Modern Physics

Photons and the Photoelectric Effect:

Energy of a photon: $E = hf$

$E = hc/\lambda \qquad hc = 1240\,\text{eV}\cdot\text{nm}$

Plank's constant: $h = 6.626\times10^{-34}\,\text{J}\cdot\text{s}$

$h = 4.136\times10^{-15}\,\text{eV}\cdot\text{s}$

Photoelectric Effect: $hf = KE_{\max} + W_0$

$W_0 = hf_0 \qquad f_0 = \text{cutoff frequency}$

KE_{max}: max KE of ejected electrons

W_0: work function (minimum energy required to eject an electron)

Momentum of a Photon and the Compton Effect:

Momentum of photon: $p = h/\lambda = hf/c$

Compton Scattering: $\Delta\lambda = \lambda' - \lambda = \dfrac{h}{m_e c}(1-\cos\theta)$

$\dfrac{h}{m_e c} = 2.426\times10^{-12}\,\text{m} = 2.426\,\text{pm}$

de Broglie Wavelength:

de Broglie Wavelength: $\lambda = \dfrac{h}{p}$

Heisenberg Uncertainty Principle:

$(\Delta p_y)(\Delta y) \geq \dfrac{h}{4\pi}$

$(\Delta E)(\Delta t) \geq \dfrac{h}{4\pi}$