

Today

Next Class

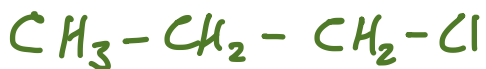
Sections 3.1-3.3
Nomenclature of Alkanes and Cycloalkanes

Sections 3.8 – 3.10
Structures and properties of organic molecules

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

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

Test on Chapters 1 and 2 and degree of substitution from Chap 3 on Friday October 8



Nomenclature of Alkanes, Alkyl Halides, and Ethers

The form of the name: #-followed by substituent name(s) followed by parent hydrocarbon name

~~methane~~
methoxy

Determine longest continuous chain.

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

Find and list the name(s) of the substituent(s) alphabetically (neglecting prefixes such as di- tri- tert- etc) before the name of the parent hydrocarbon along with the number of the carbon to which it is attached

- Alkyl substituents

- names are based on the length of the substituent chain attached to the parent hydrocarbon
- the "ane" ending for the alkane of the same length is replaced with a "yl" ending
- for branched substituents, which are rare, names such as *sec*-butyl and *tert*-butyl are acceptable, but systematic substituent names are preferable.
 - numbering of the substituent's substituent begins with the carbon attached to the parent hydrocarbon
 - the substituent's substituent number together with the names are placed inside parentheses
 - the number for the carbon on the parent hydrocarbon to which the branched substituent it attached is placed in front of the parentheses

→ Halogen Substituents

chlorine → chloro

- the "ine" ending of the element's name is replaced with an "o"



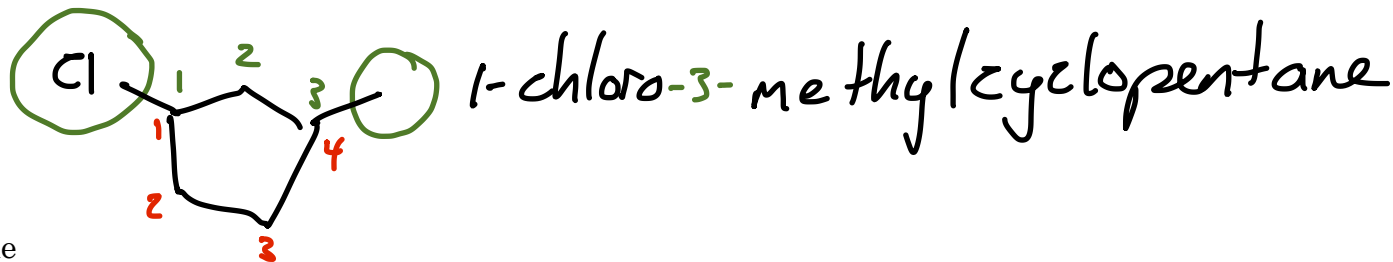
→ Ether or Alkoxy substituents

- names are based on the length of the substituent chain attached to the O atom attached to the parent hydrocarbon
 - the "ane" ending for the alkane of the same length is replaced with an "oxy" ending
 - for branched substituents, common names are acceptable, and the IUPAC convention is the same as for branched alkyl substituents
- alkane → alkoxy
- 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

https://www.westfield.ma.edu/PersonalPages/cmasi/nomenclature_handout.pdf

alkanes with alkyl, halo, alkoxy substituents

Nomenclature of Cycloalkanes



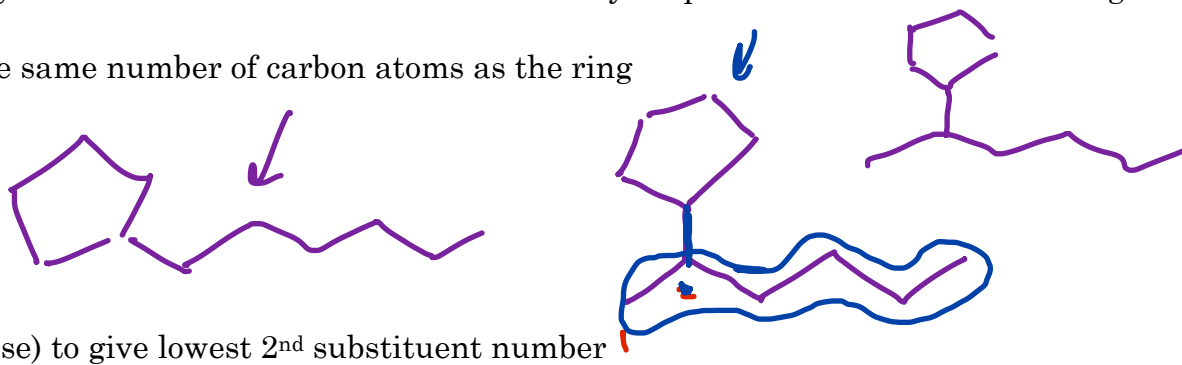
All of the rules from Alkanes plus...

Determine the name of the parent alkane

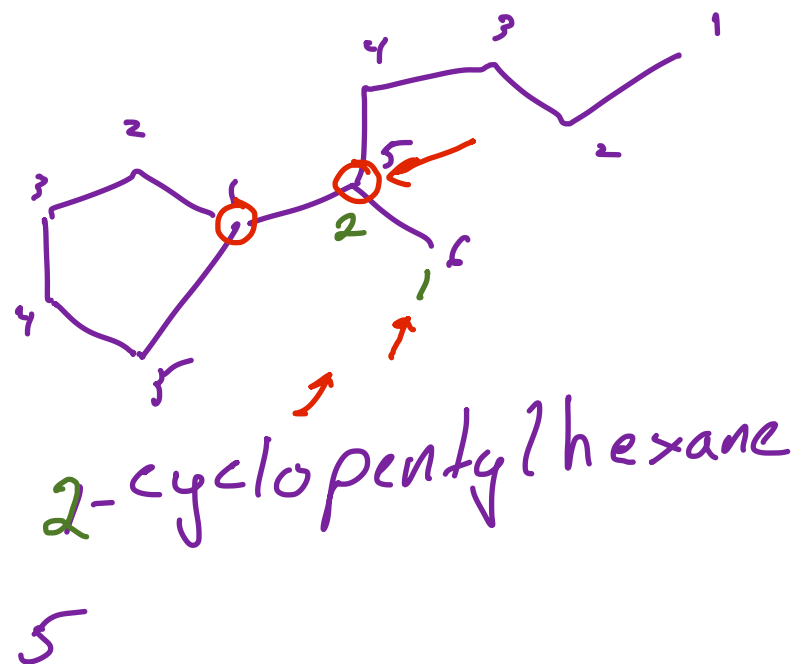
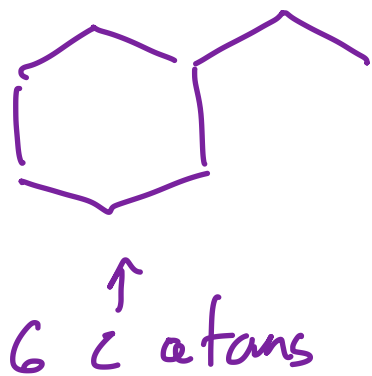
- the ring is the parent hydrocarbon unless the alkyl substituent has more carbons. If the acyclic part of the molecules is a longer chain then it is the parent hydrocarbon
- add "cyclo" before the name of the alkane with the same number of carbon atoms as the ring

Substituents

- one substituent, no need to give it a number
- two
 - 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

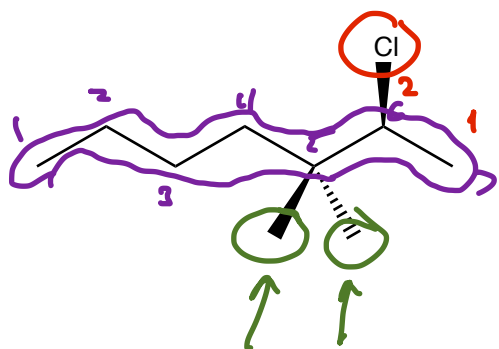


ethylcyclohexane



Alkyl Halides and Ethers are Substituted Alkanes

longest chain?



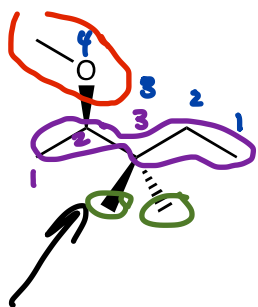
heptane

chlorine \Rightarrow chloro

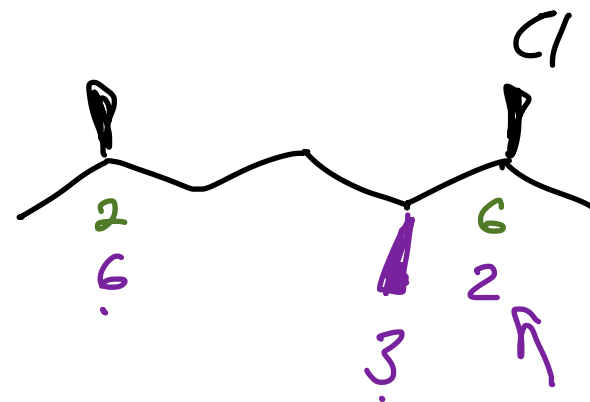
methane \Rightarrow methyl \Rightarrow dimethyl

\rightarrow ~~2~~-chloro-~~3,3~~-dimethyl heptane

~~4~~-methoxy-~~3,3~~ dimethyl pentane



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Alcohols are Special

Alcohols: molecules containing an OH unit

Common name

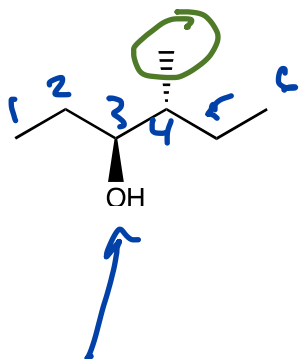
- Alkyl alcohol

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



hexane \Rightarrow hexanol

4-methyl-3-hexanol



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functional groups take priority

OH is a functional group

Practice

