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Dept. of chemistry

class : U.G.sem - V

Paper : MTC - 9(T)

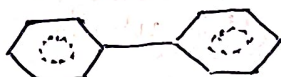
UNIT - 1

Topic - Polynuclear Hydrocarbons

Introduction :

Polynuclear hydrocarbons are made up of two or more aromatic (aromatic) rings. They can be of two types : -

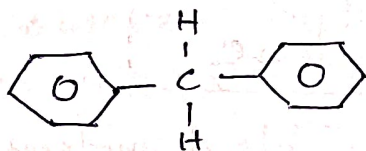
1] Those in which the aromatic rings are isolated. For example :-



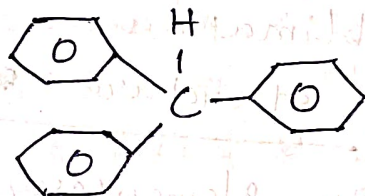
Diphenyl OR
Biphenyl



Triphenyl



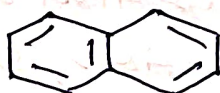
Diphenylmethane



Triphenylmethane

2] Those in which the aromatic rings are fused, i.e. share one or more pairs of carbon atoms. These are also referred to as condensed hydrocarbons.

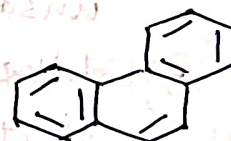
For example :



Naphthalene



Anthracene

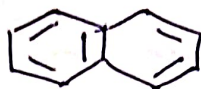


OR
Phenanthrene



Phenanthrene

NAPHTHALENE $[C_{10}H_8]$



Isolation from coal-Tar :

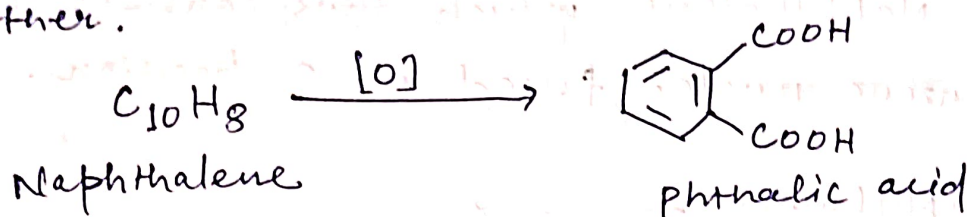
In coal-tar distillation fractions Naphthalene is found to be present in middle oil (Temp- $170^{\circ}C$ to $230^{\circ}C$) and heavy oil (Temp - $230^{\circ}C$ to $270^{\circ}C$).

The middle oil and heavy oil fractions containing Naphthalene are cooled when Naphthalene crystallises out. The oil is pressed to get Naphthalene free from oil containing phenol and cresols the crude Naphthalene crystals are melted, treated with conc. H_2SO_4 washed with water and finally treated with an alkali to remove acidic impurities. It is finally refined by sublimation.

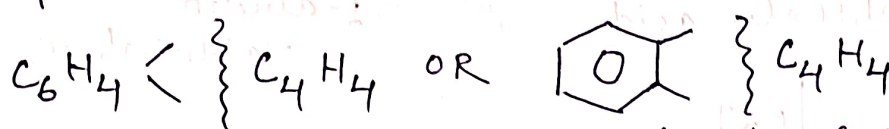
: structure of Naphthalene :

- 1.] By elementary analysis and molecular weight determination — the molecular formula assigned to Naphthalene is $C_{10}H_8$.
- 2.] It is resistant, though less than Benzene, to the addition reactions characteristic of unsaturated compounds.
- 3.] Like Benzene, Naphthalene undergoes electrophilic aromatic substitution reactions like nitration, halogenation, sulphonation etc. suggesting that Naphthalene has at least one benzene nucleus.

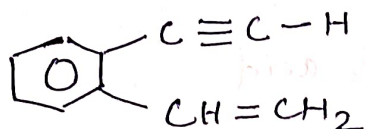
- 4.] on the oxidation Naphthalene gives well known acid the phthalic acid showing the presence of at least one aromatic ring and two side chains in ortho position to each other.



The formula of Naphthalene may, therefore be summarised as:

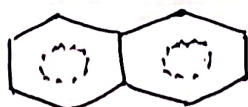


The two side-chains, on the basis of valency requirements must be unsaturated. one such structure of Naphthalene could be—



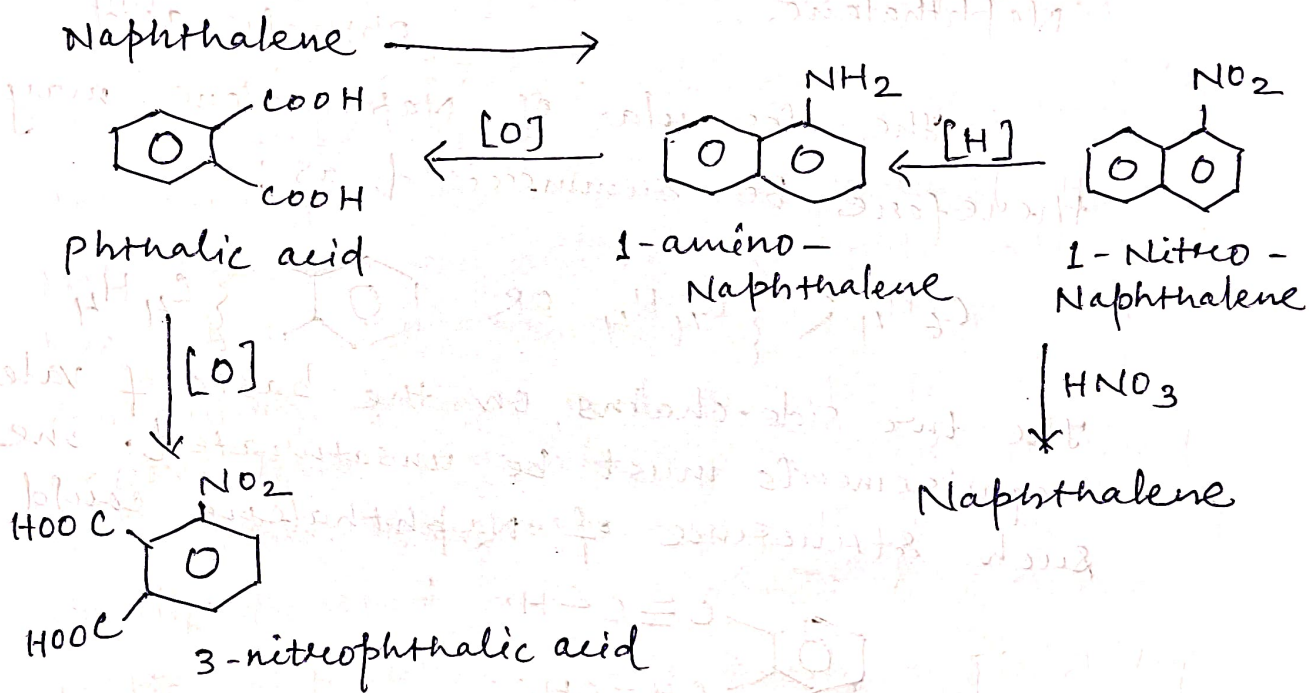
However, such a structure is antagonistic to the aromatic character of Naphthalene. consequently, this and related structures for Naphthalene are ruled out.

- 5] on the basis of these observations Erlenmeyer in 1865 suggested the following structure of Naphthalene.



- 6] A more direct and conclusive proof for the presence of two ortho fused nuclei in Naphthalene was given by Graebe [1869]. He converted Naphthalene into mono-Nitro-Naphthalene which

on oxidation gave o-Nitrophthalic acid indicating that the benzene ring having amino group is oxidised and the benzene ring present in phthalic acid must be coming from other benzene ring of Naphthalene which thus consists of the two benzene nuclei fused in o-position.



7.] The structure so proposed is finally confirmed by its various synthesis.

