cover sections 3-1 to 5-2, inclusively.
- Sections 5-3 to 5-7 will be covered in the second exam.
- Make sure you can answer all questions at the end of each section in the text.
- The following list of questions is longer than the real exam will be.

- Be able to explain each experiment discussed in class, and how it contributed to quantum mechanics.
- Describe in words the relation between Planck's law and:
  a) Stefan-Boltzman law, and b) Wein's displacement law.
- What is the difference between the Planck law and the Rayleigh-Jeans equation?
- What is the UV catastrophe, what is the cause of it, and how did Planck's law overcome it?
- Sketch the blackbody spectrum (intensity vs. wavelength) for two separate temperatures. Indicate which temperature is higher. Point out the relevant differences between the two spectra.
- Explain the two different places that quantization is used to build the Bohr model of the atom.
- Why is Compton scattering not considered classical?
- A 0.8mW laser pointer is emitting red light of 660nm in wavelength. How many photons does it emit every second?
- Briefly explain the experimental results of the Franck-Hertz experiment. How did they support the Bohr model of the atom?
- In Moseley's equation, what is the value of A_n, derived from the Bohr model?
  Why did Moseley plot $f^{1/2}$ vs. Z instead of f vs. Z?
  Explain the significance of the parameter b.
- What is the highest frequency of the H spectrum?
- Why do heat lamps radiate infrared light?
- What does UV light, not visible damage the skin?
- Draw a graph of the kinetic energy, electrical potential energy, and total energy as a function of 'r' of an electron in a circular orbit around the nucleus.
- How much every does it require to ionize an election in the n=2 orbital of a hydrogen atom? (eV)
- List two examples of blackbody sources of radiation.
  List two light sources which would not be considered black body.
- A tungsten filament in a 100 W light bulb is at a temperature of 5600 K.
  What is the peak (most intense) wavelength?
  If all of the power was lost to electromagnetic radiation, what is the surface area of the filament?
- Calculate the L_α frequency for hydrogen (n=2 -> n=1).
- What is the shortest possible wavelength that can be emitted by the hydrogen atom?
- Will 300 nm light induce a photoelectric current from Ag (work function 4.73 eV)? Show work.
- What is the cutoff wavelength for a 60 kV X-ray tube? Is it the maximum or minimum wavelength?
- How was deuterium, the heavy isotope of hydrogen discovered?
- What is the de Broglie wavelength of an electron a) traveling 1 m/s? b) With 53 eV of energy?