Useful Formulae and Constants

Wein's Law	λ_{max} T = 2.897*10^{-3} mK	
Basic Physics	v = d / t	Area = πr^2
Gain	$g = \Delta N \sigma_0$	*where σ_0 is the cross-section*

Boltzmann's Law	$N = N_0 \exp^{\frac{-E}{kT}}$	Decay	$N = N_0 \exp^{\frac{-t}{\tau}}$
Threshold gain	$g_{threshold} = \gamma + \frac{1}{2x} \ln(\frac{1}{R_1 R_2})$	Planck's Relationship:	$E = h\nu = \frac{hc}{\lambda}$
EO Transmission	$T = T_0 \sin^2(\frac{\pi V}{2V_{1/2}})$	Half-wave Voltages	$\frac{V_{\frac{1}{2}-\lambda_1}}{V_{\frac{1}{2}-\lambda_2}} = \frac{\lambda_1}{\lambda_2}$
Linewidth:	$\Delta\nu = 2\nu_0 \sqrt{\frac{2kT\ln(2)}{Mc^2}}$	Saturation Intensity:	$I_{sat} = \frac{h\nu}{\sigma_0 \tau}$
Fresnel equation:	$R = (\frac{n_1 - n_2}{n_1 + n_2})^2$	Saturated Gain:	$g_{sat} = \frac{g_0}{1 + \frac{\rho}{\rho_{sat}}}$
Bragg Diffraction	$\theta_B = \frac{\lambda f}{2\nu}$	Acoustic Wavelength	$\Lambda = \frac{v_{acoustic}}{f}$

Fabry-Perot Interferometer	FSR = c/2nt	
Macroscopic Polarization:	P = a_1 E_0cos(ωt) + ½ a_2 E_0^2 - ½ a_2 E_0^2cos(2ωt) + …	
Linear Term:	$a_1 = \varepsilon_0 (n^2 - 1)$	
AOM:	DE = $P_{I\text{ st order RF on}}$ / $P_{0\text{th order RF off}}$	IL = P_{Input} / $P_{0\text{th order RF off}}$

0 C = 273.15 K

1eV = 1.602E^{-19}J

k = Boltzmann's constant (1.38 * 10^{-23} J/K)

h = Planck's constant (6.626 * 10^{-34} Js)

c = Speed of Light (3*10^8 m/s)

ε_0 = permittivity of free space (8.85*10^{-12} F/m)

1 mole = 6.02*10^{23} atoms/molecules

Indices of Refraction: Quartz = 1.46, Glass = 1.51

Dilated Pupil = 0.4cm^2

Atomic masses: Neon = 20 amu, Argon = 38 amu, Helium = 4 amu, Cadmium=112 amu,
CO_2 = 44 amu, Krypton = 83.8 amu