

Equations

$$d \sin(\theta) = m\lambda \quad \text{Double slit}, \quad 2d \sin(\theta) = m\lambda \quad \text{Bragg}$$

$$a \sin(\theta) = m\lambda \quad \text{Single slit}, \quad \theta_{res} = \frac{\lambda}{a} \quad (\text{slit}), \quad \theta_{res} = 1.22 \frac{\lambda}{D} \quad (\text{hole})$$

$$d \sin(\theta) = m\lambda \quad \text{Diffraction grating}, \quad \text{Resolving Power}, \quad R = mN = \frac{\lambda}{\Delta\lambda}$$

$$\phi = 0, 2\pi, 4\pi, 6\pi \dots \quad \text{Constructive Interference} \quad \Delta x = 0, \lambda, 2\lambda, 3\lambda \dots$$

$$\phi = \pi, 3\pi, 5\pi \dots \quad \text{Destructive Interference} \quad \Delta x = \lambda/2, 3\lambda/2, 5\lambda/2 \dots$$

$$\phi = K_n \Delta x, \quad K_n = \frac{2\pi}{\lambda/n}, \quad \phi = \pi \quad (\text{if } n_1 < n_2) \quad \Delta x = \lambda/2$$

$$\lambda_{max} T = 0.2898 \times 10^{-2} \text{ m K}, \quad E = \frac{hc}{\lambda} \quad (\text{photons!})$$

$$KE_{max} = E_{photon} - \Phi, \quad KE_{max} = eV_{stop}, \quad E_{threshold} = \Phi \quad (\text{Work Function})$$

$$\lambda_{scattered} - \lambda_{incident} = \frac{h}{m_e c} (1 - \cos(\theta)), \quad KE = \frac{p^2}{2m}$$

$$\Delta x \Delta p_x \geq \frac{h}{4\pi}, \quad \Delta E \Delta t \geq \frac{h}{4\pi}, \quad \lambda = \frac{h}{p} \quad (\text{DeBroglie}) \quad L = \frac{nh}{4\pi} \quad (\text{Bohr})$$

$$E_n = -\frac{Ke^2}{2a_o} \frac{1}{n^2}, \quad a_o = \frac{h^2}{(2\pi)^2 m_e K e^2}, \quad E_n = -\frac{13.6 \text{ eV}}{n^2} (Z-X)^2 \quad (X \text{ for Screening})$$

$$\frac{1}{\lambda} = \frac{13.6 \text{ eV}}{hc} \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right), \quad \ell = 0, 1, 2, \dots, n-1, \quad m_\ell = -\ell, -\ell+1, \dots, \ell-1, \ell \quad m_s = \pm 1/2$$

Constants

$$\begin{aligned} h &= 6.626 \times 10^{-34} \text{ J s} \\ c &= 2.9979 \times 10^8 \text{ m/s} \\ e &= 1.6022 \times 10^{-19} \text{ C} \\ m_e c^2 &= 0.511 \times 10^6 \text{ eV} \end{aligned}$$

$$\begin{aligned} hc &= 1239.8 \text{ eV nm} \\ 1 \text{ eV} &= 1.6022 \times 10^{-19} \text{ J} \\ M_{electron} &= 9.11 \times 10^{-31} \text{ kg} \end{aligned}$$