Ch 29/30/31 Review Notes

Ch 29

	energy	momentum	wavelength	properties
particle	$1/2mv^2$	mv	h/p (de Broglie)	conservation of p and E
wave	hf=hc/λ	h/λ	λ or v/f	diffraction interference
units	J or eV	kgm/s or NS	m	

Remember:

1.6×10^{-19} J = 1 eV

Radio ⟶ Gamma = ↓ λ, ↑ f, ↑ E

Momentum in an Atom:

- Bohr = proportional to n (can't be 0)
- Quantum = proportional to l (can be 0)
- deBroglie = inversely proportional λ (p = h/λ)

Photoelectric Effect:

- **$hf = KE_{max} + W_o$**
- W_o = work function = unique for metal = energy to knock out electron
- KE_{max} = current, extra energy for e to move faster
- hf = energy on ONE photon

Compton Effect

- **$\Delta\lambda = (h/mc)(1-\cos\theta)$**
- need x-ray photon energy
- h/mc = Compton wavelength for electron moving at c
- θ = angle between incident and transmitted photon/wave
- λ out > λ in (less energy out)

Heisenberg Uncertainty

- **$\Delta p \Delta y \geq h/2\pi$**
- **$\Delta E \Delta t \geq h/2\pi$**

Ch 30

Rydberg - Chemistry method

- **$1/\lambda = R(1/n_2^2 - 1/n_1^2)$**
- **$R = 1 \times 10^7$**
  - > n = 1 (Lyman) UV
  - > n = 2 (Balmer) vis
  - > n = 3 (Paschen) IR

min E: $n_2 = n_1+1$

max E: $n_1 = \infty$

hc/λ = Energy in Joules

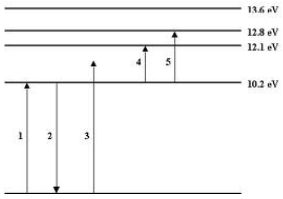
Quantum Method

$E_n = 13.6(Z^2/n^2)$ E in eV

Quantum Numbers

- n, ℓ, m_ℓ, m_s
- $\ell < n$, $|m_\ell| \leq \ell$, $m_s = \pm 1/2$
- # of total e⁻'s = $2(2\ell + 1)$
- Paulie Exclusion = no 2 e⁻'s have all the same quantum #'s

Be able to read and get info from energy level diagram:



Ch 31

Be able to read $^{14}_{6}C$

Isotope = changes A, Element = changes Z

Decay EQ's

Mass and charge conserved (Add up on both sides)

- alpha: Helium nucleus $^{222}_{88}Ra \rightarrow {}^{4}_{2}He + {}^{218}_{86}Rn$
- Beta: electron $^{14}_{6}C \longrightarrow {}^{14}_{7}N + {}^{0}_{-1}e$
- Gamma: photon $^{125}_{53}I^{*} \longrightarrow {}^{125}_{53}I + \gamma$

Mass Defect into Energy

(aka binding energy)

- $E = \Delta mc^2$ (Joules!!!!)
- $E = [Z(m_p) + (A\text{-}Z)m_n)]$ (u!!!)
- E/nucleon = E/A

Half Life

$T_{1/2} = \ln 2/\lambda$ (λ = DECAY CONST)

$A = -\Delta N/\Delta t = -\lambda N$ (in Bq!!!)

Conversion from N to mass:

(N nuclei)(mole/6.02 x 10^{23} nuclei)(A g/mole)