Organic Chemistry

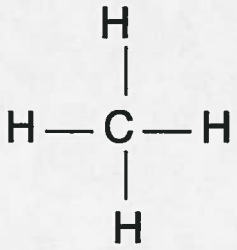
Most of the chemical substances in living systems are organic molecules (contain C, H and may include N and S).

Classes of Organic Molecules

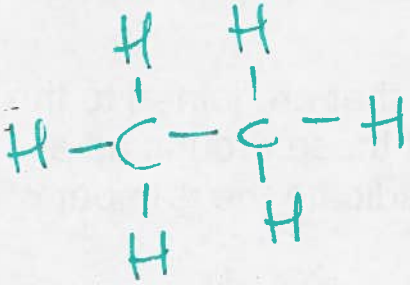
1. Alkanes

Are saturated hydrocarbons (contain ONLY hydrogen and carbon atoms) with only carbon to carbon single bonds.

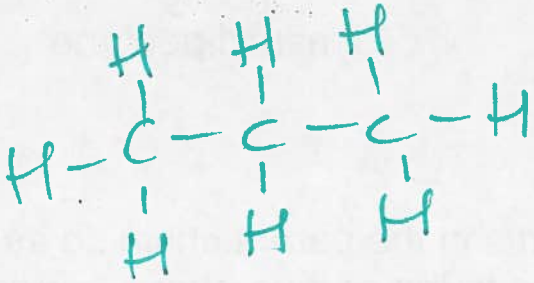
e.g methane



ethane

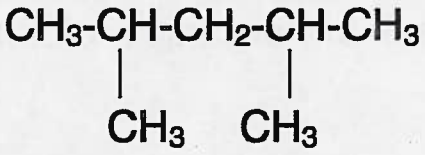


propane

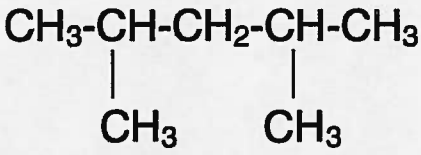


Alkane Nomenclature

Naming alkanes according to the IUPAC system involves only a few rules:

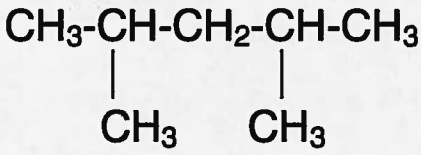
E.g. 

1. Identify the longest continuous chain of carbon atoms in the molecule. Use the alkane name that pertains to this number of carbon atoms.

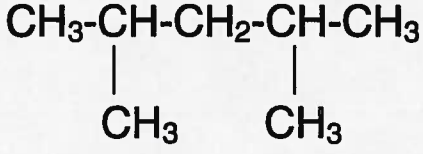
 pentane

meth =	1 carbon	hex =	6 carbons
eth =	2 carbons	hept =	7 carbons
prop =	3 carbons	oct =	8 carbons
but =	4 carbons	non =	9 carbons
pent =	5 carbons	dec =	10 carbons

2. Identify the groups (other than H) that are joined to the longest chain. Add the names of these groups as a prefix along with di-, tri-, etc. to indicate the number of each group.

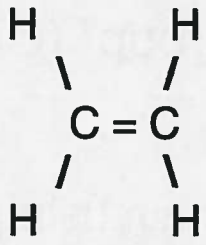
 dimethyl pentane

3. Number the carbon atoms in the parent chain so as to give the lowest possible numbers to the carbon atoms bonded to the substituent groups.

 2,4-dimethyl pentane

2. Alkenes

Are unsaturated hydrocarbons (contain ONLY hydrogen and carbon atoms) which contain one or more double bonds between carbon atoms. E.g. ethene



Alkene Nomenclature

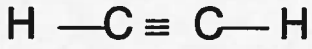
1. Follow rules for naming carbon chain as in alkanes, BUT use suffix "ene" to indicate a double bond.

2. Number the location of the double bond in the carbon chain, using the lowest possible number.

3. For 2 or more double bonds use suffix "adiene" , "atriene" etc...

3. Alkynes

Are unsaturated hydrocarbons (contain ONLY hydrogen and carbon atoms) which contain one or more triple bonds between carbon atoms. E.g. ethyne



Alkyne Nomenclature

1. Use suffix "yne" to denote a triple carbon bond, indicating the location of the bond by number. Again, use the lowest possible number of the carbon chain.

2. If a double bond is also present, the double bond should have the lowest number in the carbon chain.

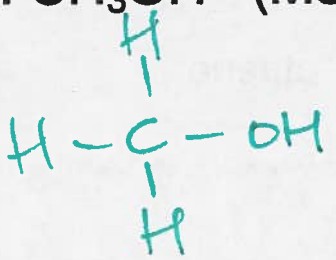
Biological molecules can be classified by distinct groupings of atoms in their hydrocarbon structure called FUNCTIONAL GROUPS.

Alcohols

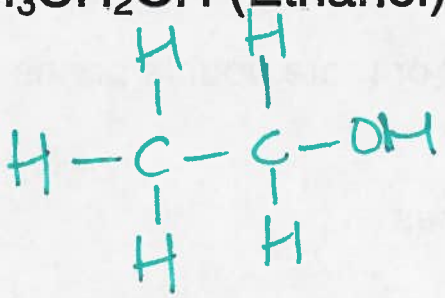
Consists of a "hydroxyl group" (OH) attached to a carbon atom.

Name the longest carbon chain using the appropriate prefix (meth, eth, but, etc.) and add the suffix "**ol**" to the end of the name

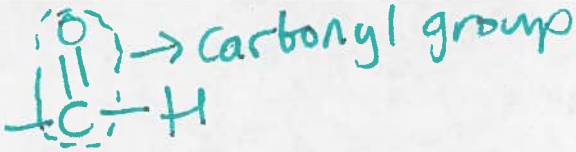
e.g. CH_3OH (Methanol)



CH_3CH_2OH (Ethanol)

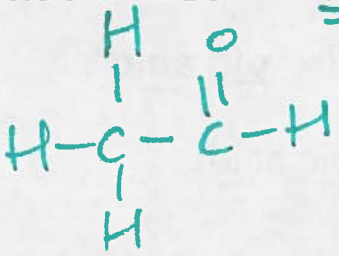


Aldehydes

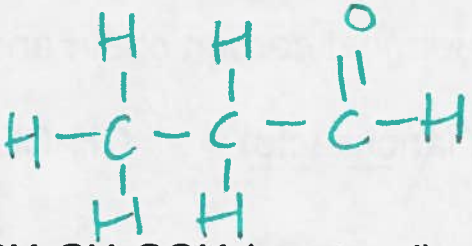


Consist of a "carbonyl group" attached to a hydrogen at the end of a hydrocarbon chain.

Name the longest carbon chain using the appropriate prefix and add the suffix "**al**" to the end of the name

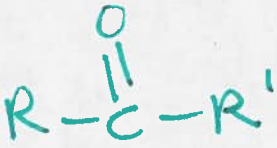


E.g. CH_3COH (Ethanal)



CH_3CH_2COH (propanal)

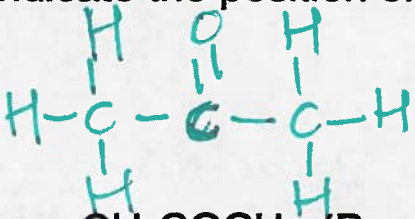
Ketones



R/R' = carbon chain

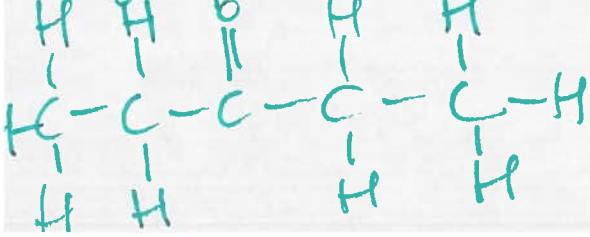
Contains a "carbonyl group" attached between 2 carbon atoms.

Name according to longest carbon chain and add the suffix **"one"**. Indicate the position of the carbonyl group by the carbon number.



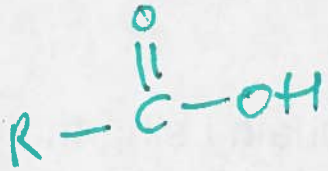
e.g. CH_3COCH_3 (Propanone)

eg: 3-pentanone * if substance has more than 4 carbons, indicate carbon number that ketone group is on.



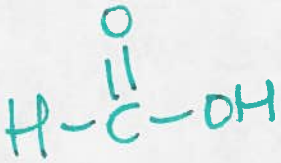
Carboxylic Acids

Contains a "carboxyl group" (--COOH) attached to the end of a hydrocarbon chain.

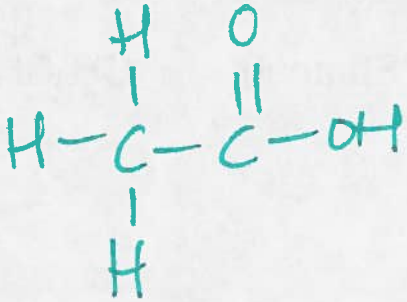


Name according to longest carbon chain and add the suffix "**oic acid**".

e.g. HCOOH (Methanoic acid)



CH_3COOH (Ethanoic acid)

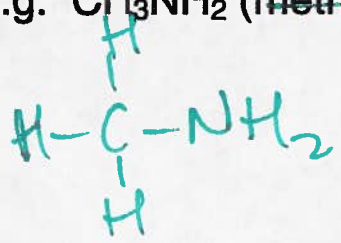


Amines

Contains a amine group ($-NH_2$), a derivative of ammonia (NH_3).

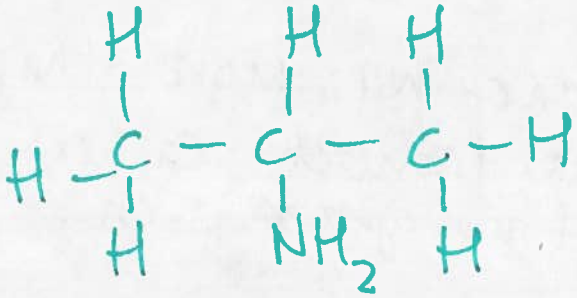
Name according to longest carbon chain and add the suffix "**amine**"

e.g. CH_3NH_2 ~~(methyl amine)~~ methanamine



* if more than 2 carbons indicate the carbon number where the amine group is

eg:



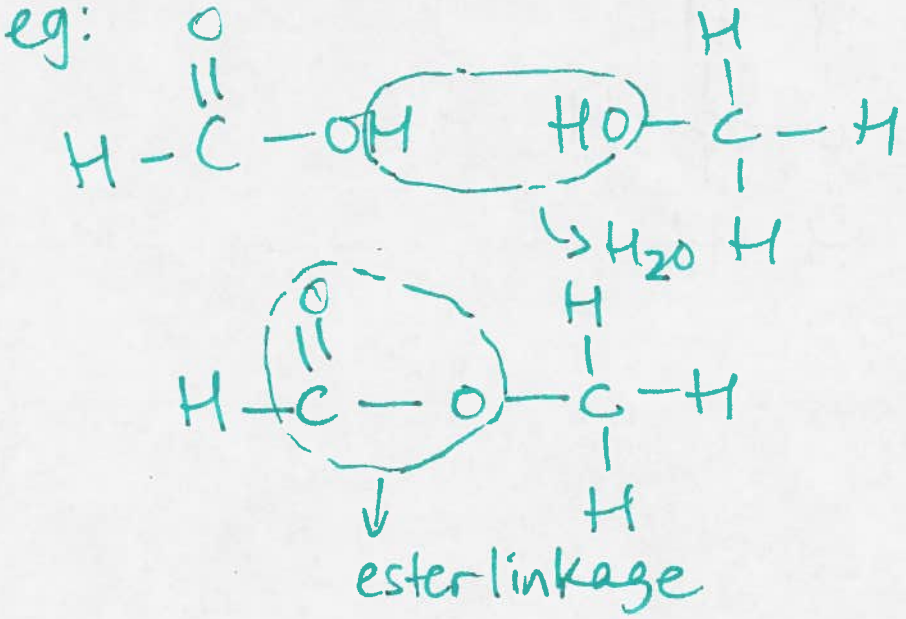
2-propanamine

Esters

Formed when a carboxylic acid reacts with an alcohol.

* recognize only (don't need to name!)

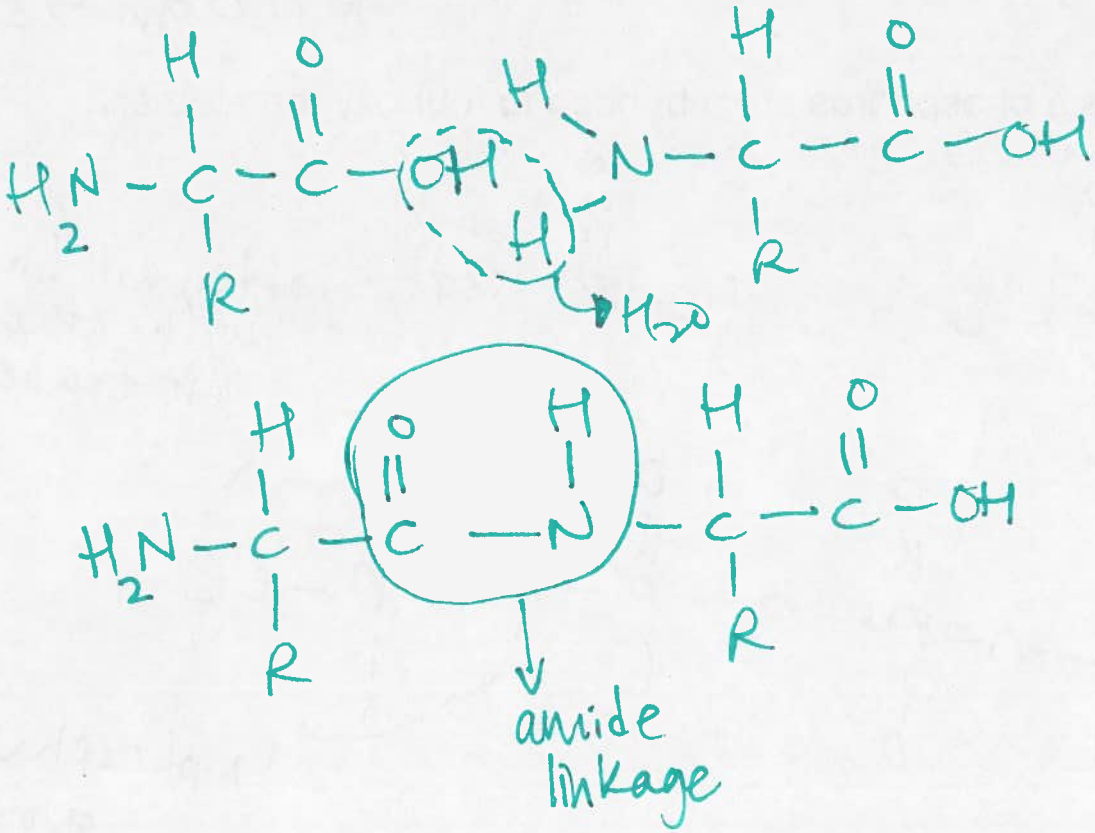
eg:



Amides

Formed when an amine reacts with a carboxylic acid.

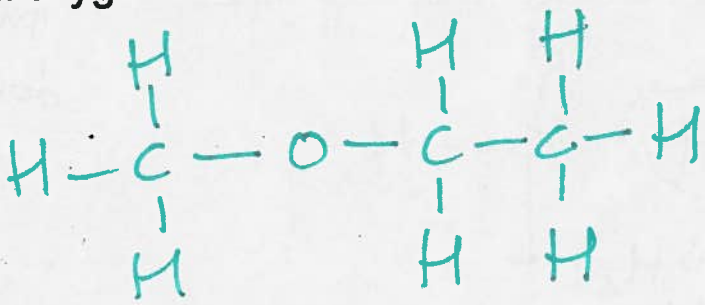
* recognize



Ethers

*recognize!

Contains a oxygen atom in between carbon atoms.

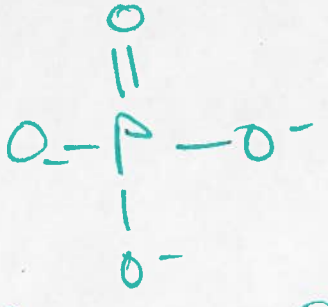


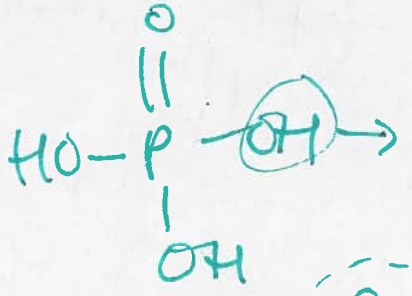
Phosphate

*recognize

Group contains a phosphorus atom bonded to four oxygen atoms; 3 single bonds, 1 double.

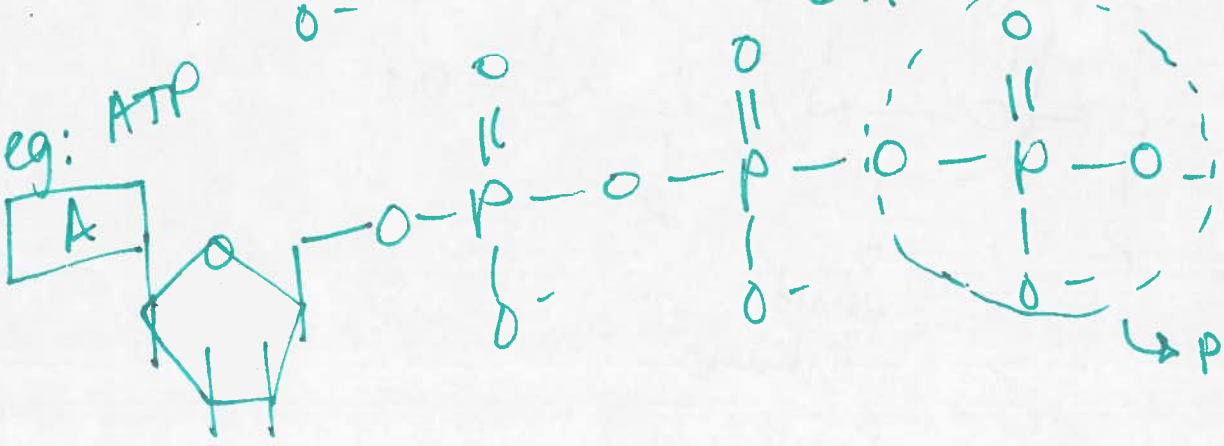
eg:





often will link with other molecules!

eg: ATP



↳ phosphate group.

*also found in DNA!