Photons Formulas

Ultra-violet: 100 - 400 nm Visible: 400 - 750 nm Infra-red: 0.750 - 1000μ

Diffraction from 2 or more slits: $d\sin\theta_{\text{normal}} = n\lambda$

$\lambda f = c = 2.998\times10^{8}$ m/s $1\text{ eV} = 1.602\times10^{-19}$ Joules

Boltzmann Constant: 1.381×10^{-23} J/K $= 8.617\times10^{-5}$ eV/K

Rayleigh-Jeans Blackbody: $dI_{\text{RJ}}(f) = \frac{2kT}{c^2}f^2 df$ $dI_{\text{RJ}}(\lambda) = \frac{2kTc}{\lambda^4}d\lambda$

Wein Blackbody: $dI_{\text{W}}(f) = \frac{2hf^3}{c^2}\exp\frac{-hf}{kT}df$ $dI_{\text{W}}(\lambda) = \frac{2hc^2}{\lambda^5}\exp\frac{-hc}{\lambda kT}d\lambda$

Planck Blackbody: $dI_{\text{P}}(f) = \frac{2hf^3}{c^2}\frac{1}{e^{\frac{-hf}{kT}}-1}df$ $dI_{\text{P}}(\lambda) = \frac{2hc^2}{\lambda^5}\frac{1}{e^{\frac{-hc}{\lambda kT}}-1}d\lambda$

Planck's Constant: $h = 6.626\times10^{-34}$ Joule-seconds $= 4.136\times10^{-15}$ eV-s

$hc = 1.240\times10^{-6}$ eV-m $= 1.240$ eV-μm $= 1240$ eV-nm

Planck-Einstein Relation: $E = nhf$

Einstein Photoelectric Law: $E_{e-\max} = hf - \phi_{\text{work}} = \frac{hc}{\lambda} - \phi_{\text{work}}$ $\phi_{\text{work}} \approx 2-6$ eV

Bragg's Law for diffraction from planes: $2d\sin\theta_{\text{surface}} = n\lambda$

X-Ray Tube Spectrum: $qV_{\text{tube}}(+\phi_{\text{work}}) = hf_{\max} = \frac{hc}{\lambda_{\min}}$

Photon Momentum-Wavelength Relation: $p = \frac{h}{\lambda}$

Compton Scattering: $\lambda' - \lambda = \frac{h}{mc}(1-\cos\theta)$

Compton Wavelength: $\frac{h}{mc} = \frac{hc}{mc^2} = 2.426$ pm

Heisenberg Uncertainty Principle: $\Delta x\cdot\Delta p_X \geq \frac{\hbar}{2}$