

UV-vis Absorption Spectroscopy
Learning Objectives

Understand the basics of UV-vis Absorption Spectroscopy...

1) **Absorption** of UV or visible light causes *excitation* of electrons from one orbital (atomic or molecular) to a higher energy orbital.

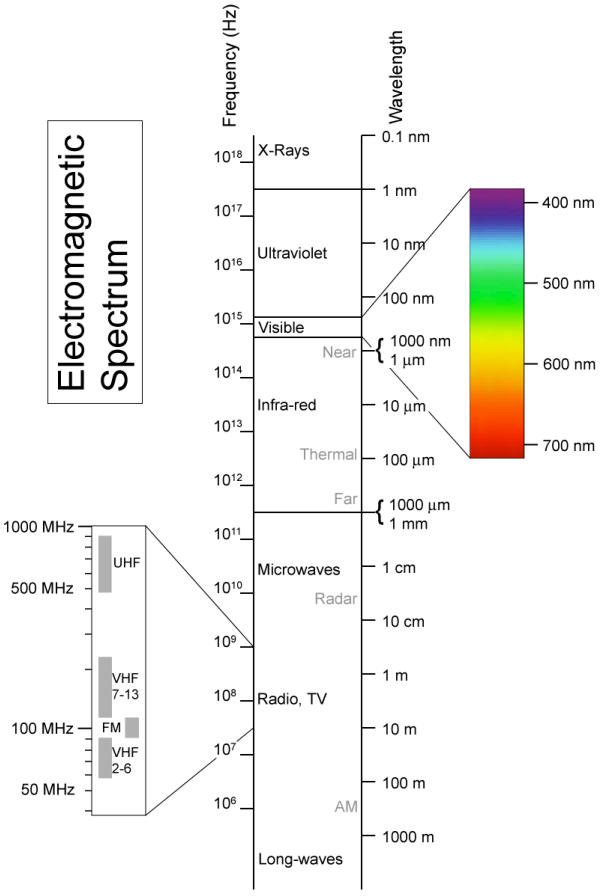
2) **The ultraviolet (UV) – visible range of electromagnetic radiation** that is used in UV-vis spectroscopy spans from 200-700 nm.

3) **UV light** spans from 200-400 nm and corresponds to 144-72 kcal/mol of energy (high enough E to break many sigma and pi bonds).

4) **Visible light** spans from 400-700 nm and corresponds to 72-41 kcal/mol of energy (high enough E to break weak sigma bonds and some pi bonds).

5) The part of a molecule that absorbs UV or visible light is called the **chromophore**.

6) The **more conjugated** a chromophore is, the **higher wavelength** light it absorbs. That is, it requires **less energy** to excite an electron to a higher energy level.



From: http://kingfish.coastal.edu/marine/Animations/

7) **Some equations to know:**

$\Delta E = h\nu$ where $h = 6.626x10^{-34}$ m^2kg/s

$\nu = \frac{c}{\lambda}$ where c ≈ 3.0 x 10^8 m/s

Beer's Law

$A = \varepsilon lc$ *where ε = the molar extinction coefficient, l = path length, and c = concentration*

Calibration points for UV-Vis spectroscopy:

λ_{max} = 165 nm
π-π*

λ_{max} = 217 nm
π-π*

λ_{max} = 254 nm
π-π*

λ_{max} = 451 nm
π-π*

λ_{max} = 170 nm
π-π*

λ_{max} = 279 nm
n-π*