

Chem 152 Notes

Chapter 12

I. Bonding

A. Ionic

B. Covalent

1. purely covalent

2. polar covalent

C. HONC

D. Shape of organic compounds

II. Representing organic compounds

A. Drawing structures

full

condensed

line

determine molecular formula for the following:

ex:

ex;

B. Naming organic compounds

prefix—root word—suffix

root words:

methane

methyl

ethane

ethyl

propane

propyl

Naming Substituted Alkanes

1. find longest chain, use appropriate root word
2. number the atoms in chain so that lowest possible numbers are used for the substituents, arrange substituents alphabetically in prefix
3. number and name substituents on the chain
4. use di-, tri-, tetra- for multiple substituents that are the same
5. write as single word

ex:

ex:

ex:

ex;

ex:

ex:

C. Functional groups

1. functional group is reactive portion of molecule

see handout—know alkanes, alkenes, alkynes, aromatic rings, alkyl halides, amines, alcohols, ethers, ketones, aldehydes, amides, esters, carboxylic acids

ex:

ex;

ex:

ex:

ex:

ex:

determine functional groups in a complex molecule

ex:

ex:

D. Isomers

1. constitutional isomers – same molecular formula, different structure

2. stereoisomers – same attachments, different in 3D

E. Types of carbon

1. primary

2. secondary

3. tertiary

ex:

ex;

F. Cycloalkanes

1. find ring size, use appropriate root word and add cyclo-

2. number the atoms of the ring so that lowest numbers used, starting with the priority group if one exists

ex:

ex:

III. Properties

IV. Sources

V. Reactions

A. Combustion

B. Halogenation in general:

mechanism:

ex:

ex:

ex:

ex:

VI. Analysis

Chapter 13 – Alkenes, Alkynes, Aromatic rings

I. Nomenclature and Properties

A. IUPAC – Alkenes

1. find longest chain with C=C, use appropriate root word
2. drop –ane and add –ene in suffix
3. number so that the alkene gets the lowest possible number (carbons of double bond must be numbered consecutively)
4. multiple double bonds are –diene, -triene, etc.
5. stereoisomers of alkenes (cis/trans or Z/E)

ex:

ex:

ex:

ex:

ex:

ex:

B. IUPAC – Alkynes

1. find longest chain with triple bond, use appropriate root word
2. drop –ane and add –yne in suffix
3. number so that the alkyne gets the lowest possible number (carbons of triple bond must be numbered consecutively)
4. multiple double bonds are –diyne, -triyne, etc.

ex:

ex:

ex:

ex:

ex;

ex:

C. IUPAC – Aromatic rings

define aromatic

define benzene

1. if simple substitution, then the root word is benzene
2. disubstituted benzene is
 - ortho for 1,2
 - meta for 1,3
 - para for 1,4
3. when numbering, use the lowest possible numbers
4. if complex side chain, then use phenyl- as a substituent in the prefix

ex:

ex:

ex:

ex:

ex:

ex:

D. Common names

ethylene

propylene

acetylene

benzene

phenyl

toluene

phenol

aniline

pyridine

E. Properties

define electrophile

define nucleophile

pi bonds are nucleophiles

F. Natural products

II. Formation

A. Alkenes

1. cracking

2. elimination of alkyl halides

B. Alkynes

1. calcium carbide

2. double elimination

C. Aromatic rings

III. Reactions

A. Alkenes

1. hydrogenation

in general:

mechanism:

2. with electrophiles

in general:

Markovnikov rule –

energy diagram

cation stabilization

carbocation stability: $3^\circ > 2^\circ > 1^\circ$

a. H_2SO_4 and H_2O

in general:

mechanism:

ex:

ex:

ex:

ex:

in general: b. HX

mechanism:

ex:

ex;

ex:

ex:

in general: c. X_2 (Br_2 or Cl_2)

mechanism:

ex;

ex:

ex:

ex:

ex: make 1-chloro-1-methylcyclopentane from any alkene

ex: make 2-pentanol from any alkene

B. Alkynes

1. hydrogenation

ex:

2. reactions with electrophiles

a. H_2SO_4 and H_2O

ex:

ex:

b. HX

ex:

ex:

c. X_2

ex:

ex:

C. Aromatic rings

1. hydrogenation

ex:

2. reactions with electrophiles

a. HNO_3 and H_2SO_4

ex:

ex:

b. X_2 and Fe

ex:

ex:

c. RCl and AlCl_3

ex:

ex:

IV. Analysis

A. Chemical

alkanes are non-reactive

alkenes and alkynes react with Br_2

aromatic rings are less reactive

B. Spectroscopic

Infra-red spectroscopy (IR)

Nuclear magnetic resonance spectroscopy (NMR)