(8) **Today**

Sections 1.12
Drawing Chemical Structures

Sections 2.1 - 2.4
Polar Covalent Bonds, Formal Charges,
Resonance/Electron Delocalization

Next Class (9)

Sections 2.1 - 2.4
Polar Covalent Bonds, Formal Charges,
Resonance/Electron Delocalization

Sections 2.4 – 2.6
Resonance/Electron Delocalization

(10) **Second Class from Today**

Sections 2.4 – 2.6
Resonance/Electron Delocalization

Sections 2.7 – 2.11
Acids and Bases

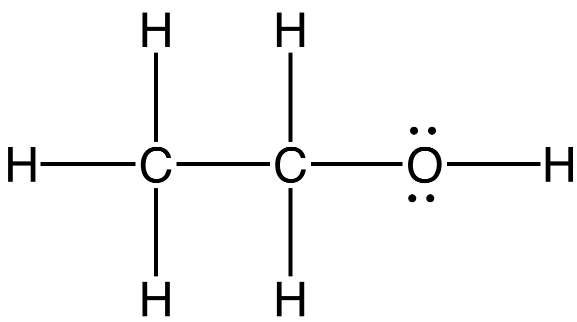
Third Class from Today (11)

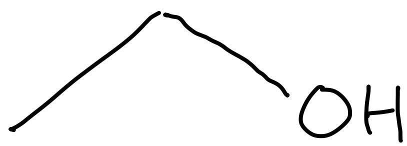
Sections 2.7 – 2.11
Acids and Bases

Converting Between Structure Types

Sections 1.12

convert Lewis to skeletal – bonds, no "C", no C–H, draw everything else



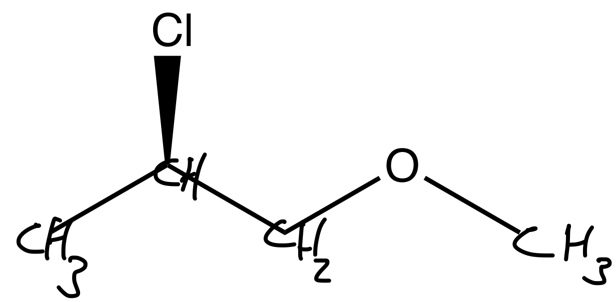


Converting Between Structure Types

Sections 1.12

convert skeletal to condensed

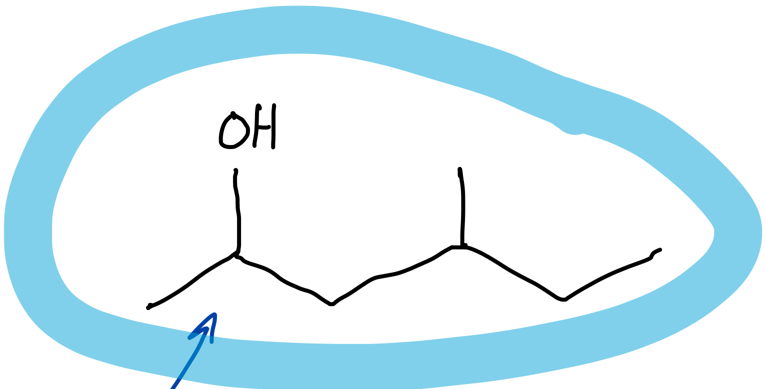
$CH_3CHClCH_2OCH_3$

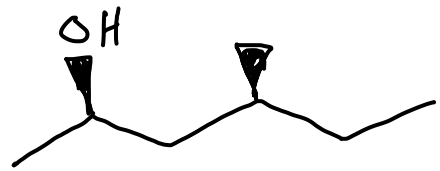


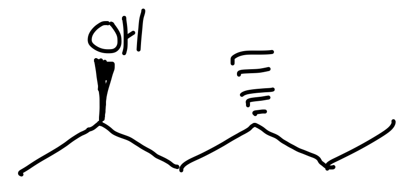
convert structural formula to skeletal

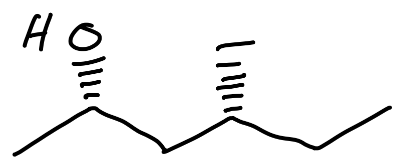
1 2 3 4 5 6

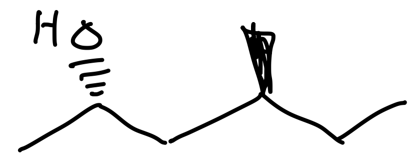
$CH_3CH(OH)CH_2CH(CH_3)CH_2CH_3$











since stereochemistry isn't being asked for a straight line is fine

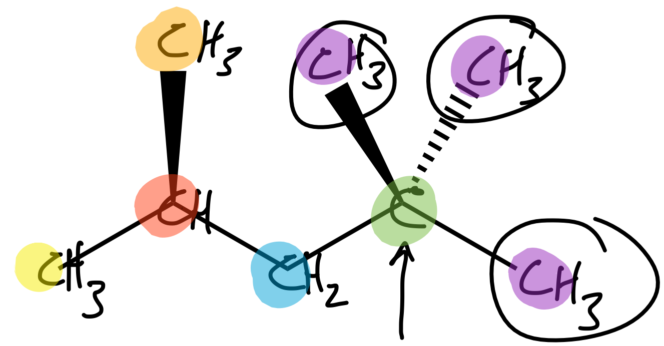
$CH_2CH(OH)CH_2CH(CH_3)CH_2CH_2$

this would indicate that the 1st C is bonded to the last C

Converting Between Structure Types

Sections 1.12

convert skeletal to condensed



$CH_3CH(CH_3)CH_2C(CH_3)_3$ without colors => $CH_3CH(CH_3)CH_2C(CH_3)_3$

also

$CH(CH_3)_2CH_2C(CH_3)_3$ without colors $CH(CH_3)_2CH_2C(CH_3)_3$

Appropriate Problems from McMurry Chap 2

Section 2.1: Problems 2-1 – 2-4

Section 2.2: Problems 2-5, 2-6, 2-28 – 2-30, 2-32, 2-53, 2-59, 2-63

Section 2.3: Problems 2-7, 2-8, 2-35, 2-36

Sections 2.4 – 2.6: Problem 2-9, 2-10, 2-20, 2-21, 2-23, 2-26, 2-37, 2-38, 2-56, 2-57, 2-61, Challenging Problems 2-33, 2-34, 2-39

Section 2.7: Problem 2-11

Section 2.8: Problems: 2-12, 2-13

Section 2.9: Problems 2-14 – 2-16

Section 2.11 Problems: 2-17, 2-18, 2-24, 2-25, 2-40 (2-42 is a good question but the Lewis acid-base concept is not strongly emphasized in our organic class), 2-43, 2-44, 2-46, 2-47, 2-48, 2-54, 2-55, 2-61, 2-64

2.12 Problems: 2-19, 2-65

Identify ionic interactions, polar covalent bonds, and nonpolar covalent bonds

Interpret electrostatic potential maps

Identify polar bonds and molecules

Determine the formal charge of atoms in a molecule

Interpret formal charge

Draw resonance contributors e^- delocalization

Draw resonance hybrids

Rank the amount a resonance contributor contributes to the resonance hybrid

Interpret the effects of electron delocalization

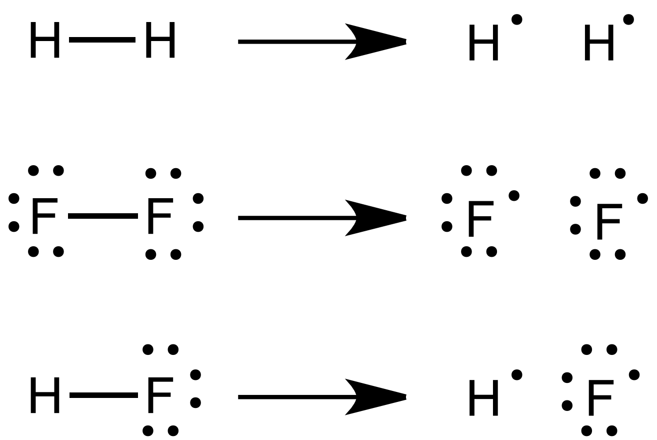
Identify Brønsted-Lowry acid and bases in acid-base reactions

Determine acid or base strength based on pK_a

Determine or explain acid or base strength based on molecular structure

Electronegativity is the measure of an atom's ability to attract the e⁻'s that are being shared in a bond to itself.

change
enthalpy



ΔH_{BDE} = 436 kJ/mol[1]

↖ Bond dissociation energy

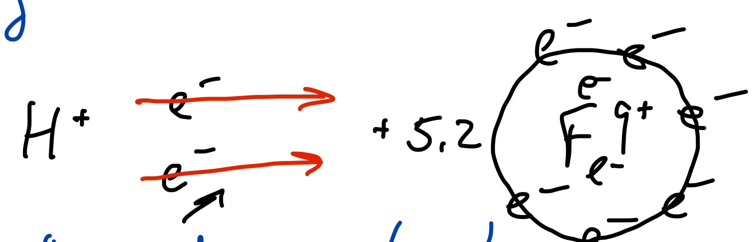
ΔH_{BDE} = 155 kJ/mol[1]

assuming BDE is average of H_2 and F_2 BDE

predicted ΔH_{BDE} = ~~296~~ kJ/mol 565 kJ/mol

δ^+ δ^-
H — F part strength of the bond is the covalent bond the other part is the attraction of the δ^+ for the δ^-

F > O > Cl ~ N > C ~ S > H



e⁻'s in the bond more strongly attracted to +5.2 of F

1. Atkins, Physical Chemistry, 3rd ed. p 882 565

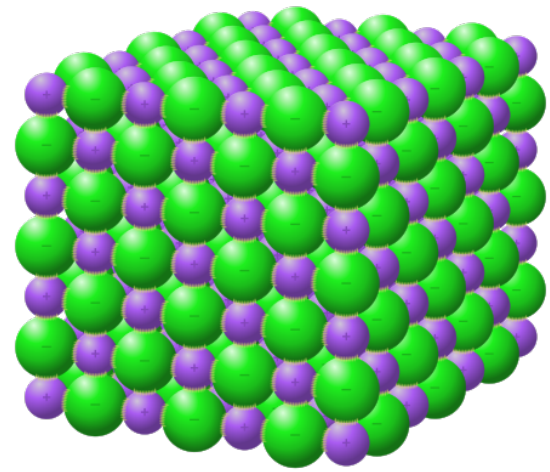
Ionic Interactions, Polar Bonds, and Nonpolar Bonds

Na^+ Cl^-

NaCl ← metal (Na), nonmetal (Cl)

Na^+ and Cl^-

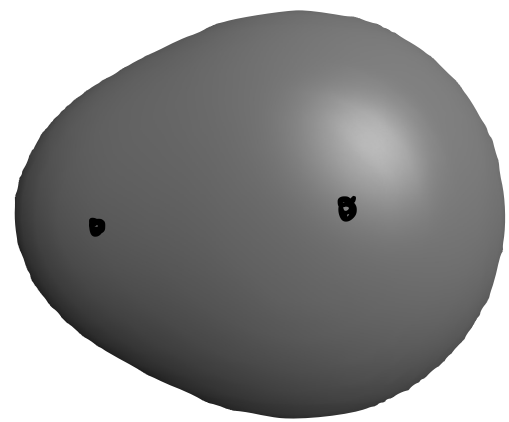
ionic interactions


[1]

polar covalent bond

HF

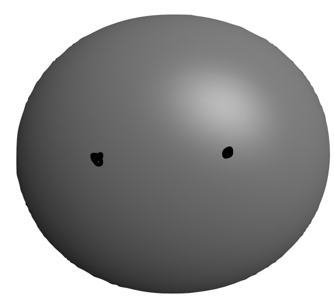
H—F



nonpolar covalent bond

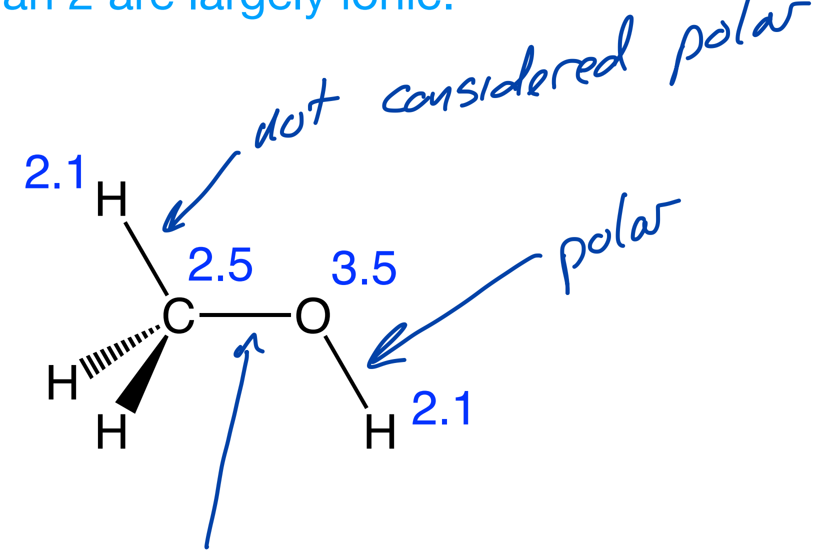
H_2

H—H



[1]https://en.wikipedia.org/wiki/Sodium_chloride#/media/File:NaCl_bonds.svg

"As a rough guide, bonds between atoms whose electronegativities differ by less than 0.5 [0.4] are [considered] nonpolar covalent, bonds between atoms whose electronegativities differ by 0.5 to 2 are polar covalent, and bonds between atoms whose electronegativities differ by more than 2 are largely ionic."[1]



$Na^{\oplus}$ $Cl^{\ominus}$

$|0.9 - 3.0| = 2.1$

$3.5 - 2.5 = 1$

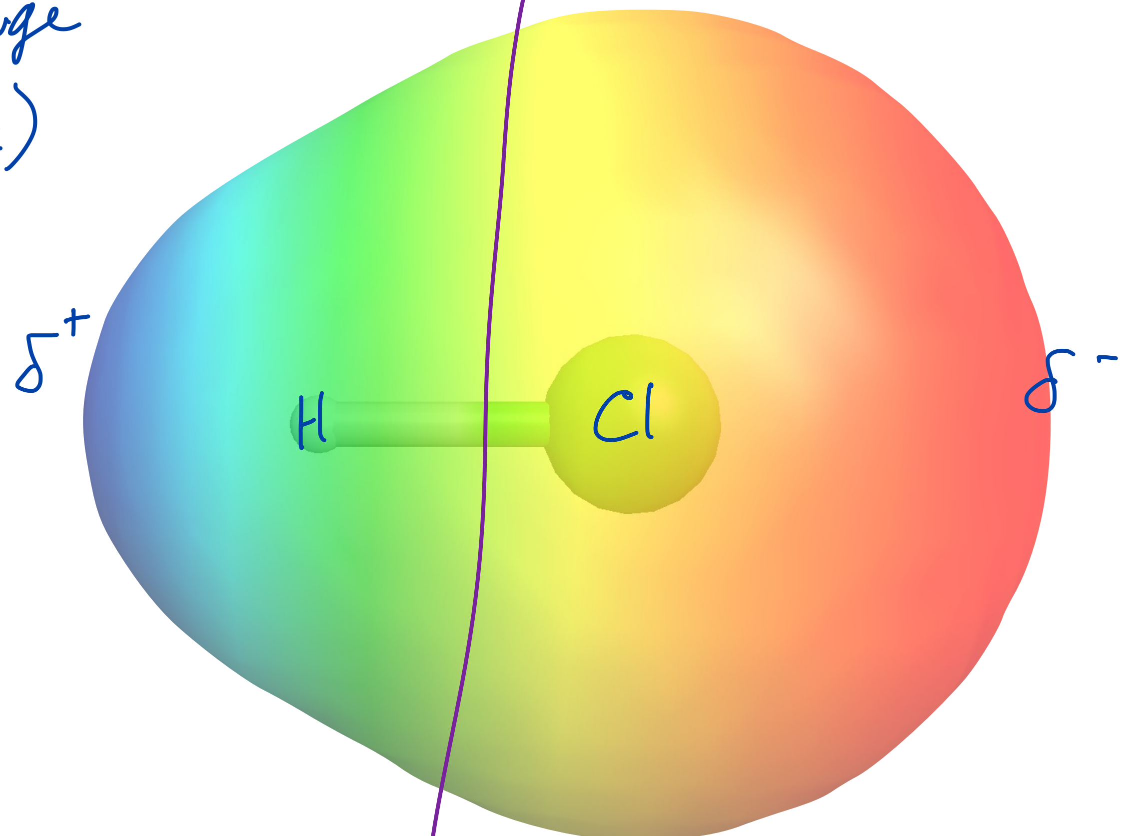
definitely polar

F > O > Cl ~ N > C ~ S > H

electronegativity ranking

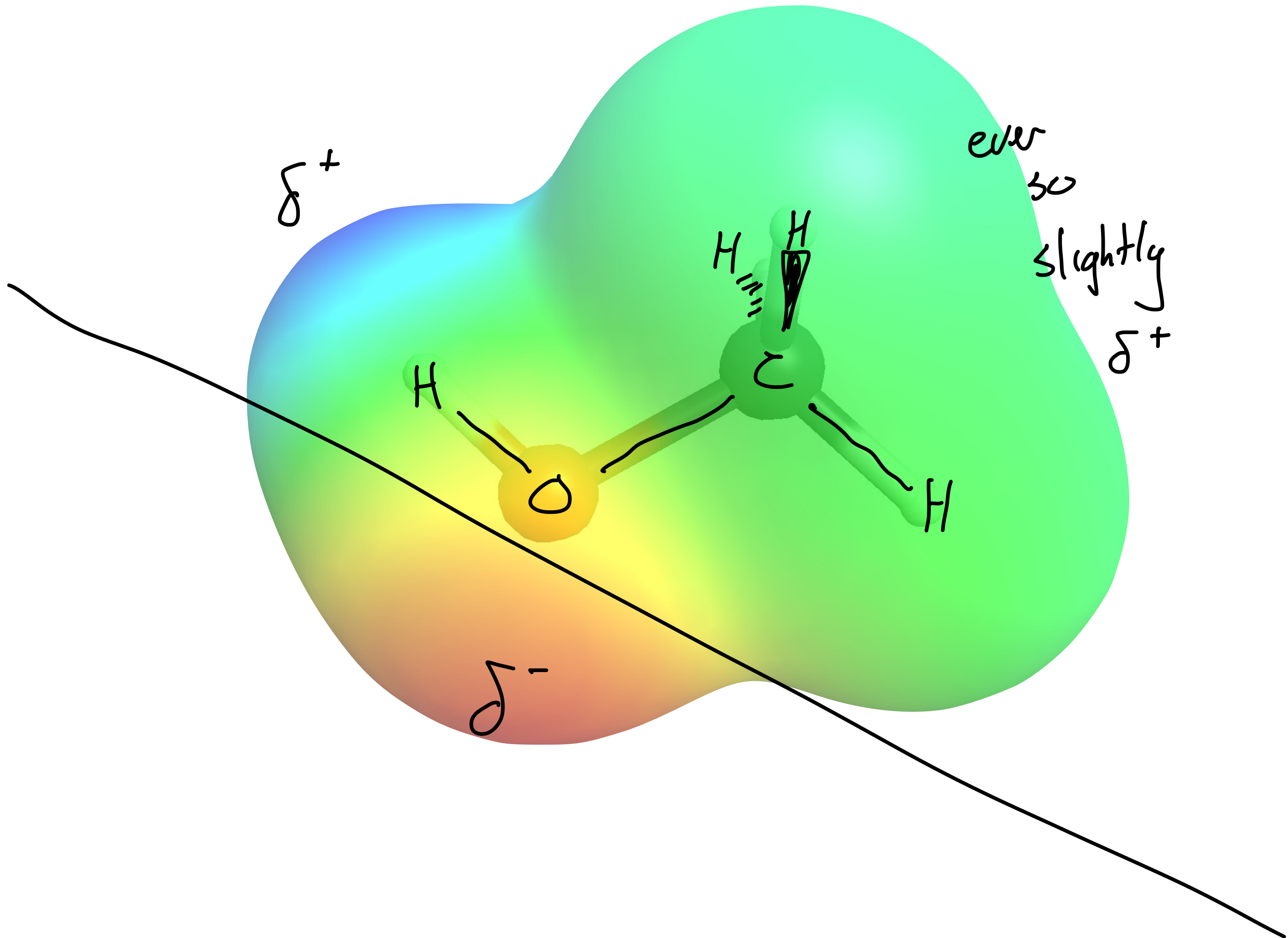
[1] Organic Chemistry, 10th ed., McMurray, OpenStax (2023) https://openstax.org/details/books/organic-chemistry

electrostatic potential map



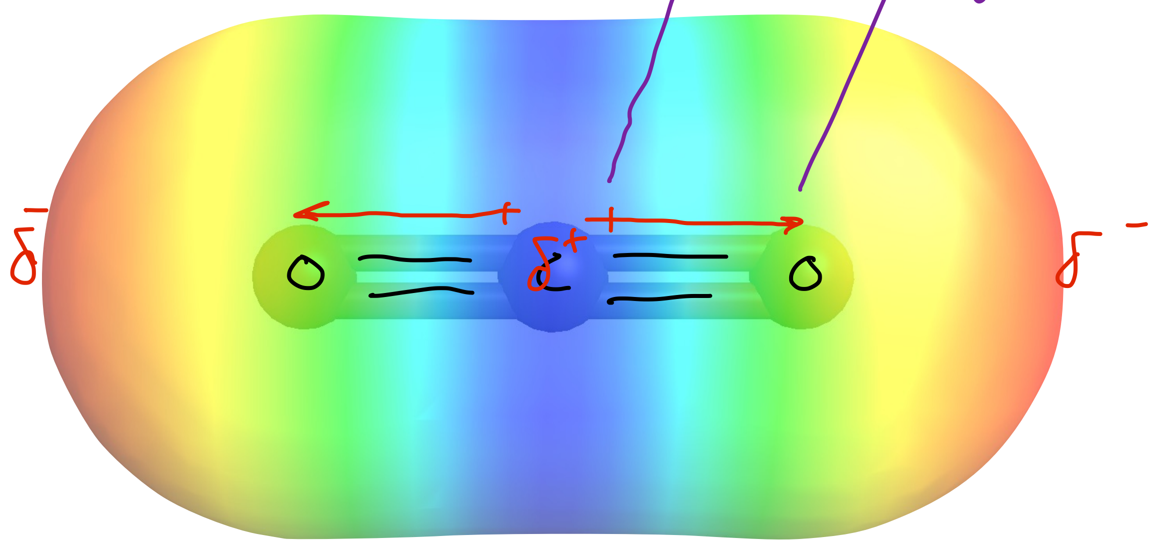
shows how a ⊕ charge would be repelled (blue) or attracted (red) to different regions of a molecule

If the molecule can be cut in 2 and the δ+ separated from the δ- then the polar bonds have combined to make the molecule polar


δ+
ever so slightly δ+
H
H
H
C
O
H
δ−

the positive end of the dipole.

neg end of the dipole



polar bonds oppose each other so CO_2 does not have a molecular dipole...

the molecule doesn't have opposide charges on opposite sides

Draw Lewis Structure

Draw VSEPR Structure

Draw Dipole arrows on polar bonds

If (+) and (-) are on opposite sides (front and back, left and right, top and bottom, upper left and lower right) then the molecule is polar otherwise it isn't.

CH_2Br_2