Today

Sections 3.1-3.3
Nomenclature of Alkanes and Cycloalkanes

Sections 3.4–3.6
Nomenclature of alkyl halides, ethers, and alcohols

Next Class

Sections 3.8 – 3.10
Structures and properties of organic molecules

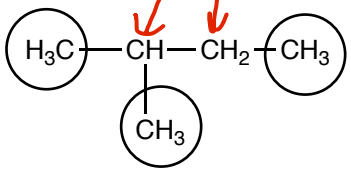
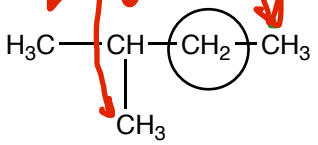
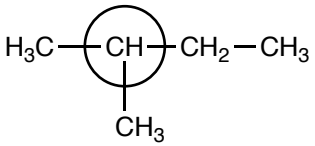
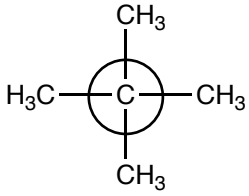
Sections 3.11 – 3.15
Rotation about single C–C bonds and conformations of cyclohexanes

Office hours today are rescheduled to 1:30 to 3:30 via zoom

Check your campus email for the zoom address if you want to stop by

Alkanes

Degree of carbon substitution

1°, primary (*n*-)	2°, secondary (*sec*-, *s*-)	3°, tertiary (*tert*-, *t*-)	4°, quaternary
			

not 1°

not 2°

hydrocarbons - contain only C + H and all C's are sp^3 hybridized all single bonds

 alkane

 alkene

To determine degree of substitution for a given carbon atom, count the # of carbon atoms directly bonded to it.

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What's an alkane

IUPAC
Nomenclature of Alkanes

low BP's, fewer e⁻, Fewer LDF's

major component of natural gas

gas grills metal cylinder with liquid

not typically used as liquid metal container to maintain liquid form

plastic container to maintain liquid form

methane	CH_4	
ethane	CH_3CH_3	
propane	$CH_3CH_2CH_3$	3 C's
butane	$CH_3CH_2CH_2CH_3$	
pentane	$CH_3CH_2CH_2CH_2CH_3$	5 C's
hexane	$CH_3CH_2CH_2CH_2CH_2CH_3$	
heptane	$CH_3CH_2CH_2CH_2CH_2CH_2CH_3$	
octane	$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_3$	
nonane	$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$	
decane	$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$	
undecane	$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$	
dodecane	$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$	

high BP's, more e⁻, more LDF's

Alkanes are attracted to each other using LDF's.

London dispersion forces: spontaneous, random, non-permanent dipoles

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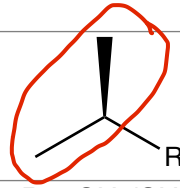
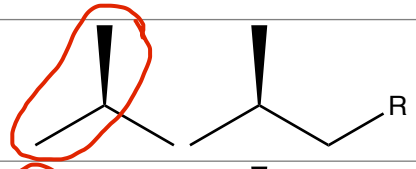
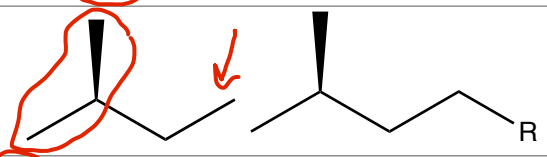
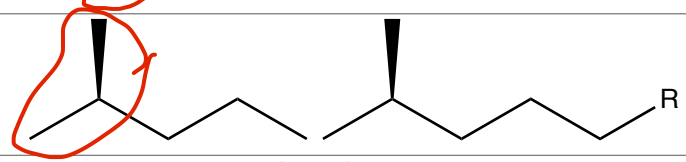
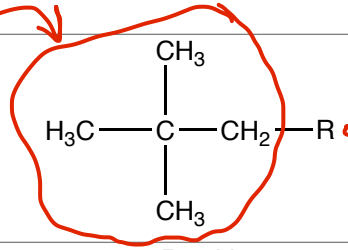
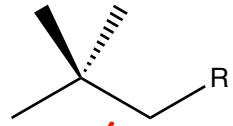
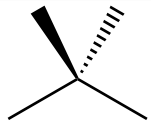
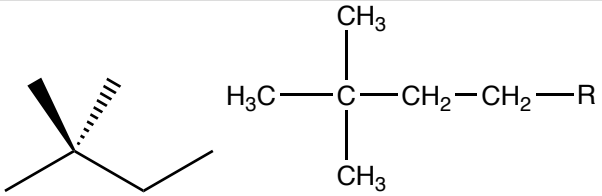
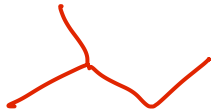
acyclic non branched alkanes

Nomenclature of Substituted Alkanes

iso- isopropyl		
isobutane/isobutyl	R = CH_3/CH_2R (4 C's)	
isopentane/isopentyl	R = CH_2CH_3/CH_2CH_2R (5 C's)	
isohexane/isohexyl	R = $CH_2CH_2CH_3$/CH_2CH_2R (6 C's)	
neo- neopentyl		
neopentane	R = H (5 C's)	
neohexane/neohexyl	R = CH_3/CH_2R (6 C's)	



this is the iso group

R is an organic variable that means "more organic stuff goes here."

organic variable

R = H

R = H, CH_3

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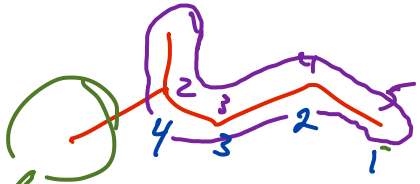
Old-Timey Names

Nomenclature of Alkanes

#-a substituent-#-b substituent alkane



Form of name: #-followed by substituent name followed by parent hydrocarbon name

Determine longest continuous chain.

2-methylpentane

- This is the **parent hydrocarbon**
- If compound has two or more chains of the same length, parent hydrocarbon is chain with greatest number of substituents

CH_3 group.

looks like an alkane

List the name of substituent(s) before the name of the parent hydrocarbon along with the number of the carbon to which it is attached--Substituents are listed in alphabetical order – neglecting prefixes such as di- tri- tert- etc.

- Find and list all of the substituents CH_3, methyl
- Names of alkyl substituents are based on the length of the substituent.
- Names for branched substituent such as *sec*-butyl and *tert*-butyl are acceptable, but systematic substituent names are preferable.
    - The numbering system for a branched substituent begins with the carbon attached to the parent hydrocarbon
    - This number together with the substituent name is placed inside parentheses
- Number the substituents 2 or 4 2 is lower
    - in the direction that gives the lower number for the lowest-numbered substituent. (Lowest possible number for all substituents on the parent chain)
    - When both directions yield the same lower number for the lowest numbered substituent, select the direction that yields the lower number for the next lowest numbered substituent
    - If same substituent numbers are obtained in either direction, number in the direction giving lowest number to the first (alphabetically) named substituent

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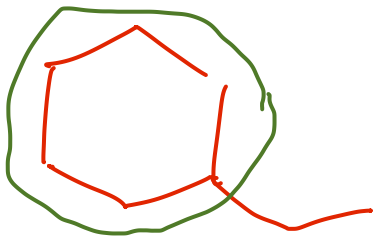
acyclic non branched alkanes

where H atoms are replaced with other atoms those replacements are substituents

Cycloalkanes

- Determine the name of the parent alkane
  - Ring is the parent hydrocarbon unless the alkyl substituent has more carbons; in that case the substituent becomes the parent hydrocarbon
  - cyclo(number of C atoms)ane
    - cyclohexane
    - cyclopentane
- Cite the name of substituent before the name of the parent cycloalkane
  - one substituent, no need to give it a number
  - two substituents
    - alphabetical order
    - first substituent is given the number 1
    - numbers counted (clockwise or counterclockwise) to give lowest 2nd substituent number
  - more than two substituents
    - not necessarily in alphabetical order
    - starting point (substituent with number 1) and direction of the counting (clockwise or counterclockwise) is decided by finding the combination that gives the lowest possible numbers for all of the substituents



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