Reminders 04-23-08:
-Exam 3 Average 65.0%
-Exam 4 Monday May 5
-Final Exam Wednesday May 7

Outline:
-Line Spectra and the Bohr Model of Atom
-Franck-Hertz Experiment
-DeBroglie Waves

- What should the energy of photons be be so that the maximum change in wavelength due to Compton scattering by electrons is 1%?
  - Using these photons, what is $\Delta\lambda$ in angstroms for Compton scattered photons at 60°?
  - What is the energy of the recoil electrons in this case?

$$\Delta\lambda = \lambda' - \lambda_0 = .0243\text{Å}(1-\cos\theta)$$
$$= \frac{h}{m_e c}(1-\cos\theta)$$

$$1\text{Å} = 10^{-10}\,m$$

$$\frac{\Delta\lambda}{\lambda} = .01 = \frac{.0243(1-\cos\theta)}{\lambda}$$

$$\theta = \pi$$

$$.01 = \frac{.0243(2)}{\lambda}$$

$$\lambda = \frac{.0486}{.01} = 4.86\text{Å}$$

$$E_r = hf = \frac{hc}{\lambda} = \frac{(6.626\times10^{-34})(3\times10^8)}{4.86\times10^{-10}m}\ \frac{1eV}{1.6\times10^{-19}J}$$

$$E = 2550\,eV$$

Recoil energy not relativistic

$$\vec{p}_{1r} = \vec{p}_{2r} + \vec{p}_e$$

$$\vec{p}_e = \vec{p}_{1r} - \vec{p}_{2r}$$

$$p_e^2 = p_{1r}^2 + p_{2r}^2 - 2p_{1r}p_{2r}\cos\theta$$

$$p_e^2 = (p_{1r} + p_{2r})^2 = \left(\frac{h}{\lambda_1} + \frac{h}{\lambda_2}\right)^2$$

If $\lambda_1 = 4.86\,\text{Å}$

$\lambda_2 = ?$

$\lambda_2 = 4.86 - (.01)(4.86)$

$\lambda_2 = 4.81\,\text{Å}$

$p_e^2 = 1.86\times10^{-48}\ \text{kg m s}$

$$E = \frac{p^2}{2m} = \frac{1.86\times10^{-48}}{2(9.11\times10^{-31})}\cdot\frac{1}{1.6\times10^{-19}}$$

$= 6.39\ \text{eV}$

$h = 6.626 \times 10^{-34}\ J \cdot s$

$h = \dfrac{6.626 \times 10^{-34}}{1.6 \times 10^{-19}} = 4.14 \times 10^{-15}\ eV\text{-}s$

If λ in nm $hc = 1240$

If λ in Å $hc = 12400$

$E = K + U =$ ________ - ____________ (1)

$\Sigma F = ma \rightarrow$ _________ = ____________ (2)

Use (2) to get $K =$ _____________

Use that result substitute into (1) to get
$E =$ _____________ (3)

Solve (2) for $v^2 =$ _______________

Solve the quantized L for $v^2 =$ ____________

Equate and solve for $r_n =$ ____________