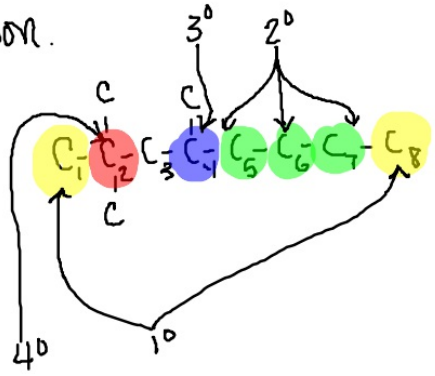
Organic 10/11/18

Classifying carbons w/in the hydrocarbon.



Primary - has 1 carbon attached

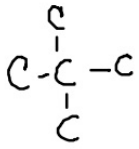
Secondary - has 2 carbon attached

Tertiary - has 3 carbon attached

Quaternary - has 4 carbon attached

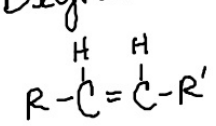
$H_3C(CH_2)_3CH_3 \longrightarrow$ C-C-C-C-C

$H_3CC(CH_3)_3$ same as $C(CH_3)_4$ $\longrightarrow$

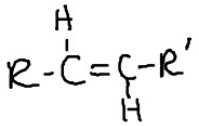


Stability of Alkenes

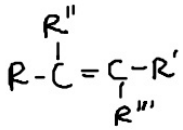
- Degree of substitution - less Hydrogen and more alkyl groups help stabilize the structure



cis



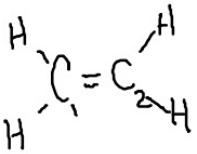
trans



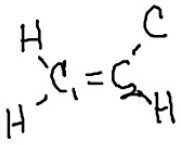
trans (no hydrogen on C=C)

(increasing stability →)

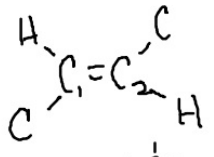
Classifying the carbon of a double bond.



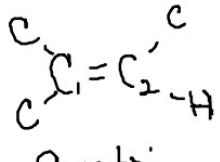
both C_1 & C_2 are mono



C_1 = mono
C_2 = di



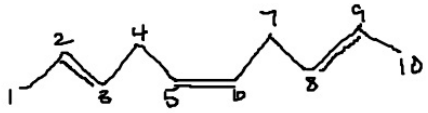
both C_1 & C_2 are di

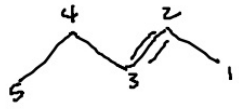


C_1 = tri
C_2 = di

* Cahn-Ingold Prelog Priority Rules (CIPP)

Reminder: double & triple bonds take precidence when # PC.

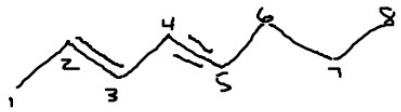




2-pentyne

trans, cis, trans - 2,5,8 - dectriene

order by position | locators | 10C | 3 double bonds



trans-Oct-2-ene-4-yne

Properties of Hydrocarbons (No substituents)

1. Density - generally less dense than water

$D_{gas\ @\ STP} = \frac{\text{molar mass}}{22.4\,L}$

gases: methane, ethane, propane & butane (at RT)

all liquid hydrocarbons at RT have a density less than 1 g/ml.

all " " will float on water.

2. Nonpolar molecules (NP covalent bonds)
   - London dispersion forces
3. Flammable
4. Hydrophobic – does not "like" water
5. Solubility – immiscible in water (not soluble in water)

   * Like dissolves Like * need an organic solvent

   Alcohols are the "Universal Solvent" in organic chemistry.
6. Low specific heat capacity
7. Relatively low M.P. & B.P. (compared to an inorganic molecule of similar mass)

   – B.P. increases as the # of carbon increase

   – B.P. decreases for structures that are branched (w/ same formula)

   n-isomer, normal conformation, is the straight chain w/o branches
8. Volatile
9. alkanes are saturated (max. # of hydrogen)

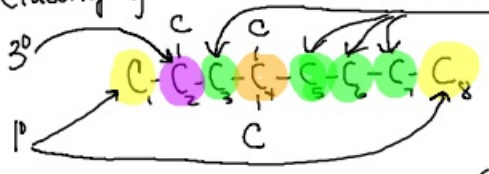
   alkenes/alkynes are unsaturated (less than max H)

   Saturated - fat - solid RT (except: coconut oil)

   unsaturated - oils - liquid at RT

Organic 10/11

Classifying the carbon w/in a hydrocarbon.



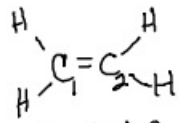
Primary - 1 carbon attached (examples: C_1 & C_8 and methyl branches)
Secondary - 2 carbon attached (examples: C_3, C_5, C_6, C_7)
Tertiary - 3 carbon attached (example: C_2)
Quaternary - 4 carbon attached (example: C_4)

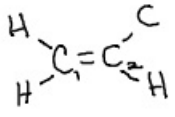
Be careful determining carbon classification if given the condensed formula. Take the time to draw it out.

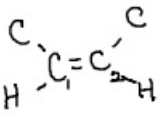
$H_3C(CH_2)_3CH_3$ → $C_1-C_2-C_3-C_4-C_5$

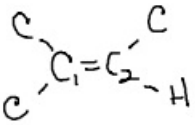
$H_3CC(CH_3)_3$ → $C_1-C_2(C)-C_3$
or
$C(CH_3)_4$

Classifying the carbons in a double bond: based on the # of carbon attached


both C_1 & C_2 are mono


C_1 = mono
C_2 = di

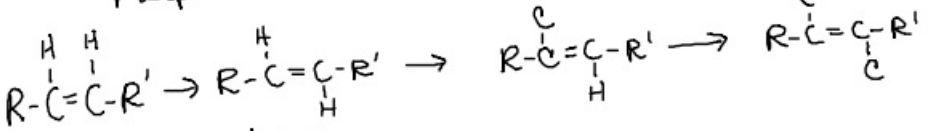

both C_1 & C_2 are di


C_1 = tri
C_2 = di

* Cahn-Ingold-Prelog-Priority Rules (CIPP)

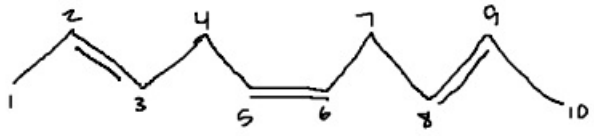
Stability of Alkenes:

Degree of substitution - less Hydrogen and more alkyl groups help stabilize a structure.



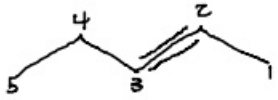
stability increases →

Reminder: double/triple bonds take precidence when # PC.

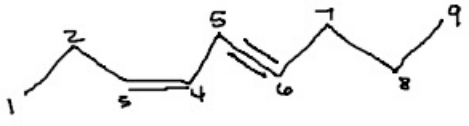


trans, cis, trans - 2,5,8 - dectriene

formation — location — #C #-ane dbl bonds — dbl bond present



2-pentyne



Cis-non-3-ene-5-yne

Properties of Hydrocarbons

1. Nonpolar molecules – C-C and C-H nonpolar covalent bonds
2. low M.P. & B.P. (when compared to inorganic compounds of similar size)
3. London Dispersion Forces
4. Low Density $D_{STP} = \frac{\text{molar mass}}{22.4\text{L}}$ (for gases)
   - Gases at RT – methane, ethane, propane, butane
   - Liquid hydrocarbons all have a density of less than 1 g/mL. (float on water)
5. Solubility: Insoluble in water (hydrophobic)
   Soluble in other organic compounds
   * Like dissolves Like *

   (alcohols are the "universal solvent" for organic compounds)
6. Have the ability to form long chains & conformations
7. Flammable
8. Volatile

*2. B.P. increases for the # of carbon present.
B.P. decreases for isomers that are branched
n-isomer (normal conformation) straight chain w/o branches.