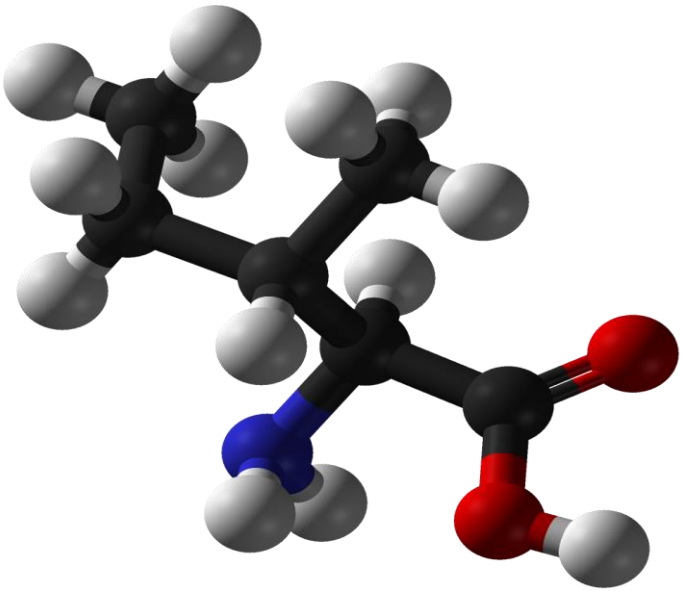
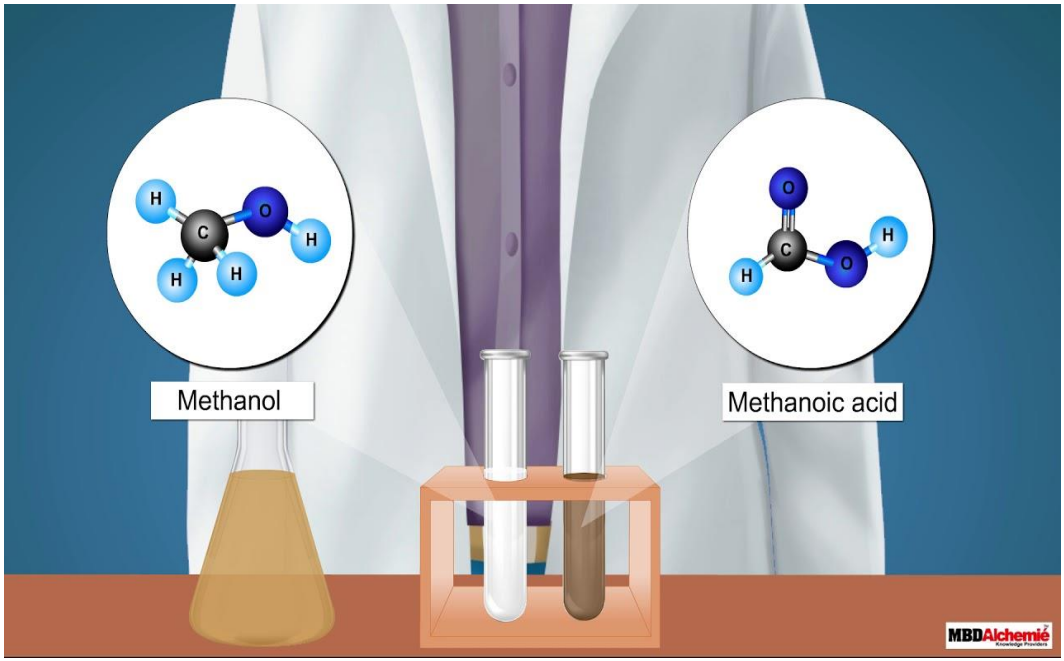
Lec 8

Structure of carbon compounds

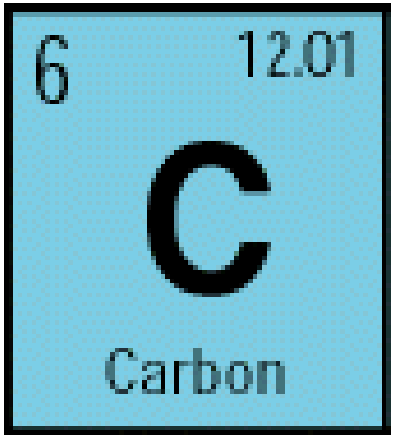
Dr. Rusul H. Hamza

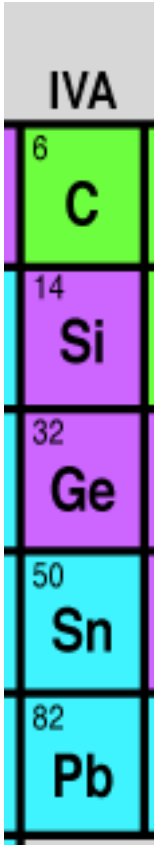




CARBON

- Carbon belongs to the group IV of the periodic table.
- It has four electrons in its outermost orbit, so its valency is four.
- Carbon is a non-metal.

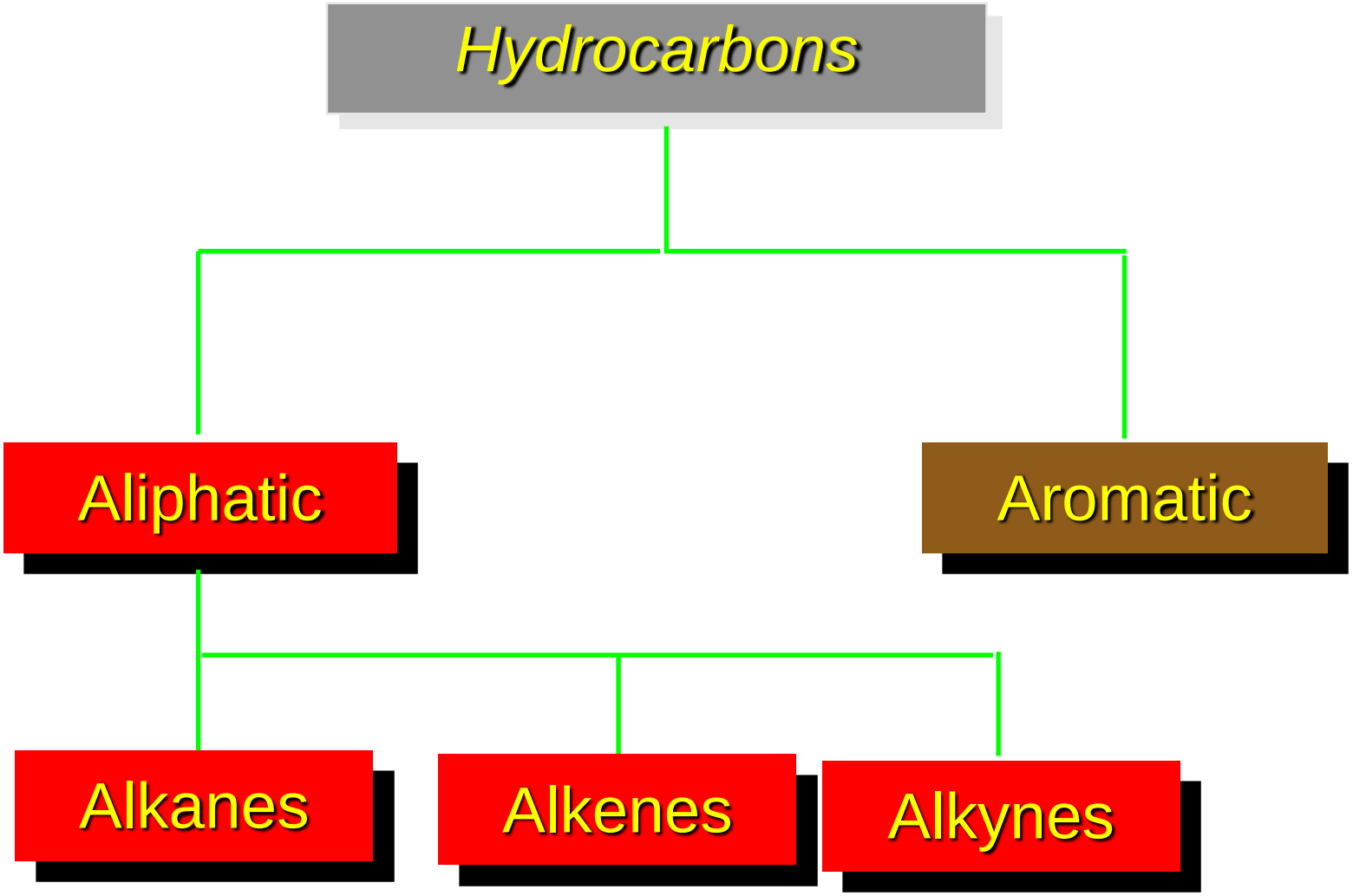




Hydrocarbons

- Hydrocarbons are compounds of carbon and hydrogen.

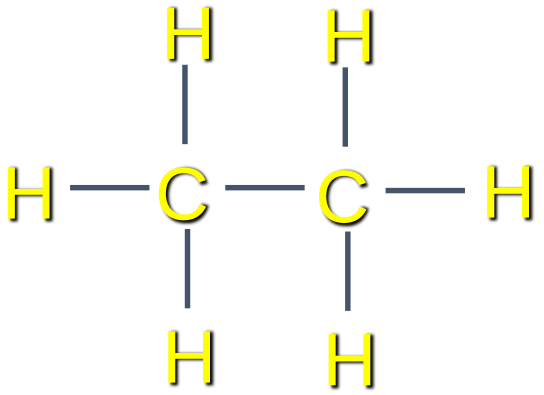
The natural source of hydrocarbons is petroleum (crude oil)


Hydrocarbons
Aliphatic
Aromatic
Alkanes
Alkenes
Alkynes

Hydrocarbons

- Aliphatic
  - Alkanes

- Alkanes are hydrocarbons in which all of the bonds are *single* bonds.

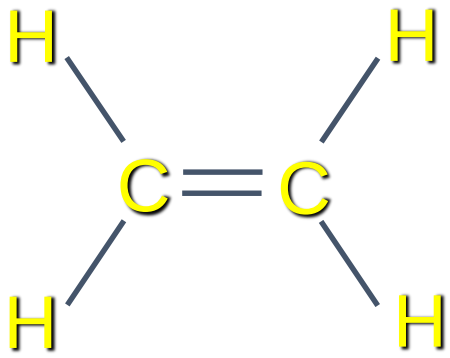


Hydrocarbons

Aliphatic

Alkenes

- Alkenes are hydrocarbons that contain a carbon-carbon *double* bond.



Hydrocarbons

Aliphatic

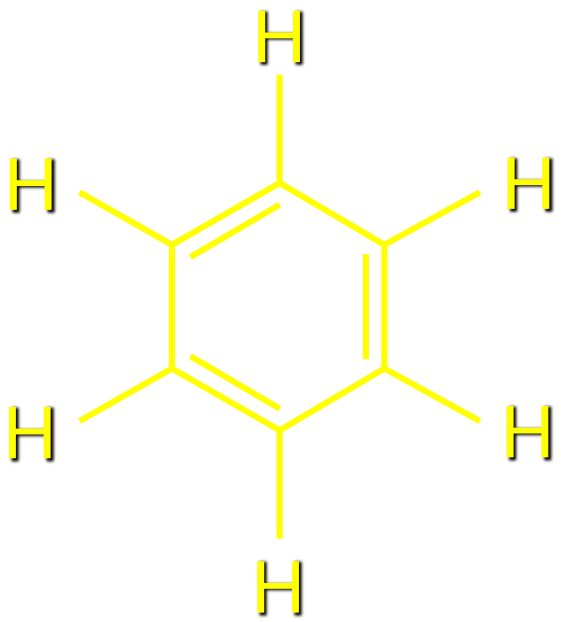
- Alkynes are hydrocarbons that contain a carbon-carbon *triple* bond.

Alkynes

Hydrocarbons

- The most common aromatic hydrocarbons are those that contain a benzene ring.

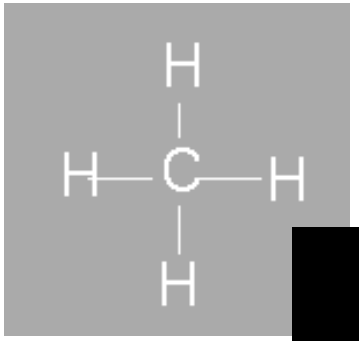
Aromatic

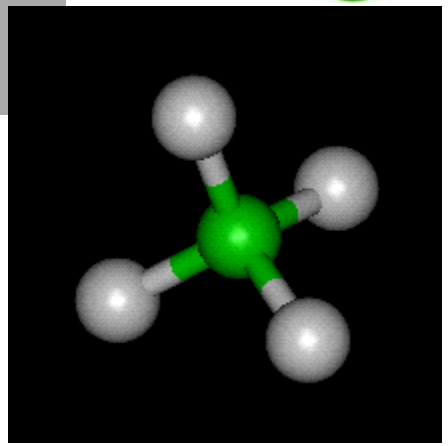


The Simplest Hydrocarbon

A molecule of methane has four hydrogen atoms linked to one central atom of carbon.

Methane CH_4

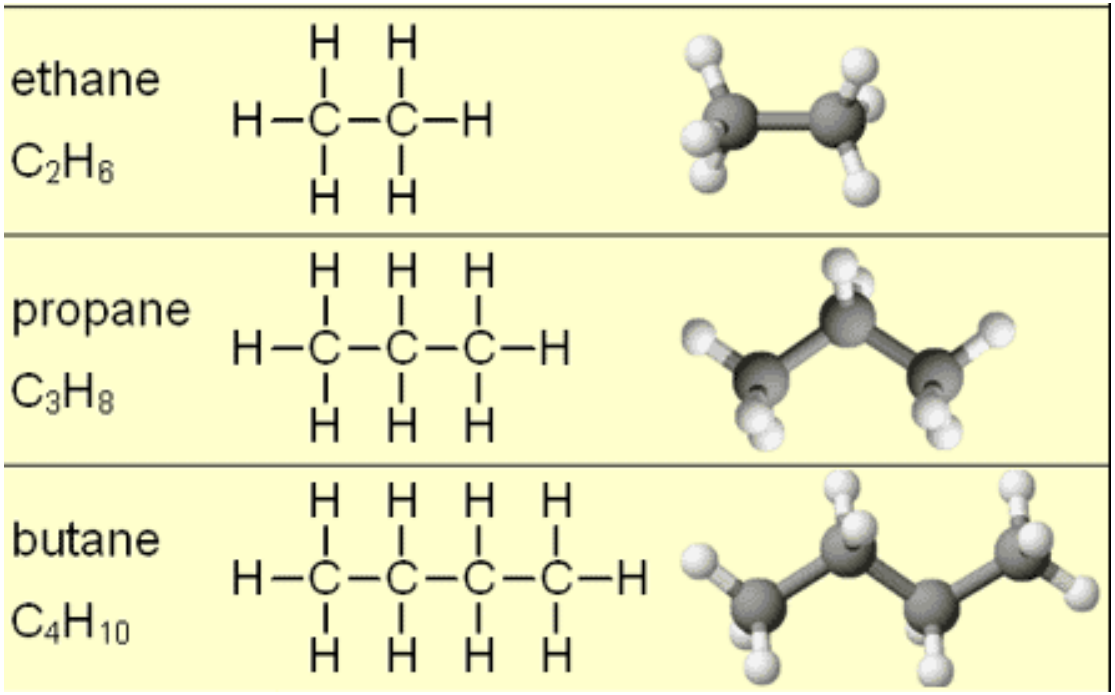




Alkanes

- The hydrocarbons methane, ethane propane and butane form a series of carbon compounds known as alkanes

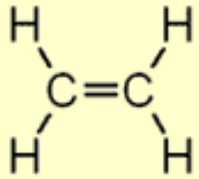
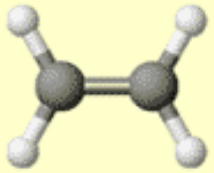
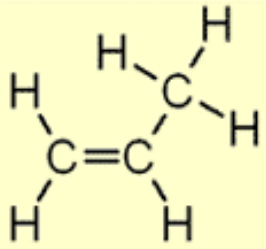
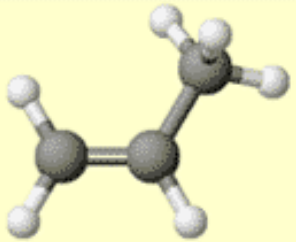
- The alkane series can be represented by the general formula



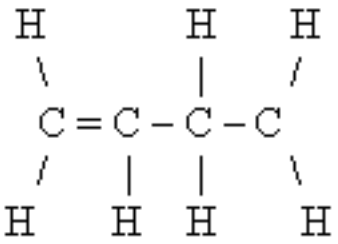
$$C_x H_{(2x+2)}$$

Alkanes

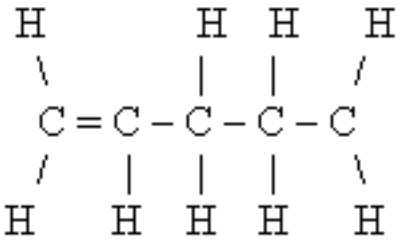
Alkenes

ethene C_2H_4		
propene C_3H_6		

BUTENE:



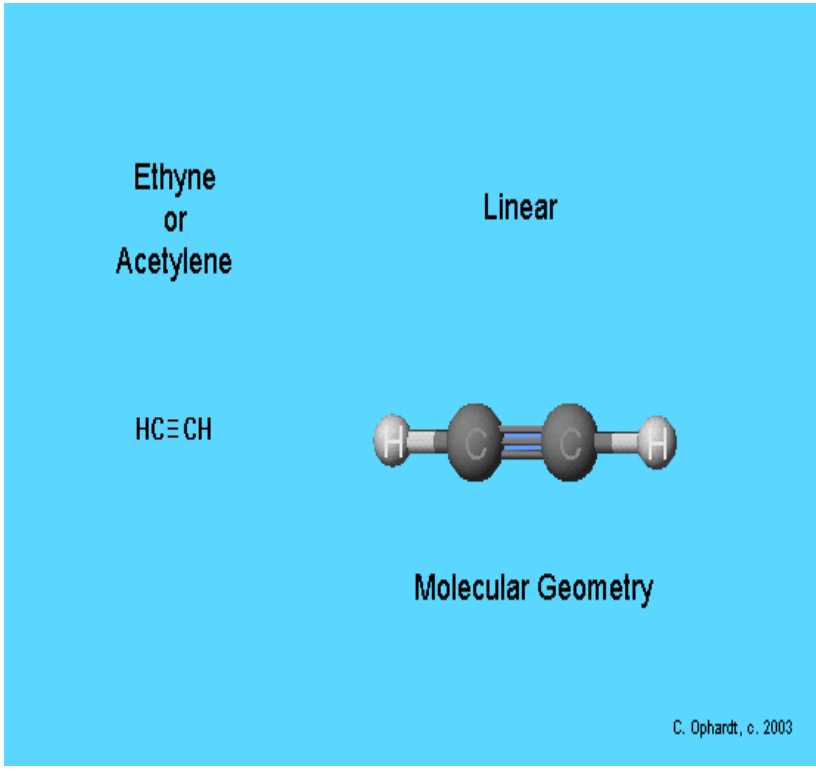
PENTENE:



Alkynes

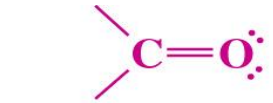
- Unsaturated hydrocarbons which contain triple bond between two carbon atoms.

Name	*Open structure*	*Condensed structure*
Ethyne	$H-C\equiv C-H$	$CH\equiv CH$
Propyne	$H-C\equiv C-\underset{\displaystyle H}{\overset{\displaystyle H}{\overset{|}{\underset{|}{C}}}}-H$	$CH\equiv C-CH_3$
Butyne	$H-C\equiv C-\underset{\displaystyle H}{\overset{\displaystyle H}{\overset{|}{\underset{|}{C}}}}-\underset{\displaystyle H}{\overset{\displaystyle H}{\overset{|}{\underset{|}{C}}}}-H$	$CH\equiv C-CH_2-CH_3$



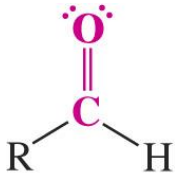
Aldehydes and Ketones

- Both contain the carbonyl group

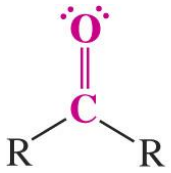


The carbonyl group

- Aldehydes have one carbon attached to the carbonyl group

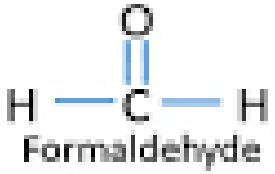


Ketones have two organic groups attached to the carbonyl group

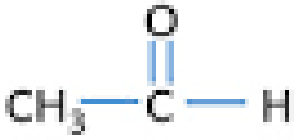


Aldehydes and Ketones

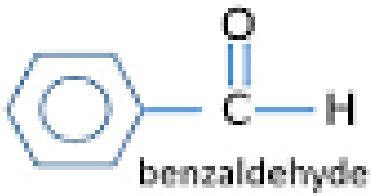
aldehydes



Formaldehyde

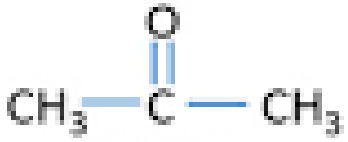


acetaldehyde

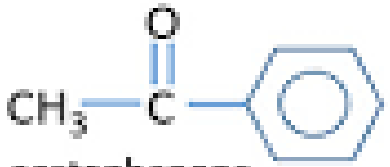


benzaldehyde

ketones



acetone

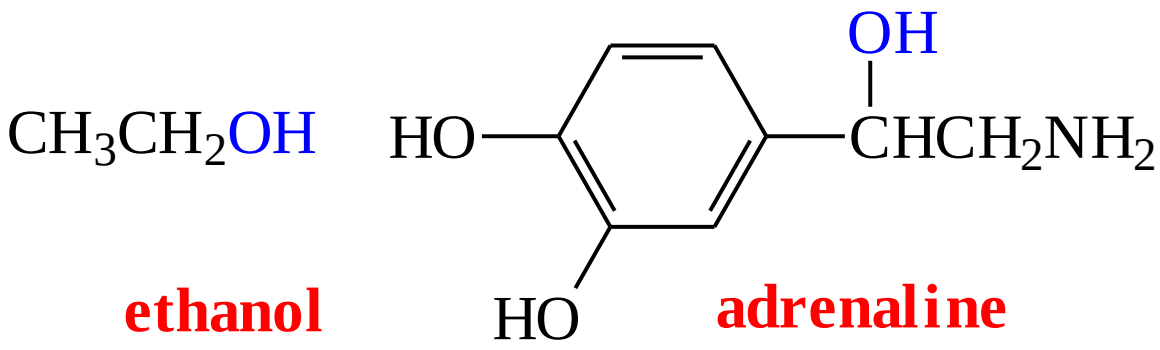


acetophenone

Alcohols

In alcohols the hydrogen of the alkane is replaced by the hydroxyl (-OH) group.

Some Alcohols

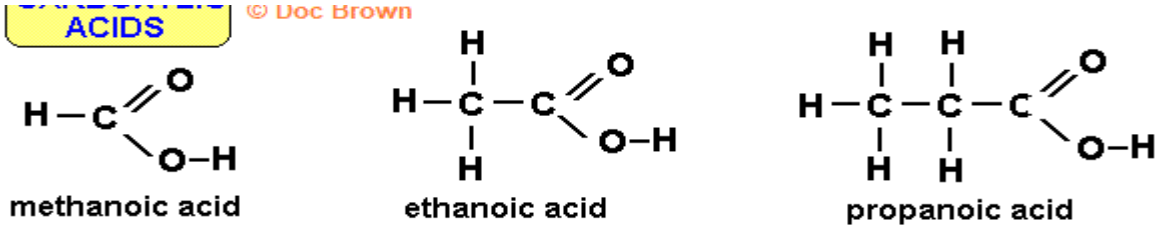


ethanol **adrenaline**

Carboxylic Acids

- Contain the carboxyl group

RCOOH



Nitro Compound

- Organic compounds containing nitrogen can be broadly classified into two groups.
- Compounds containing nitro functional group - NO2
- Compounds containing amine functional group - NH2

CH3 -NO2 Nitro methane

PHENOLS

Aromatic compounds containing one or more OH groups directly attached with carbon of benzene ring are called Phenols.