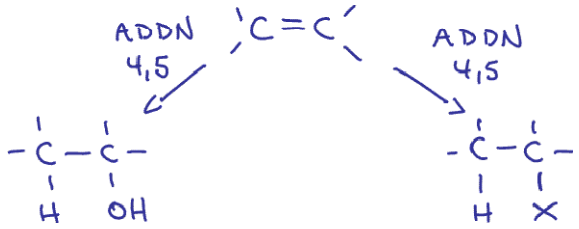
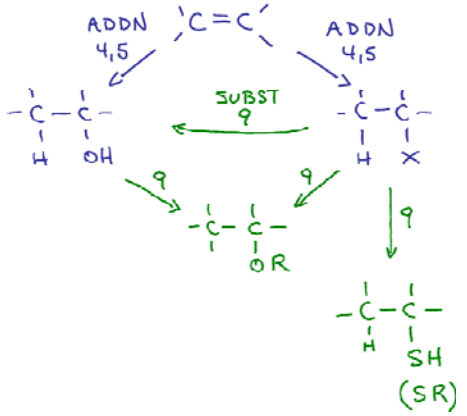
Survey of Key Functional Groups

Ch 8.1

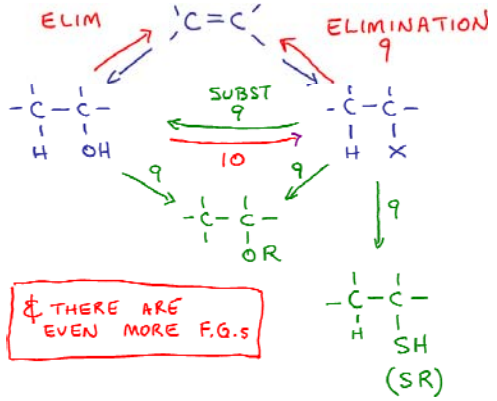
Overview



Overview

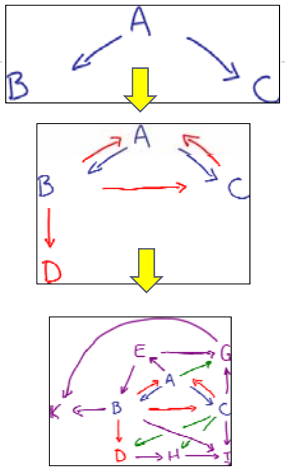


Overview

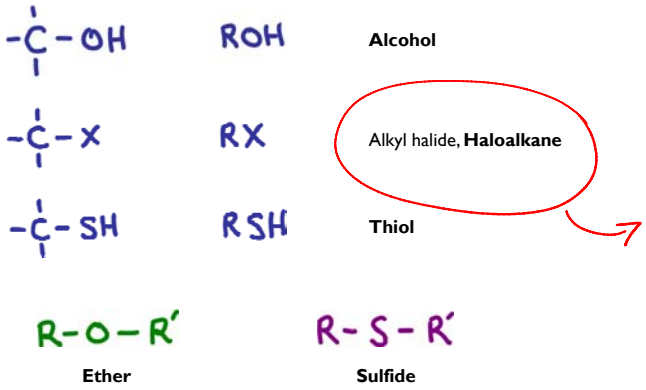


Concerns

- Getting overwhelmed
  - Strange new formulas
  - Strange new names
  - Strange new reagents
  - Many new relationships
  - leads to **brain meltdown !!!**
- Info builds ONE step at a time
- Ch 8 surveys FG
  - Names, drawings, properties
  - No new reactions (almost)



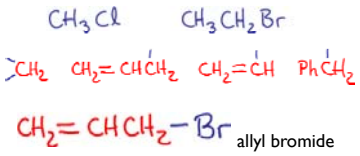
Functional Group Names



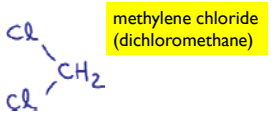
RX Names
Common or Substitutive (IUPAC)?

- **Alkyl halide**
  - **Alkyl** group attached
  - to **Halogen**
- Methyl chloride
- Ethyl bromide
- Special compounds
- Special groups
  - methylene, allyl, vinyl, benzyl
- Special history

- **Haloalkane**
  - **Halogen** substitutent
  - attached to **Alkane**
- Chloromethane
- Bromoethane



Special Compounds Use Common Names



methylene chloride (dichloromethane)

Haloforms

chloroform	$CHCl_3$
bromoform	$CHBr_3$
iodoform	CHI_3

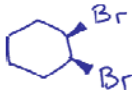
carbon tetrachloride	CCl_4
carbon tetrabromide	CBr_4

Useful solvents
- hydrophobic
- moderately polar
- volatile

but all linked to health problems

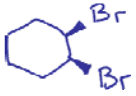
these slides will be posted

Give "haloalkane" (IUPAC) names



Give "haloalkane" (IUPAC) names

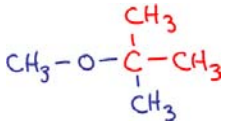
2- fluoropropane



cis-1,2-dibromocyclohexane

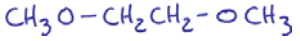
ROR' Names
Common & Substitutive

- **Dialkyl ether**
  - 2 **Alkyl** groups attached
  - to oxygen make **Ether**
- Diethyl ether ("ether")
- Methyl *tert*-butyl ether (MTBE)



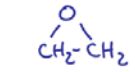
- **Alkoxyalkane**
  - **Alkoxy** (RO) substitutent
  - attached to **Alkane** (R')
- **Alkoxy** = alk~~yl~~ (R) + oxy
- **Alkane** = alk~~yl~~ (R') + ane
- Ethoxyethane
- 2-Methoxy-2-methylpropane

ROR' Names
Additional considerations



1,2-dimethoxyethane

Many special rings



oxirane
epoxide
"alkene" oxide

Tetrahydrofuran (THF)

furan

1,4-dioxane

anisole

RSR' Names
Common & Substitutive

- **Dialkyl sulfide**
  - 2 **Alkyl** groups attached
  - to sulfur make **Sulfide**
- **(Alkylthio)alkane**
  - **Alkylthio** (RS) substitutent
  - attached to **Alkane** (R')
- **Alkylthio** = alkyl (R) + thio
- **Alkane** = alk~~yl~~ (R') + ane

ethyl methyl sulfide

(methylthio)ethane

RX, ROR', RSR' name similarities

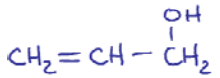
- Common names used widely
  - Special compounds (names often break "common" rules)
  - Rings (ROR, RSR only)
- IUPAC
  - Substituted alkane
    - Haloalkane
    - Alkoxyalkane
    - (Alkylthio)alkane

ROH, RSH name similarities

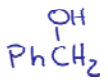
- Common names used
  - Special compounds
- IUPAC
  - New suffix replaces "alk**ane**"
  - ROH, alkan**ol**
  - RSH, alkane**thiol**

Alcohol names - common or IUPAC?

- Common names are fading out
  - Special groups

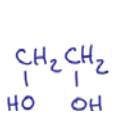


allyl alcohol

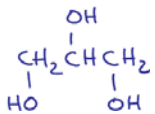


benzyl alcohol

  - Special compounds



ethylene **glycol**

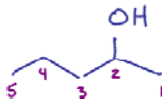


glycerol

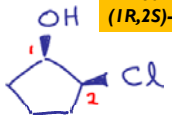
IUPAC - **Alkanol**

- Parent chain = longest chain bearing OH
  - **Alkanol** = alkane + **ol**
- # = position of OH
  - give smallest # possible
  - always #1 in ring

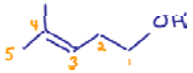
Parent = alkanol



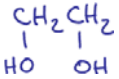
2-pentanol
pentan-2-ol



2-chlorocyclopentanol
cis-2-chlorocyclopentanol
***(1R,2S)*-2-chlorocyclopentanol**



4-methyl-3-penten-1-ol

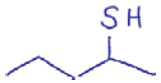


1,2-ethanediol
ethane-1, 2-diol

IUPAC - **Alkanethiol**

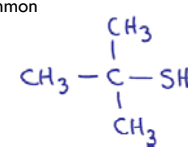
- Parent chain = longest chain bearing SH
  - Keep 'e' from alkane
  - Add 'thiol' (one word)
- # = position of SH
  - give smallest # possible
  - always #1 in ring

Parent = alkanethiol



2-pentanethiol
pentane-2-thiol

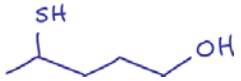
Common



tert-butyl mercaptan

When groups compete: alcohol vs. thiol

- How would you name this?



- 5 C chain. Could be…
  - some kind of **1-pentanol**
  - some kind of **2-pentanethiol**
- **Who wins? OH or SH?**
- **And how do you name other group as substituent?**

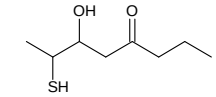
- IUPAC Rules !!!

IUPAC Rules (p. 327)

1. Identify the **principal group**
   a. Rank candidates (OH beats SH)
2. Identify the **principal chain**
   a. Chain contains principal group(s)
   b. Chain contains max. number double & triple bonds, etc.
3. Number the **principal chain**
   a. Lowest # for C bearing principal group
   b. Lowest # for multiple bonds, etc.
4. Construct name
   a. Name principal chain, group, and #
   b. Name substituents and #'s

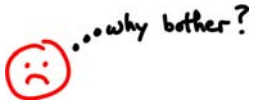
But IUPAC rules are problematic

- Complicated
  - Must fill in **etc.** (several rules)
  - Must know principal group **rankings**
  - Must know **substituent names**



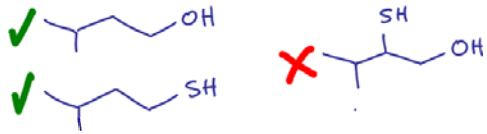
6-hydroxy-7-mercaptooctan-4-one

- And IUPAC names are not even universally accepted



Chem 201 simplification

- I will only give you **naming problems** for compounds that contain ONE principal group
  - You don't need to learn principal group **rankings**
  - You don't need to learn **substituent names**



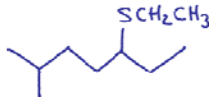
- But … I will expect you to be able to work with more complicated names **when I provide them**

Typical naming problems

- Draw 5-(ethylthio)-2-methylheptane
- Draw an oxirane

Typical naming problems

- Draw 5-(ethylthio)-2-methylheptane



- Draw an oxirane