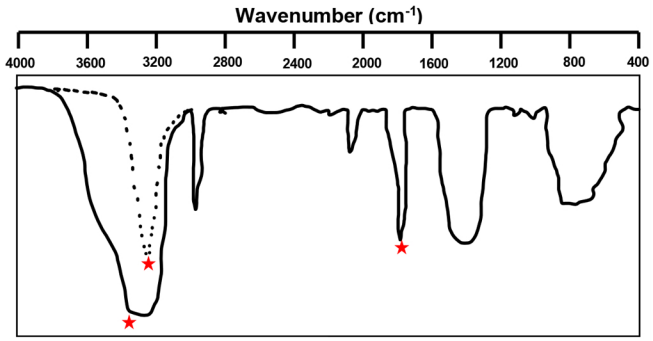
Spectroscopy

Infrared Spectroscopy

Visualizing molecular vibrations: Bond stretching or bending



Three peaks to remember:

1) **Broad 3300: O-H**
2) **Sharp 3300: N-H**
3) **Sharp 1750: C=O**

- Symmetrical molecules will NOT have spectrum
- 'Same' molecules (N_2 O_2, Br_2, etc. will NOT have spectrum
- If asked about any other absorbances, a list will be provided in test

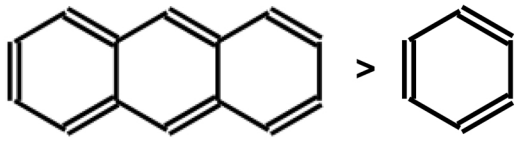
UV Spectroscopy

Not a critical memorization component—need to know two things:

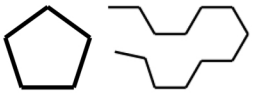
- Lone electron pairs absorb UV light
- Conjugated molecules (adjacent double bonds, resonance) absorb UV light: **greater conjugation = greater absorbance**

Questions will most likely ask which molecules show most absorbance, or which molecule will not show absorbance

Conjugated



Unconjugated



(Any molecule w/o lone pairs or resonance)

Nuclear Magnetic Resonance (NMR) Spectroscopy

- **n+1 rule**: number of equivalent hydrogens + 1 = number of peaks in a cluster
- Hydrogens' proximity to electronegative atoms and double bonds = deshielding (peaks seen downfield)
- Hydrogens on the same atom are equivalent
- Usually every hydrogen will be accounted for, but you don't need to account for every hydrogen to reach the correct answer!

- **Example 1:**
  - Pay more attention to how there are three equivalent hydrogens, then look at deshielding; you might not even have to count peaks.
- **Example 2:**
  - The O-H hydrogen has no adjacent hydrogens, so it is a single peak (n+1)
  - The CH_3 hydrogens also have no adjacent hydrogens, so they are a single peak (but less deshielded)