

Today

Infrared Spectroscopy
Section 13.10 - 13.18

Next Class

Finish Infrared Spectroscopy (for now)
Section 13.10 - 13.18

Start NMR Spectroscopy
Chap 14

Positions of IR Bands

constant related to stiffness of the spring

Section 13.11, 13.12, 13.13

A **vibration** that **changes the dipole of a molecule** creates an oscillating electric field that **can interact with Infrared light**.

Hooke's Law

$$F = kx$$

treat a bond like a spring

Harmonic Oscillator

$$f = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$$

Frequency of IR Absorbed

$$\bar{\nu} = \frac{1}{2\pi c} \left[\frac{f(m_1 + m_2)}{m_1 m_2} \right]$$

Strength of bond = force constant for the bond

↑ masses of the

2 atoms

when do we see large differences in this term...

not with

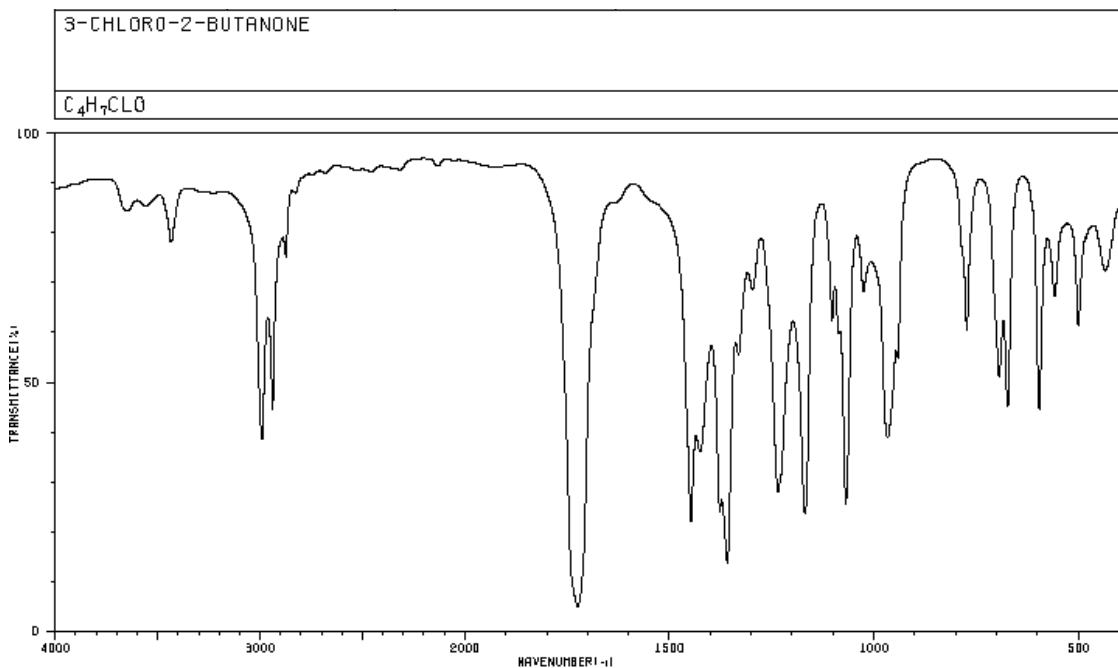
C-C vs C-O or C-N

Strong vs weak
 ↓
 large force constant vibrates at higher frequency

$\frac{24}{144}$
 C-C vs

$\frac{13}{12}$
 C-H

higher



SDBSWeb : <https://sdb.s.db.aist.go.jp> (National Institute of Advanced Industrial Science and Technology, date of access)

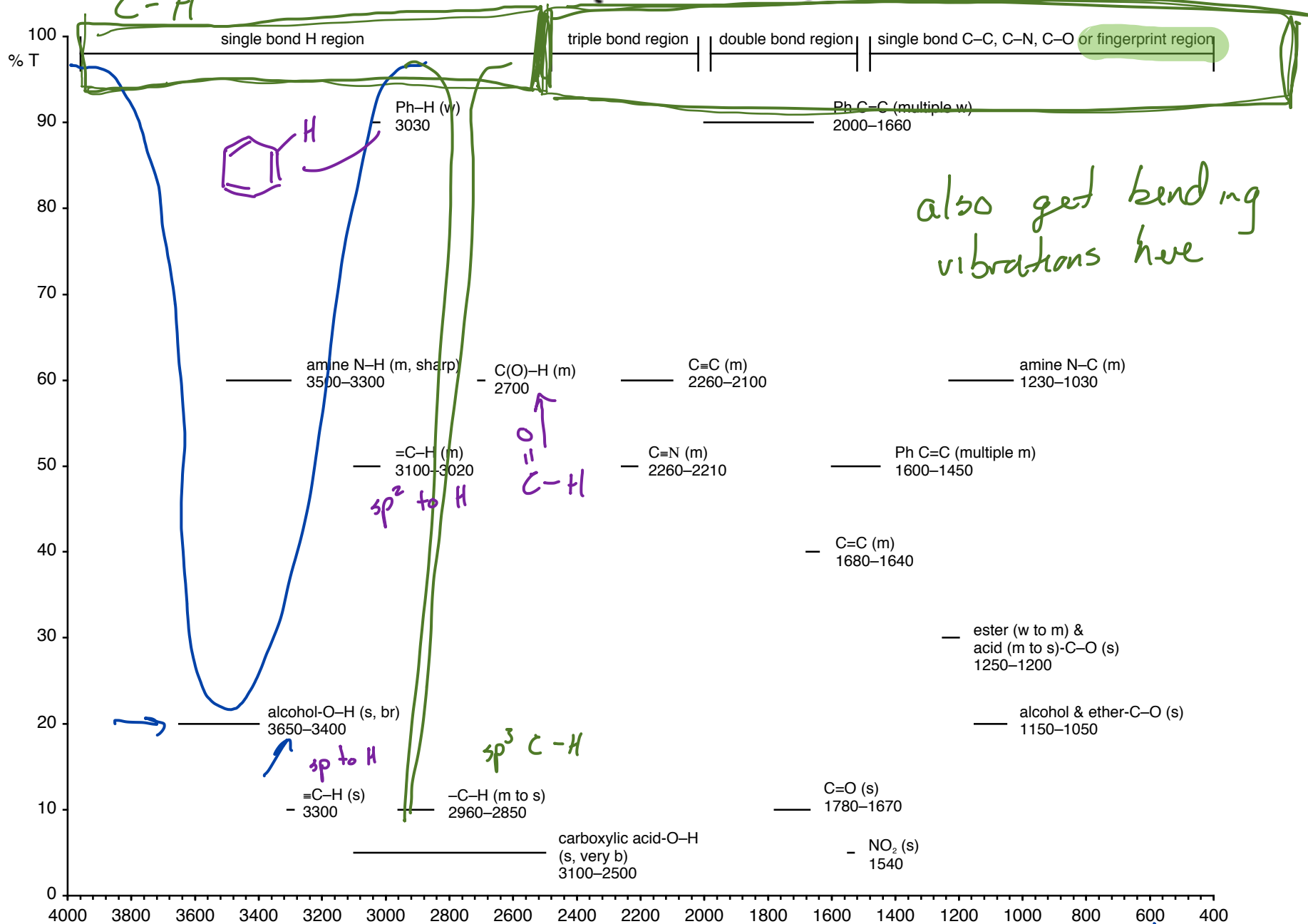
Guides

O-H, N-H,
C-H

$$\bar{\nu} = \frac{1}{2\pi c} \left[\frac{f(m_1 + m_2)}{m_1 m_2} \right]$$

bigger atoms

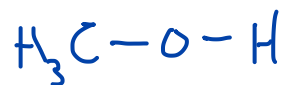
Section 13.11, 13.12, 13.13



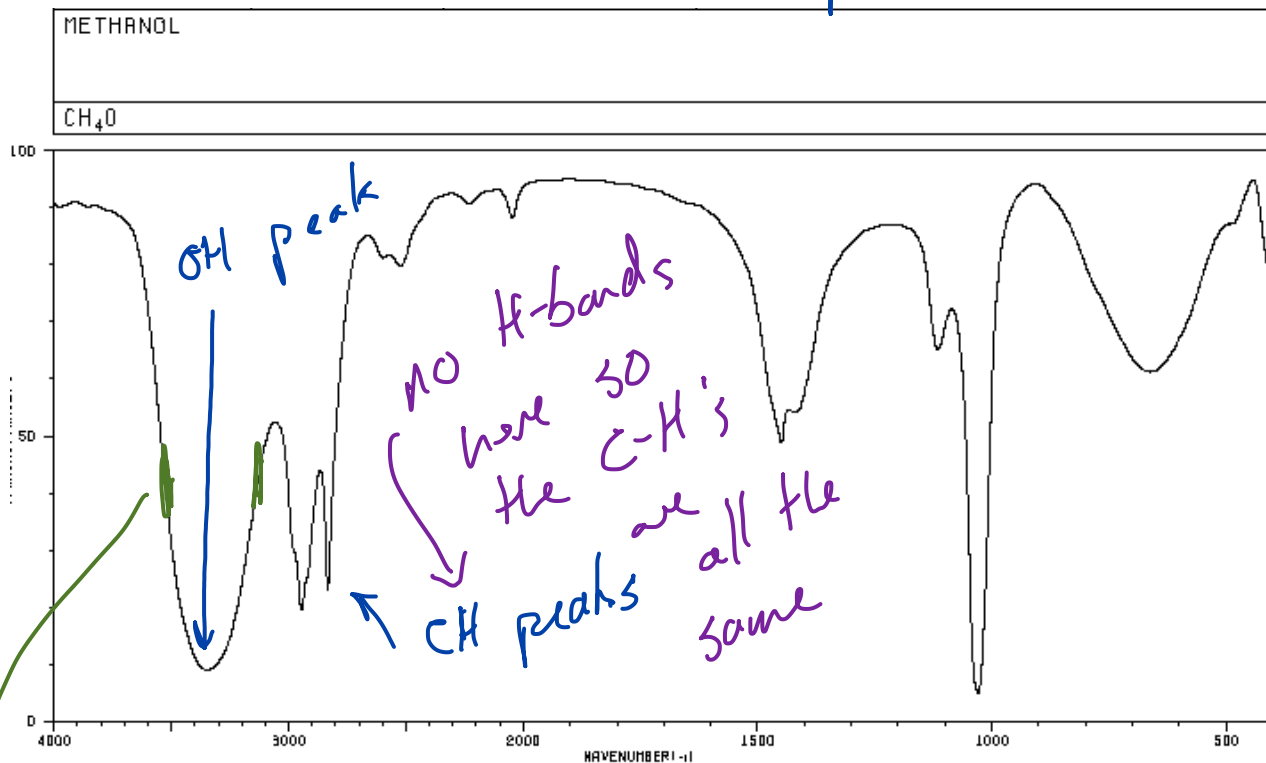
also get bending vibrations here

IR spectroscopy is very good at identifying functional groups

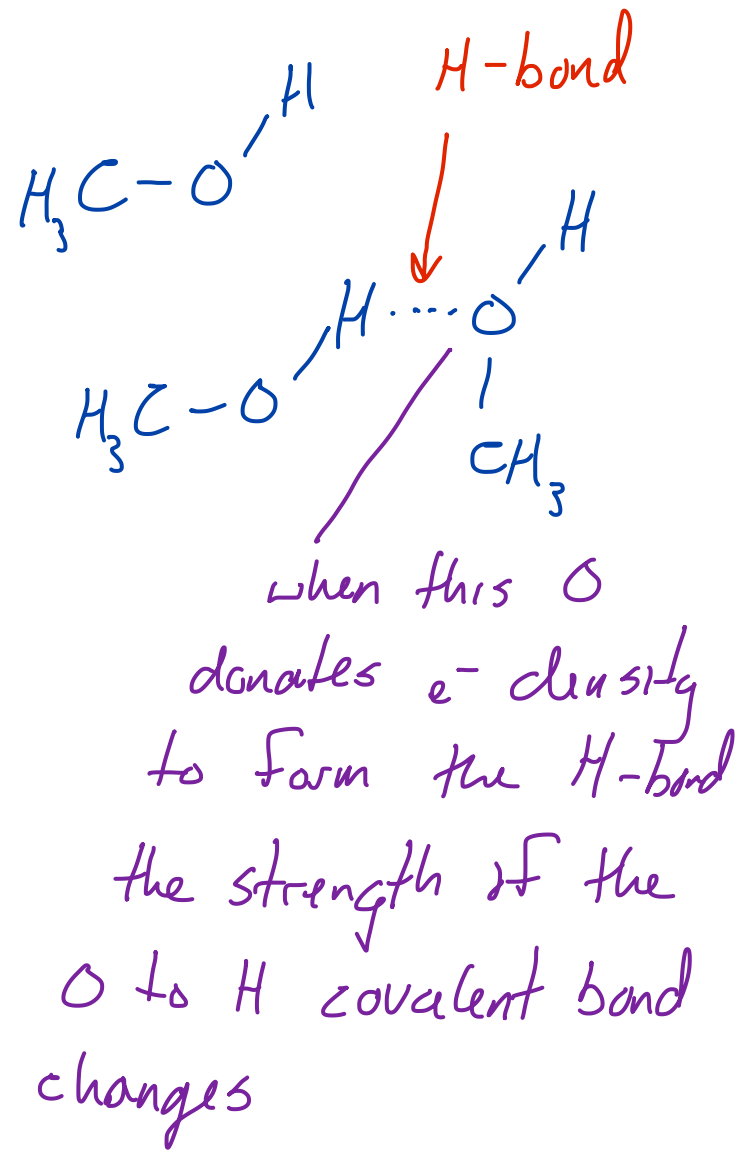
Intensity and Shape, OH vs CH



CH peaks tend to be sharp
OH peaks tend to be broad



3347	6	1116	62
3336	8	1030	4
2945	16	662	56
2833	22		
2522	77		
2046	84		
1450	47		



because of all the H-bond interactions there are many different bond strengths so it absorbs many different frequencies

When alcohols are dissolved in non-H-bonding solvents and the solutions are dilute the OH peaks aren't as broad because there isn't as many H-bond interactions

