Week 3

Bohr Model of Atom

Allowed energy levels: \( E_n = -13.6 \, \text{eV} / n^2 \)

Energies of photons that can be emitted or absorbed = \( | E_{n_1} - E_{n_2} | \)

LED model: in solids, energy levels become bands (Pauli Exclusion Principle)

Electrons can move from various places in one band to various places in the other, thus, there is a range of allowed energies = a range of allowed wavelengths that can be absorbed or emitted. The minimum energy = energy of band gap.

Wave packets: a way to visualize something that is both/neither a wave and/nor a particle

Geometrical Optics

Huygens -- a way to visualize qualitative effects by seeing each point on a wave front as the source on a new spherical wave

Reflection/refraction

define index of refraction: \( n = c / v \)

and since \( f \) is constant \( \lambda / n = \lambda / n \)

Snell’s Law: \( n_1 \sin \theta_1 = n_2 \sin \theta_2 \)

Dispersion: index of refraction varies with wavelength/frequency, causing different colors to bend different amounts at boundaries between materials.

The graph to the right, showing the index of refraction as a function of frequency, shows “normal dispersion” where the index increases as the frequency increases.