Krane Chapter 6

Problem 8

$d = (e^2/4\pi\epsilon_0)Zz/K = (1.44Mev - fm)(2)(29)/6.0Mev = 14fm$

Problem 17

The transitions of the Lyman series are those with n0 = 1 Paschen series have n0 = 3

$\Delta E = E_n - E_{n0} = h\nu = hc/\lambda$

$\lambda = (hc/13.6ev)(n \bullet n0)^2/(n^2 - n0^2)$

$\lambda_{\lim it} = (hc/13.6ev)(n0)^2$ (Let n goto infinity)

Problem 18)

From $v = n\hbar/mr = n\hbar/(mn^2 a_0) = (1/\hbar n)((e^2/4\pi\epsilon_0) = \alpha c/n$

For a different nuclear charge use Ze

$v = Z\alpha c/n$

Problem 22

The photon energies of the incident light are

$E = hc/\lambda = 1240eV - nm/59nm = 21eV$

When (and if) an atom in a ground state absorbs a 21 eV photon the atom is ionized (requires only 13.6 eV).

The excess energy (21-13.6) appears as kinetic energy of the electron (neglecting the small recoil energy of the nucleus.) Hence 21-13.6 = 7.4 eV is the KE of the electron.

Problem 37

(a) $2\pi r = n\lambda, \;\; n = 1, 2, 3...$

If the circumference is an integral number of deBroglie waves, then after each orbit their will be a ”wave with no beats” or a standing wave on the circle.

(b) with $\lambda = h/p$

$2\pi r = n\lambda = nh/p = nh/mv$

so

$mvr = nh/2\pi = n\hbar$