Light as a Wave

Electromagnetic Radiation

- $\lambda$: wavelength
- $\nu$: frequency
- $c$: speed

$\lambda \nu = c$

$c = 3.0 \times 10^8 \text{ m/s}$

Light as a Wave

Electromagnetic Spectrum

- Visible
- UV
- IR
- Microwave (MW)
- Radio, NMR, MRI

Diffraction and Interference

- Intensity
- Probability Distribution
Chem 4A Lecture 03: Light Waves
Absorption Emission

Diffraction and Interference

A + B

Intensity

Probability Distribution

ChemQuiz® 3.1

How will the two-slit interference pattern change upon decrease of $\lambda$?

A) B) C)

Wave Functions

Coordinates and quantum numbers

$\Psi(r, \theta, \varphi)$ : Probability (e)

Three quantum numbers: $n$, $\ell$, $m_e$

- $n$: Principal Energy
  - $n$: 1, 2, 3...
  - Total nodes $n-1$

- $\ell$: Angular Momentum Shape
  - $\ell$: 0 (s), 1 (p), 2 (d), n-1
  - Angular nodes $\pm \ell$

- $m_e$: Magnetic Orientation
  - $m_e$: $-\ell$, $-(-\ell-1)$, ..., 0, ..., $(-\ell)$, $\ell$
Absorption and Emission

ChemQuiz® 3.2

What color is an object with the absorption spectrum shown?

A) ~ blue  B) ~ green  C) ~ red
**ChemQuiz® 3.3**

Glass is transparent. Which one is its absorption spectrum?

- A) I
- B) II
- C) III

**ChemQuiz® 3.4**

Through which of the filters (whose absorption spectra are shown) will a blue solution appear black?

- A) 1
- B) 2
- C) 3