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Photons

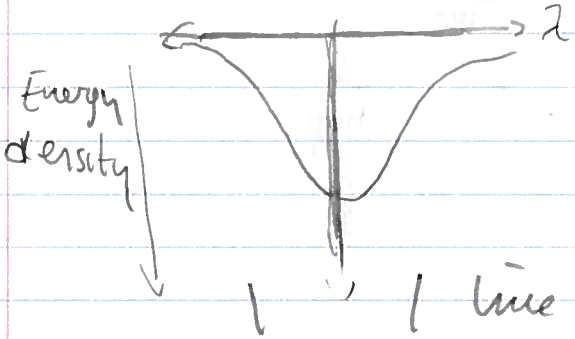
Bound Bound Absorption

Electron Absorbs Photon & jumps to higher energy level in Atom

Absorption ⟺ EMISSION

Inverse of Absorption is EMISSION => Electron Emits / Realases photon & Jumps down Energy Level

$\Delta p \Delta x \geq \frac{\hbar}{2}$ $\Delta E \Delta t \geq \frac{\hbar}{2}$



$\lambda = \frac{hc}{\Delta E}$

If light has enough energy it can kick electron out of Atom completly

Possibilities of Radiation

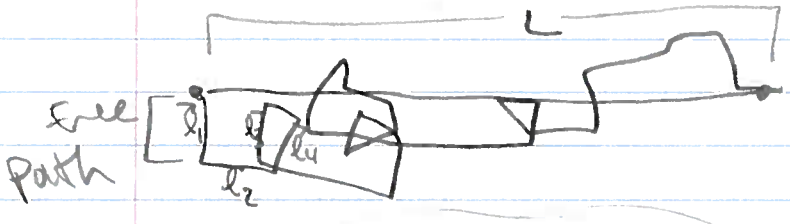
ionization ↔ recombination

free electron moves faster when absorbs photon

electron emits photon & slows down

nearly free absorption ⟺ bremsstrahlung

Free scattering
electron absorbs photon & immediatly emits photon in Diffent Direction (Compton / Thompson Scattering)



Mean Free Path l

$$\left[\tau \Rightarrow \text{optical depth} = \frac{L}{l}\right]$$ including Absorption

How many l paths on Average does it take Photon to travel Length L?

$$|\vec{l_1} + \vec{l_2}| = \vec{l_1}^2 + \vec{l_2}^2 + 2\vec{l_1}\vec{l_2}$$ ← scalar product is 0

$$l^2 + l^2 = 2l^2$$

$$L^2 = N \cdot l^2$$

$$\frac{L^2}{l^2} = N$$

$L = 1M$

$l = .001M$

$\frac{1^2}{.001^2} = .0000$

N = # of steps needed

probability(hit) $\sim$ $\int$ density of Spheres $\cdot\, d \cdot \bar{K}$ distance

$\frac{kg}{m^2}$

Cross section

$$1 = \rho \cdot d \cdot \bar{K}$$

$$l = \frac{1}{\rho \bar{K}}$$

[opacity] $\bar{K}$

Depends on: 1) what Matter is Made of (Chemical) opacity
w/ 2) Temp