Physics 117 HW # 13 Problems

Ch 23: Q: 24, 38, 52; Ex: 15, 20, 23

Ch 24: Q 1, 6; Ex: 1, 7.

24. In Rutherford's model of the atom, nothing separates the negative electrons from the positively charged nucleus but empty space. Why don't the electrons just rush right into the nucleus?

38. What property of the emitted photoelectrons depends on the frequency of the incident light?

52. Radon (element 86) is a gas. Would you expect the molecules of radon to consist of a single atom or a pair of atoms? Why?

15. What is the radius of the $n = 4$ level of hydrogen?

20. When a proton captures an electron, a photon with an energy of 13.6 eV is emitted. What is the frequency of this photon? Does it lie in, above, or below the visible range?

23. What difference in energy between two atomic levels is required to produce an X ray with a frequency of 2×10^{18} Hz?

1. Make a list summarizing the successes and failures of the Bohr theory.

6. For standing waves on a guitar string, adjacent antinodes are always moving in opposite directions. Use this principle to explain why a standing-wave pattern with three antinodes cannot exist on a wire loop.

1. What is the de Broglie wavelength of a Volkswagen (mass = 1000 kg) traveling at 30 m/s (67 mph)?

7. What speed would an electron need to have a wavelength equal to the diameter of a hydrogen atom (10^{-10} m)?