Real World Physics

General/Review

$$1.6 \times 10^{-19}\ \text{J} = 1eV$$
$$1.6 \times 10^{-19}\ \text{C} = e\ or\ q_e$$

$$KE_0 = EPE$$
$$\frac{1}{2mv^2} = \frac{k_e Qq}{r}$$
$$\frac{1}{2}(4 * 1.67 \times 10^{-27} kg) = \frac{(9 \times 10^9)(2e)(79e)}{r}$$

Photoelectric Effect

- When a light source illuminated certain metals electrons were emitted
- The ejected electrons are "**photoelectrons**"
- **Photon** – packet of energy from a light source
- Energy of a photon
  - $E = hf$
  - $E = \frac{hc}{\lambda}$
  - $h = 6.63 \times 10^{-34}\ J \cdot s$
- h = Planck's constant
- $KE_{\max} = hf - \phi = qV_s$
- $\phi \equiv$ **work function** of the metal (Wendy's Bucks)(The amount of energy required to break free of the atom, based on the metal itself)
- **Cutoff frequency** → $f_c = \frac{\phi}{h}$
- **Cutoff wavelength**→ $\lambda_c = \frac{hc}{\phi}$
- **Stopping potential** – the V_0 required to reduce the current to zero
  - Creates environment where electrons do not want to go to the catching plate (it repels them)
    - Create V so that even electrons with max. KE cannot reach the catching plate
  - Independent of radiation intensity
  - $KE_{max} = q_e \Delta V_s$
    - Experimental way to discover KE_{max}

Atomic Physics

$$E_{photon} \propto \frac{1}{\lambda}$$

$$E_{photon} = \frac{hc}{\lambda_{photon}} = hf_{photon}$$

Energy level

$$E_f - E_i = E_{photon} = \frac{hc}{\lambda}$$

$$E_n = \frac{E_1}{n^2}$$

Energy series always move from/to the ground state (E_1)

De Broglie

- $\lambda = \frac{h}{p} = \frac{h}{mv}$

The Compton Effect

- Photon strikes an electron at rest
  - The photon after the collision has a λ shift. This is a longer λ & less energy
    - After collision the photon has less energy after collision
    - observes a sort of conservation of momentum
  - $\Delta\lambda = \frac{h}{m_c C}(1 - cos\theta)$
  - $p_{photon} = \frac{E}{C} = \frac{hf}{c} = \frac{h}{\lambda}$
    - Remember p is momentum