



Organic Chemistry

- Organic chemistry: The study of carbon-based compounds and their properties
- Saturated hydrocarbons: contain only single C-C bonds

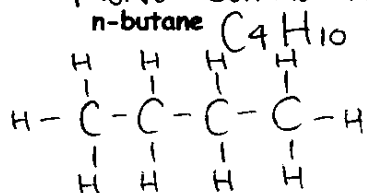
- Unsaturated hydrocarbons: contain double or triple bonds

Saturated Hydrocarbons: the ALKANES: chains of carbon connected by single bonds: $\overset{\text{C-C}}{\text{-ane}}$

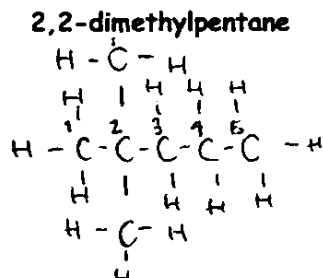
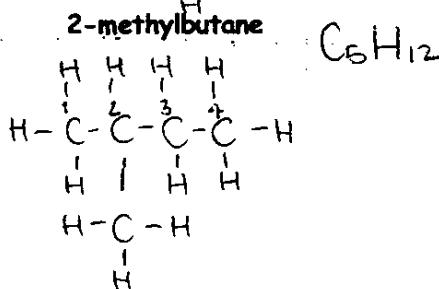
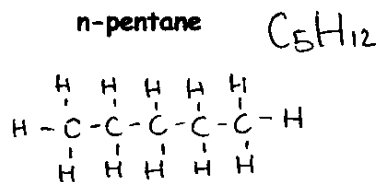
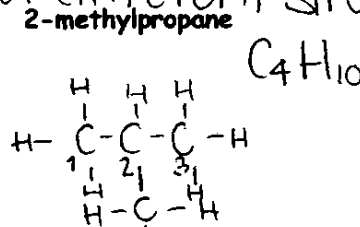
Methane	CH ₄	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$
Ethane	C ₂ H ₆	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$
Propane	C ₃ H ₈	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$
Butane	C ₄ H ₁₀	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$ or CH ₃ CH ₂ CH ₂ CH ₃
Pentane	C ₅ H ₁₂	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$
Hexane	C ₆ H ₁₄	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$

or

- "normal" hydrocarbons: straight chains; no branching
- branched-chain hydrocarbons: isomers of "normal" hydrocarbons; have same formula, but different structures



isomers \longleftrightarrow



cycloalkanes:



cyclobutane

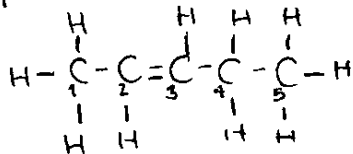
- # longest chain
- ① # from the thing you named it after (-ene, -yne)
 - ↓
 - ② # to min. 1st group
 - ③ # to min. 2nd group ... etc.
 - ④ alphabetical order

Unsaturated Hydrocarbons:

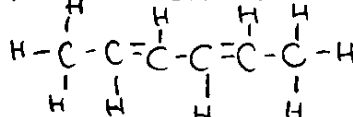
-ene

Alkenes: contain C-C double bonds

2-pentene



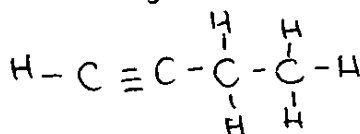
2,4-hexadiene



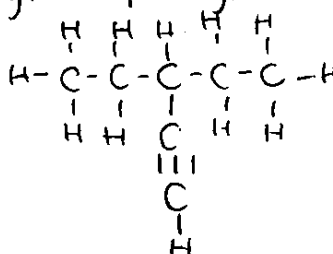
-yne

Alkynes: contain C-C triple bonds

1-butyne

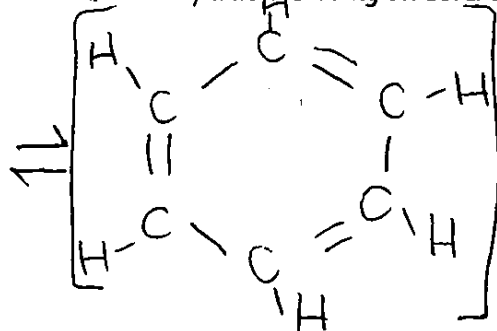
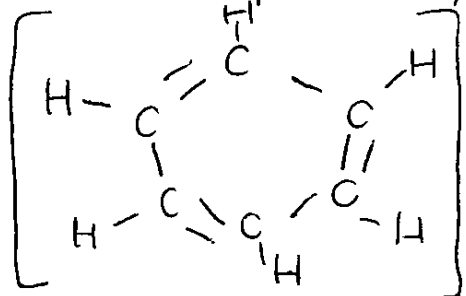


3-ethyl-1-pentyne



Aromatic Hydrocarbons:

Benzene: the simplest aromatic hydrocarbon; has a symmetrical ring structure:



C₆H₆

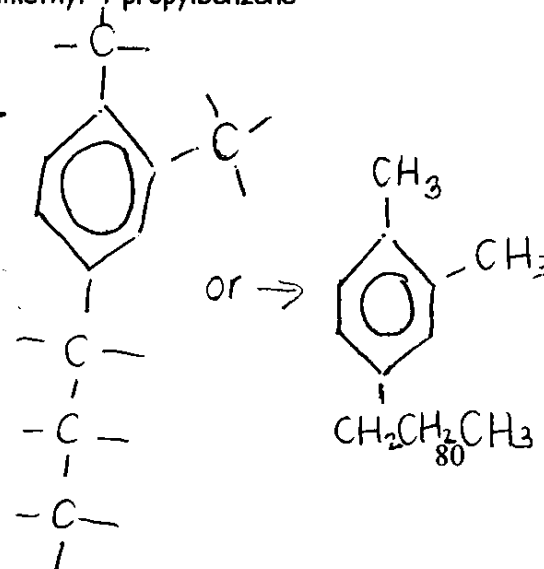
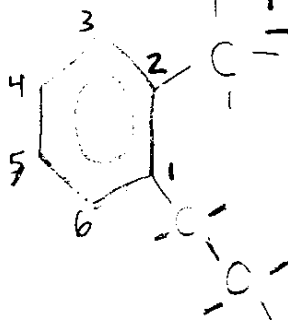


Derivatives of benzene:

~~2-methyl-3-ethylbenzene~~

1,2-dimethyl-4-propylbenzene

should be named
1-ethyl-2-methylbenzene

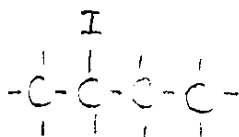


Functional Groups

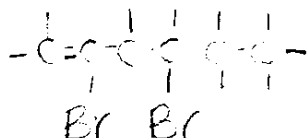
Functional groups: special groups of atoms attached to a hydrocarbon skeleton; the most common sites of chemical reactivity

Organic halides: a hydrogen is replaced by a halogen (fluoro-, chloro-, bromo-, iodo-)

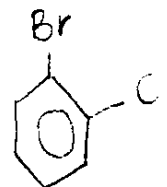
2-iodobutane



2,4-dibromo-1-hexene



1-bromo-2-chlorobenzene

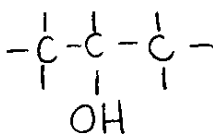


Alcohols & phenols: contain the hydroxyl group (-OH)

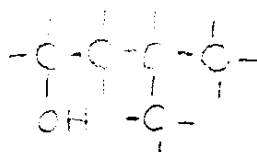
alcohols: at least 1 H on a hydrocarbon is replaced by OH

phenols: at least 1 H on an aromatic ring is replaced by OH

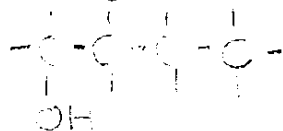
2-propanol



3-methyl-1-butanol

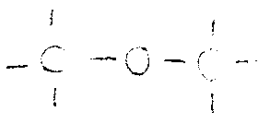


1,2-butanediol



Ethers: cmpds in which an O atom is bonded to 2 organic groups: $-C-O-C-$

methoxymethane
(dimethyl ether)



methoxypropane
(methyl propyl ether)

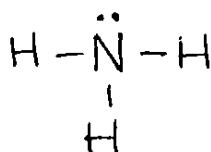


methoxybenzene
(methyl phenyl ether)

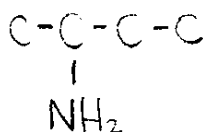


Amines: derivatives of ammonia (NH₃) in which 1 or more hydrogen atoms are replaced by organic groups (alkyl or aryl groups)

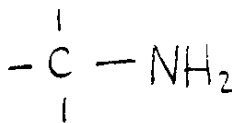
ammonia



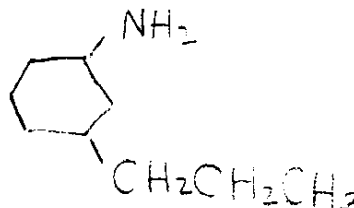
2-aminobutane



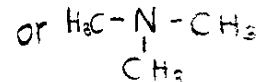
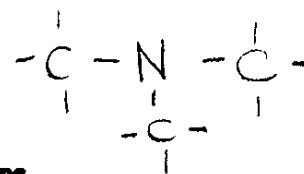
methylamine



1-amino-3-propylcyclohexane



trimethylamine



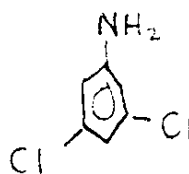
*aniline is the simplest aromatic amine:

aniline

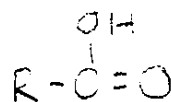
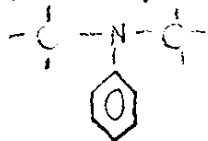


aminobenzene = aniline

3,5-dichloroaniline



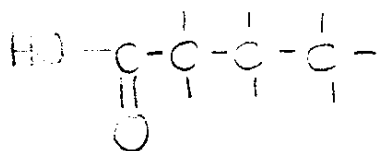
N,N-dimethylaniline



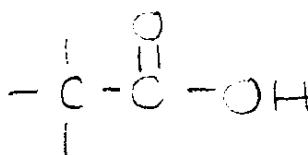
Carboxylic acids: (general formula is R-COOH)

named by dropping the terminal "e" from the parent hydrocarbon and adding "-oic acid"

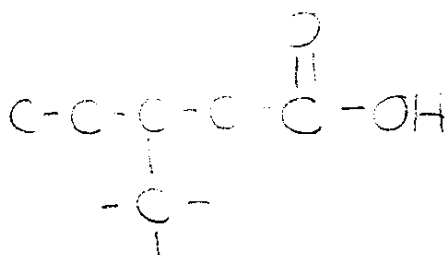
butanoic acid



ethanoic acid



3-methylpentanoic acid



benzoic acid

