

Naming Hydrocarbons and Substituted Hydrocarbons

Aim

- to apply the IUPAC rules for naming organic compounds

Notes

Naming hydrocarbons

- family: alkane, alkene, or alkyne - use suffix ANE, ENE, or YNE
- Length of chain, length of side chain, number of side chains or functional groups, location of side chains or functional groups - use prefixes

Number	Prefix			
	Carbons in Main Chain	Carbons in side chain	Number of side chains or groups	Location of side chains or groups
1	meth	methyl	-	1
2	eth	ethyl	di	2
3	prop	propyl	tri	3
4	but	butyl	tetra	4
5	pent	pentyl	penta	5
6	hex	hexyl	hexa	6
7	hept	heptyl	hepta	7
8	oct	octyl	octa	8
9	non	nonyl	nona	9
10	dec	decyl	deca	10

Substituted hydrocarbons

- Halogenated hydrocarbons - prefix in name
 - fluorine = fluoro; chlorine = chloro; bromine = bromo; iodine = iodo

example: $\text{CH}_3\text{CH}_2\text{CHClCH}_2\text{CH}_3$ (3-chlorobutane)

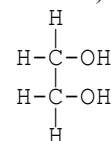
Alcohols

- general formula: R-OH
- suffix: ol
- monohydroxy alcohols: one -OH
 - primary alcohols: the -OH is attached to one end of a hydrocarbon chain
 - general formula: R-CH₂OH
 - example: CH₃CH₂CH₂OH (propanol)
 - secondary alcohols: the OH is attached to a carbon that is attached to two other carbons
 - general formula: $\begin{array}{c} \text{OH} \\ | \\ \text{R}-\text{C}-\text{R} \\ | \\ \text{H} \end{array}$
 - example: CH₃CHOHCH₃ (2-propanol)
 - tertiary alcohols: the OH is attached to a carbon that is attached to three other carbons
 - general formula: $\begin{array}{c} \text{OH} \\ | \\ \text{R}-\text{C}-\text{R} \\ | \\ \text{R} \end{array}$
 - example: CH₃CH₂COHCH₃ (tertiary butanol or 2-methyl-2-propanol)

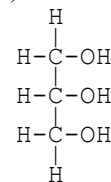
- important monohydroxy alcohols

- ethanol - beverage alcohol
- 2-propanol - rubbing alcohol

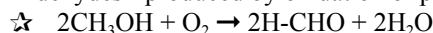
- dihydroxy alcohols (glycols): with two -OH groups
 - example: ethylene glycol or 1,2-ethanediol (active ingredient in antifreeze)



- trihydroxy (trihydric) alcohols: with three -OH groups
 - example: glycerol or 1,2,3-propanetriol (product of digestion of fat)



- Aldehydes - produced by oxidation of primary alcohols



- general formula: R-CHO

- suffix: al

- example: CH₃CH₂CHO (propanal)

- important aldehydes: methanal - formaldehyde

- Ketones - produced by the oxidation of secondary alcohols

- general formula: RCOR

- suffix: one

- example: CH₃COCH₃ (propanone)

- important ketones: propanone - (acetone, dimethyl ketone)

- Acids

- general formula: RCOOH

- suffix: oic acid

- example: CH₃CH₂COOH (propanoic acid)

- important acids: ethanoic acid-acetic acid (vinegar)

- Ethers - produced by dehydration synthesis of two primary alcohols [R-OH + HO-R → R-O-R + H₂O]

- general formula: R-O-R

- example: diethyl ether (C₂H₅OC₂H₅) or ethoxyethane

- use: anesthetic and solvent

- Esters R-COOR (fragrances)

- example: CH₃COOCH₃ methyl methanoate

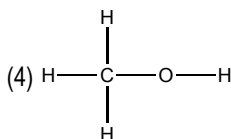
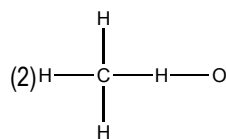
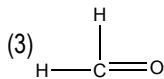
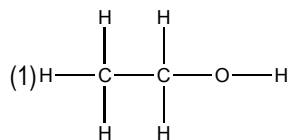
- Amines - derivatives of ammonia

- Amino acids R-C(NH₂)COOH

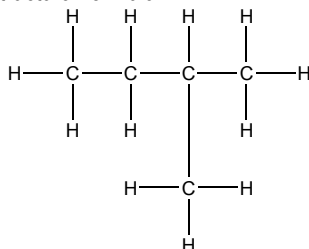
- Amides - dehydration synthesis of amino acids

Answer the questions below by circling the number of the correct response

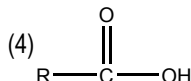
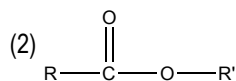
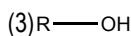
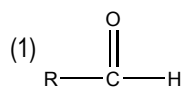
1. Which is the correct structural formula for methanol?



2. What is the correct I.U.C. name of the compound represented by the following structural formula?



- (1) n-pentane
(2) isobutane
(3) 2-methylbutane
(4) n-butane
3. Which is an isomer of 2,2-dimethylpropane?
(1) ethane
(2) propane
(3) n-pentane
(4) n-butane
4. Which molecule contains four carbon atoms?
(1) ethane
(2) butane
(3) methane
(4) propane
5. The general formula of organic acids can be represented as



6. How many carbon atoms are contained in an ethyl group?

- (1) 1
(2) 2
(3) 3
(4) 4

7. Which is an isomer of 2-chloropropane?

- (1) butane
(2) propane
(3) 1-chlorobutane
(4) 1-chloropropane

8. Which is an ester? (1) CH_3OH (2) CH_3COOH (3) CH_3OCH_3 (4) $\text{CH}_3\text{COOCH}_3$

9. The compound $\text{CH}_3\text{CH}_2\text{COOCH}_3$ is an example of
(1) an ester
(2) an alcohol
(3) an acid
(4) a polymer

10. The formula of methanoic acid is

- (1) HCHO
(2) HCOOH
(3) CH_3OH
(4) HCOOCH_3

11. Which is the formula for ethanoic acid?

- (1) CH_3COOH
(2) $\text{CH}_3\text{CH}_2\text{OH}$
(3) $\text{CH}_3\text{CH}_2\text{COOH}$
(4) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

12. The compound $\text{CH}_3\text{COOCH}_3$ is classified as

- (1) an acid
(2) an alcohol
(3) an ester
(4) a hydrocarbon

13. Which formula represents an organic acid?

- (1) CH_3COOH
(2) CH_3OH
(3) CH_3OCH_3
(4) $\text{CH}_3\text{COOCH}_3$

14. The compound methanal, HCHO , is an example of an

- (1) ether
(2) aldehyde
(3) alcohol
(4) acid

15. What could be the name of a compound that has the general formula $\text{R}-\text{OH}$?

- (1) methanol
(2) methane
(3) methyl methanoate
(4) methanoic acid

16. Which organic compound is a ketone?

- (1) CH_3OH
(2) CH_3COCH_3
(3) CH_3COOH
(4) $\text{CH}_3\text{COOCH}_3$