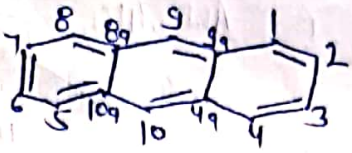
Anthracene



M.f. – $C_{14}H_{10}$

⇒ Anthracene is a solid polycylic aromatic hydrocarbon consisting of three fused benzene rings..

⇒ It is a component of coal tar.

⇒ It is used in the production of the red dye alizarine and other dyes.

⇒ Anthracene is colourless but exhibits a blue (400-500) nm peak) fluorescene under ultraviolet radiation.

⇒ The fused ring aromatic system do not have completely identical resonance contributers as benzene have but structural formulas with localised double bond and single bonds that can be written as resonance contributers

⇒ This nonequivalency due to nonequuivalent resonance contributor is responsible for chemical propecties of polyclic aromatic hydrocarbon.

Positions of the double bonds in anthracene:

⇒ Anthracene is best regarded as a resonance hybrid of four resonating structures.

⇒ The resonance energy of anthracene is 84 Kcal/mole i.e 28 kcal/mole per ring

⇒ The resonance energy of anthracene is lower than benzene 36 Kcal/mole

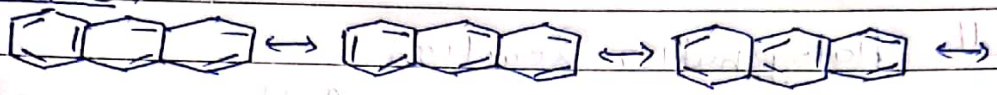
⇒ The lower resonance energy indicates the less aromatic character

Anthracene

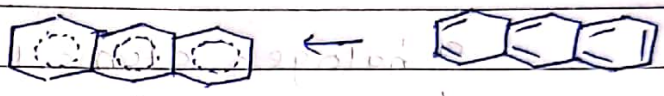
1. ~~Nitration~~:

⇒ The less aromatic character of anthracene shows that case of substitution and addition reactions will also will also be less than benzene ring.

Resonance →



Each C-atom in Anthracene is sp^2 hybridized

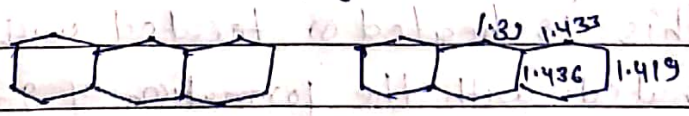


→ The X-ray diffraction has shown that anthracene molecule is plan. and C-C bond lengths are not equal.

→ In one C-C bond length is shorter than the other C-C bond.

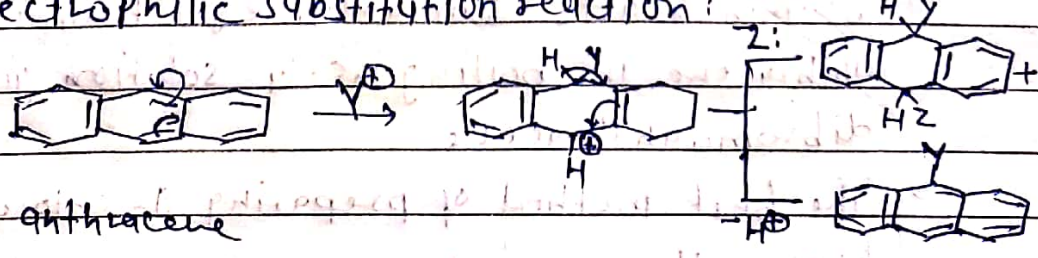
→ The reason for the different in bond lengths is due to the bond order i.e. one is single bond and other is double bond.

→ The double bond character of the various bond is shown in figure (I) and (II)



(I) (II)

Electrophilic substitution reaction:



anthracene

→ The self-polarisability of various nuclear position are in the following order 9 > 1 > 2

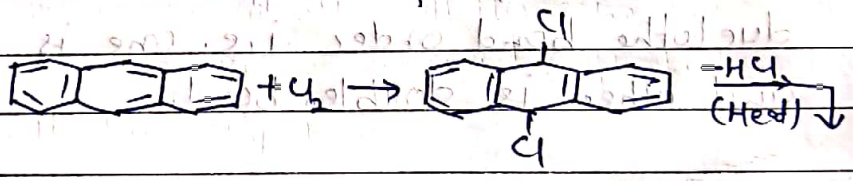
→ Consequently position 9 will be the most reactive followed by position 1- and -2

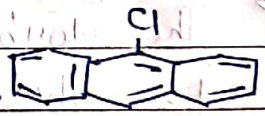
↓ Halogenation Reaction :-

Anthracene reacts with a halogen atoms in the absence of a catalyst to form anthracene dihalides.

→ Anthracene dihalide decomposes on heating to give 9-haloanthracene

→ When chlorine is passed into a cold solution of anthracene in carbon disulphide, Anthracene dichloride is formed.





→ If this is heated or treated with alkali HCl is eliminated with the formation of 9-chloroanthracene

→ This is also obtained by chlorinating anthracene at 100 °C, together with some 9,10-dichloroanthracene

→ Bromin reacts similarly; eg:, bromination of anthracene in boiling CCl_4 solution gives 9,10-dibromoanthracene

→ The best method of preparing 9-chloro or 9-bromoanthracene is to heat anthracene with the