Anthracene

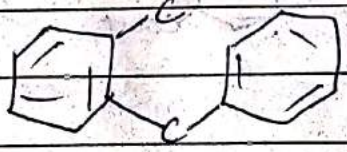
$C_{14}H_{10}$ is obtained from anthracene oil fraction of coal tar by cooling the latter and pressing the solid (which crystallise out) free from liquid

Structure of Anthracene:-

Bromination of anthracene gives bromoanthracene $C_{14}H_9Br$ which on fusion with KOH, forms hydroxy anthracene $C_{14}H_9OH$ and this on vigorous oxidation gives phthalic acid and a small amount of o-benzoylbenzoic acid.

$$C_{14}H_9OH \xrightarrow{[O]} \text{(COOH, COOH)} + \text{(COOH)}$$

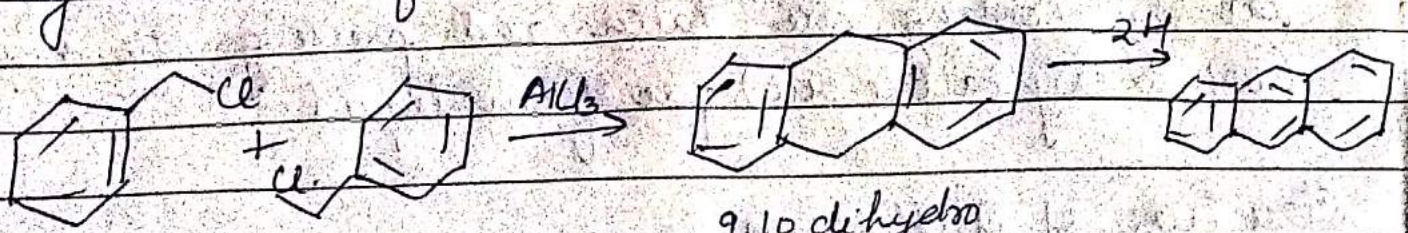
This suggests that anthracene contains atleast two benzene rings, and that is skeleton



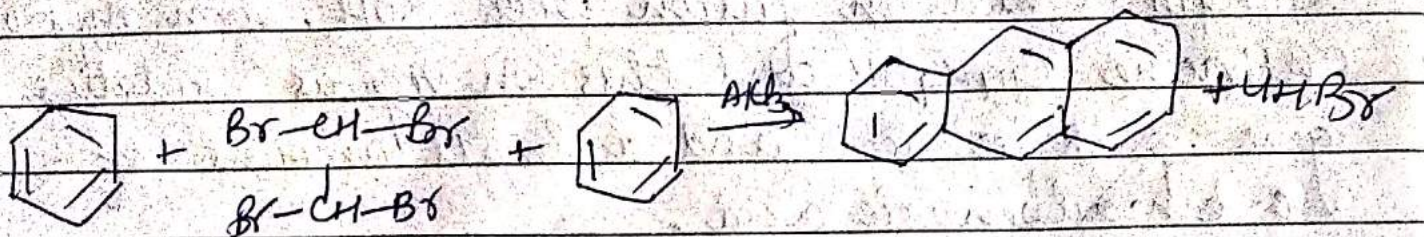
The presence of two benzene rings is conformed by the fact that on fusion with KOH at 250°C, anthraquinone (which may be obtained from anthracene by direct oxidation) gives two molecules of benzoic acid The above skeleton contains 14 Carbon atoms and to fit in 10 hydrogen atoms and retain the quadrivalency of carbon, the middle ring must be closed i.e, a structure of anthracene which is consistent with the foregoing reactions is three benzene rings fused together in linear manner

Synthesis of Anthracene:

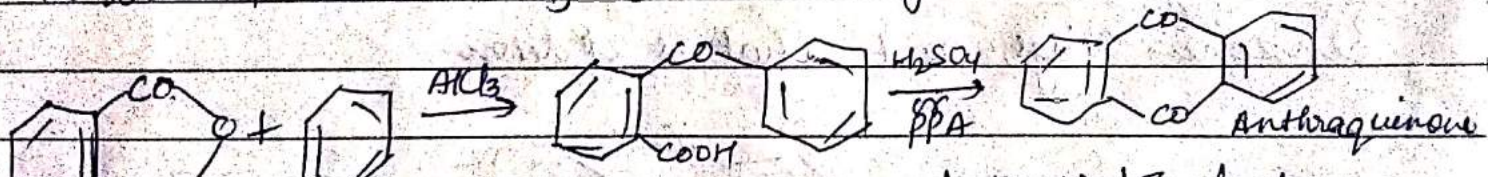
① By Friedel-Crafts reaction



9,10 dihydro anthracene

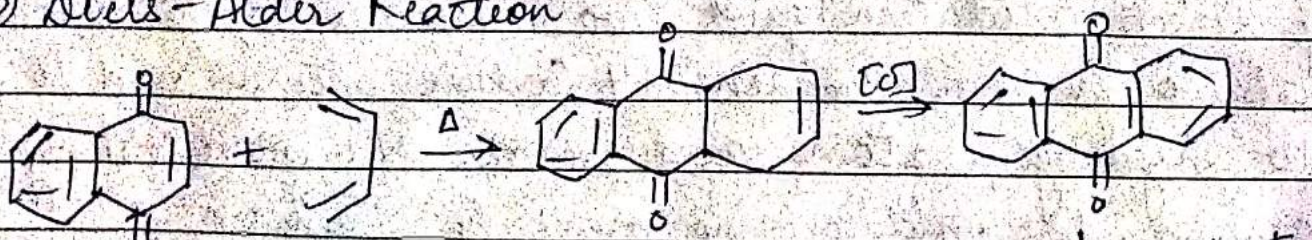


② When phthalic anhydride in benzene solution is treated with $AlCl_3$ (Haworth Synthesis



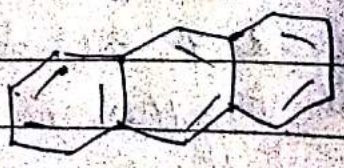
distillation | Zn dust

③ Diels-Alder Reaction



1,4 naphthaquinone

Zn dust



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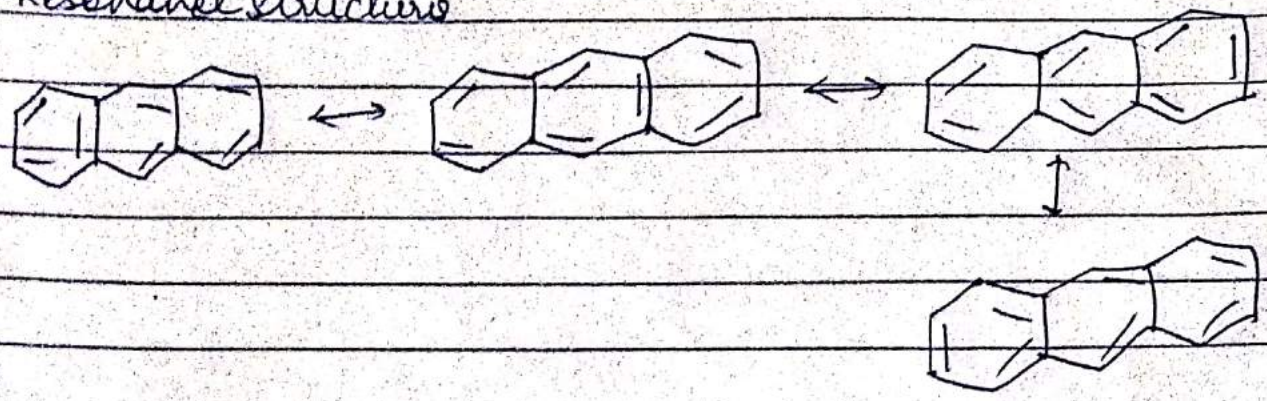
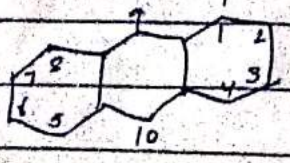
Resonance structure



Resonance Energy of anthracene 84 Kcal/mole
* all Carbons are sp^2 hybridised
* 14π electrons
* 4 resonating structures

Anthracene is an alternant hydrocarbon and the π electron densities are unity at all positions. The Self polarisabilities are in the following order
9 > 1 > 2
Consequently position 9 will be the most reactive than 1 finally 2.

There are three possible monosubstitution products



1, 4, 5, 8 - α
2, 3, 6, 7 - β
9, 10 - γ

There are 15 possible disubstitution products if both substituents are identical, if ~~both~~ substituents are not identical the number of isomers is larger.