Physical Constants and Useful Combinations:

Speed of light	c	3.00×10^8 m/s
Planck's constant	h	6.63×10^{-34} J s; $hc = 1240$ eV nm
	$\hbar = h/2\pi$	1.05×10^{-34} J s; $\hbar c = 197$ eV nm
Coulomb force constant	$k_e = 1/4\pi\epsilon_0$	8.99×10^9 Nm^2/C; $k_e e^2 = 1.44$ eVnm
Elementary charge	e	1.602×10^{-19} C; 1 eV $= 1.602 \times 10^{-19}$ J
Fine structure constant	$\alpha = k_e e^2/\hbar c$	$0.0730 \approx 1/137$
Permeability of vacuum	μ_0	$4\pi \times 10^7$ N/A$^2 = 4\pi$ mm G/A; 1 T $= 10^4$ G
Gravitational constant	G	6.67×10^{-11} N m^2/kg^2
Avogadro's number	N_A	6.02×10^{23}/mol
Boltzman's constant	k_B	1.38×10^{-23} J/K = 25 meV/293 K
Gas constant	$R = N_A k_B$	8.31 J/mol K
Compton wavelength	$\lambda_c = h/m_e c$	0.00243 nm
Bohr radius	$a_0 = \hbar^2/m_e k_e e^2$	0.529 Å
Ionization energy of H	$E_0 = m_e k_e^2 e^2/2\hbar^2$	13.6 eV
Bohr magneton	$\mu_B = e\hbar/2m_e$	9.27×10^{-24} J/T
Unified mass unit	u	1.66×10^{-27} kg = 931 MeV/c^2
Mass of electron	m_e	9.11×10^{-31} kg = 0.511 MeV/c^2
proton	m_p	1.67×10^{-27} kg = 938 MeV/c^2
α-particle	m_α	6.64×10^{-27} kg = 3727 MeV/c^2

Formulas:

Stefan-Boltzmann law	$R = \sigma T^4 \qquad \sigma = 5.67 \times 10^{-8}$ W/m^{2}K^4
Wein's displacement law	$\lambda_m T = 2.898 \times 10^{-3}$ m K
Rayleigh-Jeans formula	$u(\lambda) = 8\pi k_B T \lambda^{-4}$
Planck's radiation law	$u(\nu) = \frac{8\pi\nu^2}{c^3}\frac{h\nu}{e^{h\nu/k_B T}-1}; \qquad E_n = n\,h\nu = n\,hc/\lambda$
Photoelectric effect	$eV_0 = hf - \phi$
Bragg diffraction	$n\lambda = 2d\sin\theta$
Compton effect	$\lambda_2 - \lambda_1 = \frac{h}{m_e c}(1-\cos\theta)$
Rydberg-Ritz formula	$\frac{1}{\lambda_{mn}} = R\left(\frac{1}{m^2} - \frac{1}{n^2}\right), n > m$
Impact parameter	$b = \frac{k_e q_\alpha Q}{m_\alpha v^2}\cot\frac{\theta}{2}$
Scattered fraction f	$f = \pi b^2 nt$
Number of scattered4s6s2s α's observed	$\Delta N = \left(\frac{I_0 A_{sc} nt}{r^2}\right)\left(\frac{Z k_e e^2}{2E_k}\right)^2 \frac{1}{\sin^4\frac{\theta}{2}}$
Size of nucleus	$r_d = \frac{k_e q_\alpha Q}{\frac{1}{2}m_\alpha v^2}$
Bohr's postulates	$L = n\hbar$ for integer n; $\quad hf = E_n - E_m$
atomic energy levels	$E_n = -\frac{Z^2 E_0}{n^2}$ where $E_0 = \frac{m_e k_e^2 e^2}{2\hbar^2} = 13.6$ eV
atomic orbital radii	$r_n = \frac{n^2 a_0}{Z}$ where $a_0 = \frac{\hbar^2}{m_e k_e e^2} = 0.529$ Å
reduced mass	$\mu = \frac{mM}{m+M}$
Moseley equation	$f^{1/2} = A_n(Z-b)$
De Broglie relations	$\nu = E/h$ and $\lambda = h/p$
Davisson and Germer diffraction	$n\lambda = D\sin\phi$