

Photons Formulas

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

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

$\lambda f = c = 2.998 \times 10^8 \text{ m/s}$ $1 \text{ eV} = 1.602 \times 10^{-19} \text{ Joules}$

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

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: $h = 6.626 \times 10^{-34} \text{ Joule-seconds} = 4.136 \times 10^{-15} \text{ eV-s}$

$hc = 1.240 \times 10^{-6} \text{ eV-m} = 1.240 \text{ eV-}\mu\text{m} = 1240 \text{ eV-nm}$

Planck-Einstein Relation: $E = nhf$

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

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

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

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

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

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