

## Physics 100 - Spring 2007 - Recitation 9

### Preparation for EXAM 2

I looked thru my lecture notes since the last exam and came up w/ the following topics list:

waves, electromagnetic waves, diffraction, refraction, interference, dispersion, Planck, blackbody radiation, photoelectric effect, de Broglie and his matter wave hypothesis, rise of quantum mechanics, the electron-volt, how imaging depends on wavelength, Bohr, Bohr model of atom, circular motion, mathematical condition for circular motion, atomic spectra (what is meant by spectrum? cause of spectra, potential use), Heisenberg, Schroedinger, Schroedinger's equation (basically what it is and why important, not how to solve it or write it down), basic idea of what comes out of Schroedinger's equation when solved for case of hydrogen atom, atomic orbitals, Rutherford, Rutherford scattering, intrinsic spin, fermions, bosons, Stern-Gerlach experiment, periodic table of the elements, atomic bonds, covalent and ionic bonds, Heisenberg's uncertainty principle, Copenhagen interpretation of quantum mechanics, many worlds interpretation of quantum mechanics, Max Born, quantum entanglement, Roentgen, x-rays, lasers, proton, neutron, nuclear physics, relevant energy scale for atomic and nuclear processes, gamma decay, beta decay, alpha decay, band of stability, half life, decay constant, binding energy/nucleon curve, fission, fusion, fission bombs, chain reaction, stellar evolution, black holes, neutron stars, white dwarfs, supernovae, synthesis of elements

*Holy Crap . . . it's a lot of stuff!*

Look thru the list . . . if something doesn't ring a bell, you might want to ask about it . . .

## A few general questions on important topics:

What evidence supports the idea that light is a wave (particle)?

Describe at least two experimental results that contributed to the rise of quantum mechanics.

Describe the Bohr Model of the atom.

Why is the Bohr Model of the atom important historically ... and in the modern age?

Jimmy Neutron says his computer can calculate the future of the universe in detail. Could this be true or not. Why?

Dirac said the rise of quantum mechanics "solved chemistry". What did he mean? Was he correct?

The binding energy per nucleon vs. Atomic Mass curve holds the key to understanding the stars. Why?

Describe the life of a star. ← The hot bright kind in the sky as opposed to the Hollywood kind.

What is a chain reaction?

What would happen to a baseball falling into a black hole?

How are quantum mechanics and chemical properties related via the periodic table?

Your friend asks, "Which is more dangerous: an  $\alpha$  source or a  $\gamma$  source?" How do you answer her?

### Some possible areas for Analytical questions —

relate wave speed, frequency, wavelength and period

Determine wavelength for matter w/ momentum  $p$

Relate energy of photon to frequency and color and wavelength.

Relate energy and frequency emitted or absorbed photon to energies levels of  $e^-$  in atom.

Relate uncertainty in position to uncertainty in momentum.  
Same for " " Energy " " " time.

half life problems

Radioactive decay: find parents or children  
of a given nucleus.

Energy released in nuclear decay or reaction or bomb.

Fission and fusion reactions: find parents  
of products.

Examples of analytical problems like those mentioned  
above can be found in the problem sets and  
recitation modules done since the last exam.

Your TA should have copies of these  
problem sets and recitation modules for you  
to examine if needed.