(2) **Today**

Section 1.2: Chemical Foundations of Biochemistry

Next Class (3)

Sections 1.23 - 1.4: Foundations of Biochemistry

Chap 2: Water and Its Role in Life

(4) **Second Class from Today**

Chap 2: Water and Its Role in Life

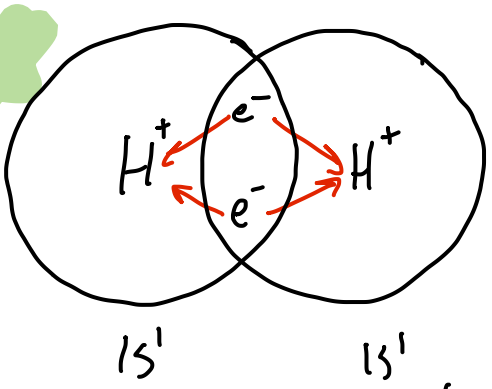
Chap 3: Amino Acids, Peptides, and Proteins

Third Class from Today (5)

Chap 3: Amino Acids, Peptides, and Proteins

Chemical Foundations: Bonding and Inter/Intramolecular Interactions

Covalent Bonds



each 1s orbital has room for 1 more e⁻

- a pair of e⁻'s shared between two atoms
- mutual attraction of nuclei to the e⁻'s is what keeps them together
- strong 300 - 400 kJ/mol
  - BDE refers to homolytic cleavage
  - eg $H_2 \rightarrow H^\bullet + H^\bullet$
- some polar bonds to H atoms can be more easily ionized

Ionic Interactions electrostatic attraction

cation Na^+

sodium lost it's e⁻ to something

anion Cl^-

Cl atom gained an e⁻ from something

⊕ is attracted to ⊖

- very strong interaction
- but can be overcome by dissolution in H_2O

  e.g. $NaCl_{(s)} \xrightarrow{H_2O} Na^{\oplus}_{(aq)} + Cl^{\ominus}_{(aq)}$

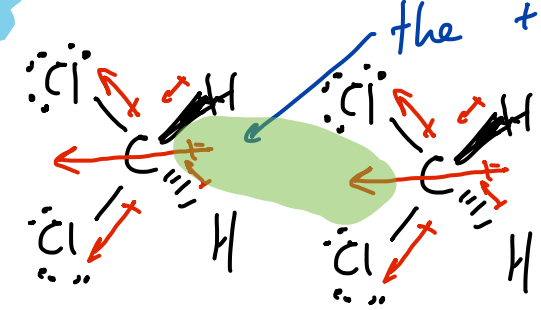
  but not always, e.g.

  $AgCl_{(s)} \xrightarrow{H_2O}$ virtually NR

Cl eneg 3.0 ish C 2.55 ish H 2.1 ish

Chemical Foundations: Bonding and Inter/Intramolecular Interactions

Dipole-Dipole Interactions



the + end of the dipole can attract a ⊖ end of another dipole

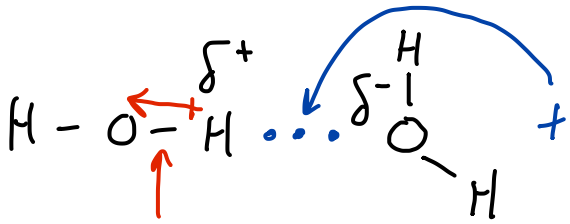
weaker than H-bonding interactions

positive end of the dipole

negative end

Hydrogen Bonding … Hydrogen Bond … H bond

not a bond. its an interaction between molecules.



this is the H bond 5 to 50 kJ/mol

not the H bond
this is a covalent bond

the H needs to be covalently bonded to N or O - H-bond donor

H-bond acceptor - N, O, F

strength depends on # of e⁻'s and polarizability (large atoms)

Chemical Foundations: Bonding and Inter/Intramolecular Interactions

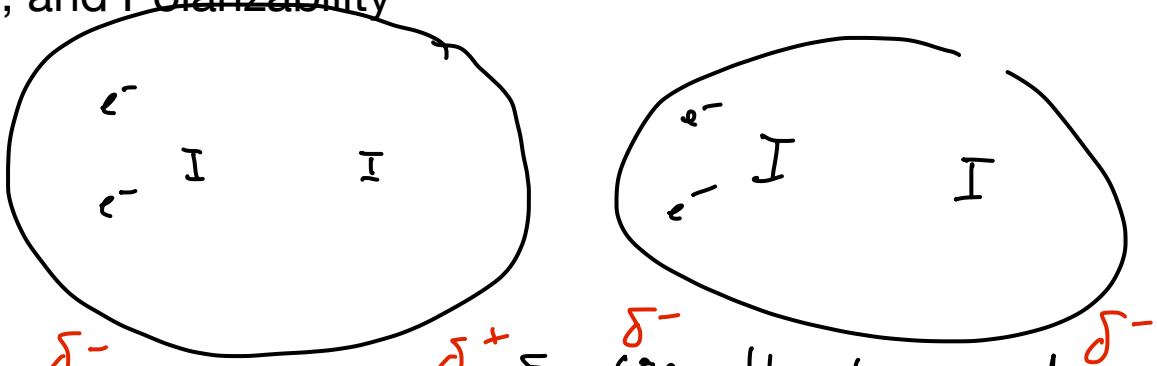
London Dispersion Forces, Size, and Polarizability

H : H

cannot form a solid at 1 atm pressure

: I : I :

solid at RT



δ^- δ^+ ← can δ^- attract e⁻ and δ^- induce a dipole

random spontaneous dipoles can form

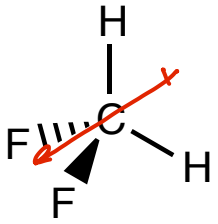
CH_4, CH_3CH_3, $CH_3CH_2CH_3$, $CH_3CH_2CH_2CH_3$

gases at RT

liquid

BP 101°C

A Comparison

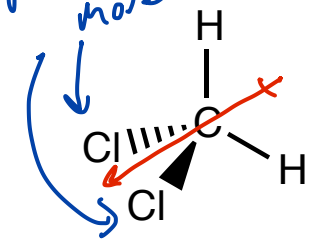


dipole moments 1.97 D

BP's −52 °C

-52, 39.6

much larger e⁻'s move



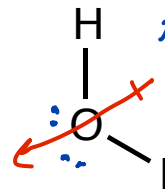
due to size of Cl's

1.60 D

39.6 °C

LDF's are stronger

High BP due to H bonds



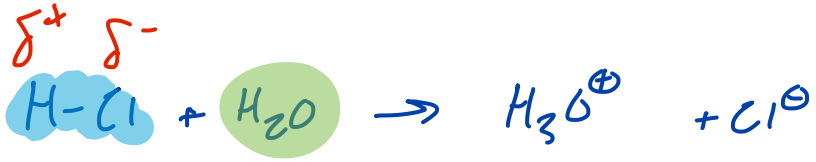
1.85 D

100°C

Chemical Foundations: Acids and Bases/Electophiles and Nucleophiles

Brønsted-Lowry Acids and Bases

Proton donor



Proton acceptor

Electrophiles and Nucleophiles

e⁻ loving ... because they don't have any

nucleus loving .. have e⁻'s they would like to donate to a nucleus