Aromaticity

Organic Compounds which resembles benzene in their chemical behaviour are called aromatic compounds. They exhibit certain characteristic propaties which are quite different from those aliphatic and alicyclic compaunds.

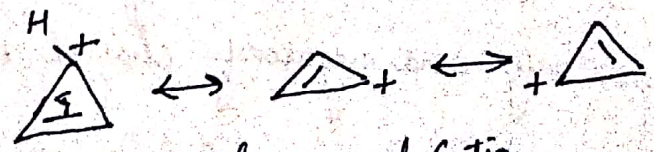
Ability to Sustain ring current by a flat or nearly flat cyclic system having delocalised $(4n+2)\pi$ & non bonded electrons.

Hucked, on the basis of molecular orbital theary, has predicted that electrons in cyclic conjugated polyenes (cyclic polyenes having alternate Single and double bonds) containing $(4n+2)\pi$ electrons where $n=0,1,2,3$ etc are completily delocalised. All Such compounds Should be aromatic

A Compound is aromatic if satisfis all the following conditions

1. It Should be cyclic with alternating Single and double bond
2. It Should be planar - In genral presence of sp^2 hybridised Carbons in the System imparts planarity.
3. It exhibits continous delocalisation of π-electrons (Continous delocalisation is possible if p-orbitals are available on each Carbon for overlap)
4. It Should follow huckel rule.

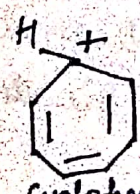
Cyclopropane ($2\pi e^-$)
No delocalisation
Noaromatic character



cyclopropenyl Cation
$2\pi e^-$
Delocalisation of π-electrons
Aromatic

Cyclopentadienyl Cation
$4\pi e^-$
No delocalisation
No aromatic character

$6\pi e^-$
Delocalisation of π-electron
planar
Arothatic



Cycloheptatrienyl Cation
$6\pi e^-$
Delocalisation of π-electrons
Aromatic

The organic compounds are covalent in nature. A chemical reaction basically involves breaking of existing bonds and formation of new bonds. A bond represents a shared pair of electrons between two atoms. The breaking (or cleavage) of bonds occur in two ways.

(a) Homolytic fission:-

During cleavage of bond, the shared pair of electrons is distributed equally between two atoms, that is each atom departs with one electron each. This results in formation of free radicals that is species with single unpaired electron.

$$A \curvearrowright B \xrightarrow[\text{fission}]{\text{homolytic}} A^{\bullet} + B^{\bullet}$$

Homolytic fission usually occurs in non-polar bonds and is favoured by high temperature. Ultraviolet radiations and by presence of radical initiators such as peroxide.

(b) Heterocyclic Cleavage:

During cleavage of bond, the shared pair of electrons is taken away completely by one of the atoms (relatively electronegative one). This results in the formation of charged species, that is positively and negatively charged ions.

$$A \overset{\curvearrowright}{-} B \xrightarrow[\text{Cleavage}]{\text{heterolytic}} A^{+} + :B^{-}$$

It usually occurs in polar covalent bonds and is favoured by polar solvents.