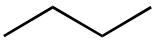
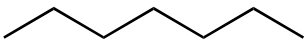
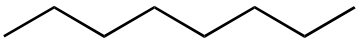
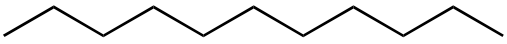
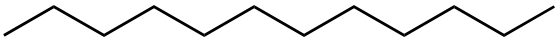
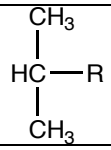
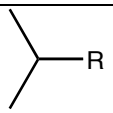
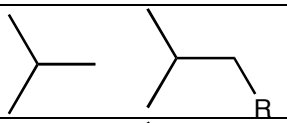
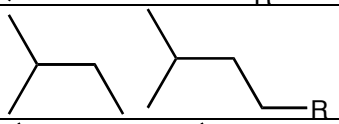
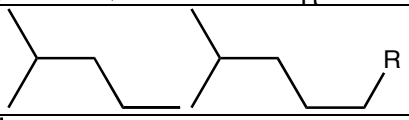
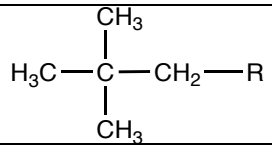
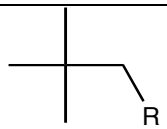
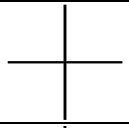
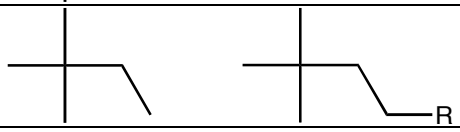
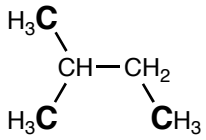
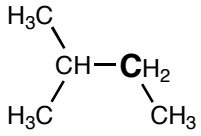
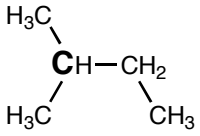
Nomenclature of alkanes

methane	CH_4	
ethane	CH_3CH_3	
propane	$CH_3CH_2CH_3$	
butane	$CH_3CH_2CH_2CH_3$	
pentane	$CH_3CH_2CH_2CH_2CH_3$	
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	$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$	

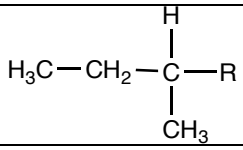
Funky groups/alkanes

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)	
neohaxane/neohexyl	R = CH_3/CH_2R (6 C's)	

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

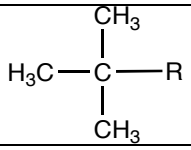
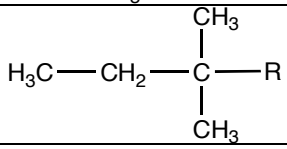
n- often used with strait chain compounds though it is not actually necessary.

sec-

sec-butyl *s*-butyl		the substituent is attached to a 2° C of butane (4 C's)

no other "*sec*-" group

tert-

tert-butyl *t*-butyl		a substituent is attached to the 3° C of a 4 C molecule/unit
tert-pentyl *t*-pentyl		a substituent is attached to the 3° of a 5 C molecule/unit

no other "*tert*-" group

Form of name

#-followed by substituent name followed by parent hydrocarbon name

- Determine longest continuous chain.
  - 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

- Cite the name of substituent 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
  - Names such as *sec*-butyl and *tert*-butyl are acceptable, but systematic substituent names are preferable.
    - Numbering of the substituent begins with the carbon attached to the parent hydrocarbon
    - This number together with the substituent name is placed inside parentheses
  - Number the substituents
    - 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 direction giving lowest number to the first (alphabetically) named substituent

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(#)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

Alkyl halides: alkanes containing a halogen

Common name

- alkyl name + halide
  - CH_3I = methyl iodide
  - CH_3CH_2I = ethyl iodide

IUPAC Nomenclature of halo-alkanes

- The halogen is a substituent on the alkane and is treated like any other substituent.
- The halogen is indicated by removing the "ine" ending from the element name and adding "o"
  - CH_3Cl = chloromethane
  - CH_3CHCl_2 = 1,1-dichloroethane

Ethers: two alkanes linked by an oxygen

Common name

- names of alkyl groups followed by the word ether
  - CH_3OCH_3 = dimethyl ether (aka methyl ether)
  - $CH_3CH_2OCH_2CH_3$ = diethyl ether (aka ethyl ether, and ether)
  - $CH_3CH_2OCH_3$ = ethyl methyl ether

IUPAC

Ethers are alkoxy alkanes (an alkoxy, RO, substituent on an alkane)

- longest alkyl chain is the alkane
- the smaller chain is given the alkoxy designation

Alcohols: molecules containing an OH unit

Common name

- Alkyl alcohol

IUPAC name

Form: #-(parent alkane)(functional group "ol" ending)
#-(substituent)(parent alkane)-#-(functional group "ol" ending)

- Based on Parent Alkane
  - the longest continuous chain that contains the OH
  - Number the chain in direction that gives functional group the lowest number
- Substituents
  - If both a substituent and a functional group are present, the functional group gets the lower number
  - If the functional group gets the same number when counted from both directions, use direction which gives the substituent the lower number
  - If there is more than one substituent, cite substituents in alphabetical order

Amines: molecules containing an NR_3 unit

Common name

- Name of the Alkyl group(s) (in alphabetical order) followed by the syllable "amine"
- The whole name is a single word

IUPAC

Form: #-(parent alkane)amine
#-(substituent)(parent alkane)-#-amine
N-(name of alkyl substituent on N)-#-(substituent on main chain)(parent alkane)-#-amine

- Based on Parent Alkane (lose e) add amine
  - The longest continuous chain that contains the N
  - Number the chain in direction that gives functional group the lowest number
- Substituents on the parent alkane
  - If both a substituent and a functional group are present, the functional group gets the lower number
  - If the functional group gets the same number when counted from both directions, use direction which gives the substituent the lower number
  - If there is more than one substituent, cite substituents in alphabetical order
- Substituents on the nitrogen
  - Use italicized N- for each additional substituent(s) on the nitrogen