

Unit-IV

* Polynuclear Hydrocarbon *

M	T	W	T	F	S	S
Page No	32					YOUVA
Date	24/8/20					

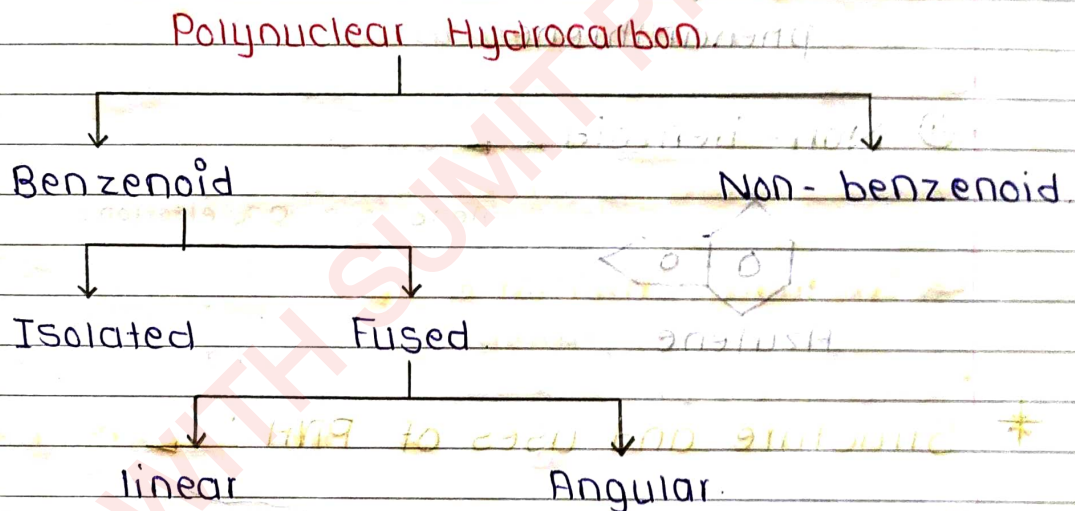
Defination

These are hydrocarbons (organic compound) containing only carbon and hydrogen that are composed of multiple aromatic rings.

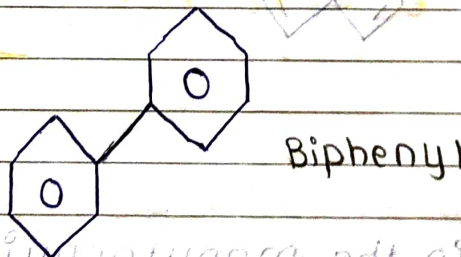
e.g...

Napthlene, Anthracene.

* Classification of PNH



① Isolated benzenoid

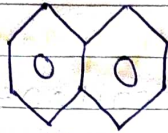


② linear benzenoid ring

It is used as precursor to other chemicals.

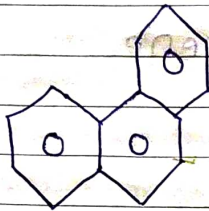
It is used as best repellent.

It is used as insecticide.



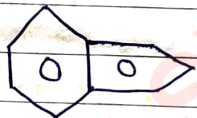
Naphthalene

③ Angular benzenoid ring →



phenanthrene

④ Non-benzoid →



Azulene

Azulene is a 10 π electron

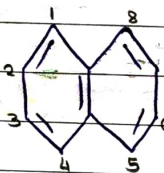
non benzoid aromatic hydrocarbon

(5 & 7 membered ring)

* Structure and uses of PNH:

① Naphthalene →

• Structure →

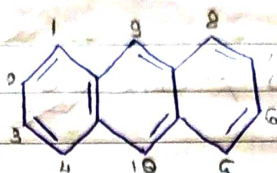


• Uses →

- ① It is used in the manufacturing of plastic, resins, fuels and dyes.
- ② It is used as fumigant.
- ③ It is used as pest repellent.
- ④ It used as precursor to other chemicals.

② Anthracene

• Structure →

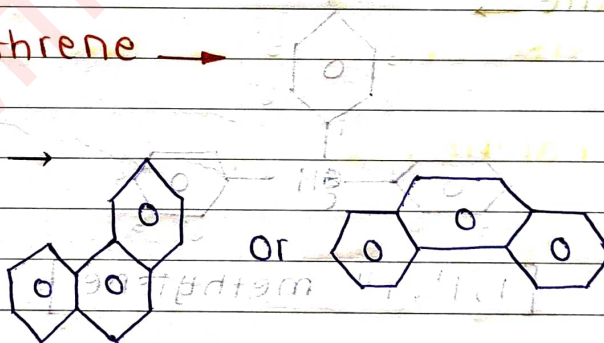


• Uses →

- ① It is used in artificial production of red dyes alizarin.
- ② It is used as insecticide.
- ③ It is used in coating materials.
- ④ It is used as natural dye.
- ⑤ Its derivatives, like anthraquinone is used as laxative, antiinflammatory, antifungal.

③ Phenanthrene

• Structure →

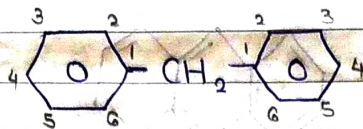


• Uses →

- ① It is used to make dyes & plastic.
- ② It is used to make drugs & pesticide.
- ③ It is used to make bile acid and cholesterol and Steroid drug.

④ Diphenyl methane

• Structure →



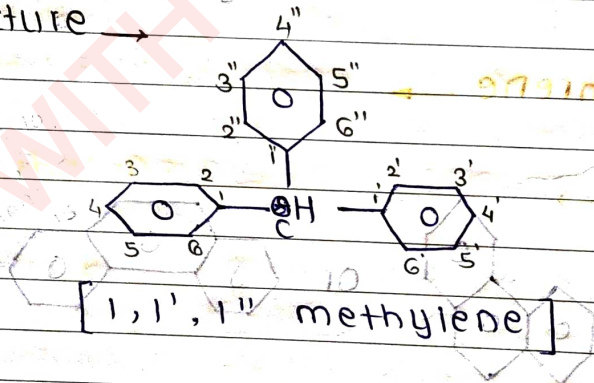
[1,1 methylene dibenzene]

• Uses →

- ① It is used to prepare dyes
- ② It is used in cosmetics
- ③ It is used to other chemicals

⑤ Triphenyl methane

• Structure →



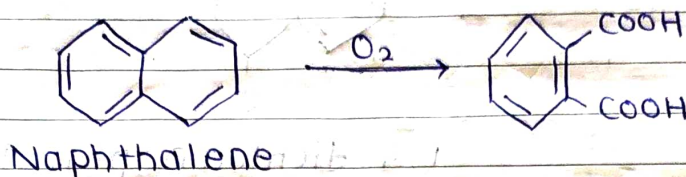
[1,1',1'' methylene]

• Uses →

- ① It is used to prepare dyes like bromo cresol green
- ② It is used in printing greens
- ③ It is used to prepare other chemicals.

* Reactions of Naphthalene

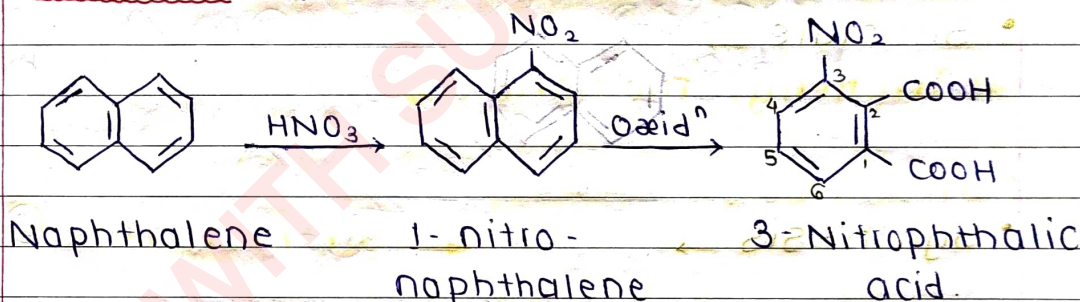
① Oxidation



(Benzene 1, 2 dicarboxylic acid)

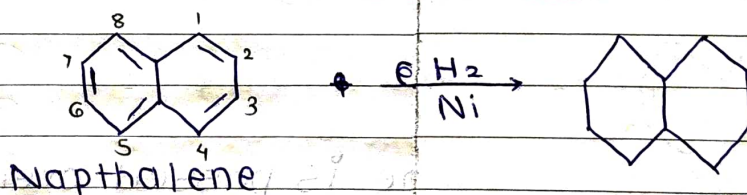
on oxidation, naphthalene gives phthalic acid.

② Nitration



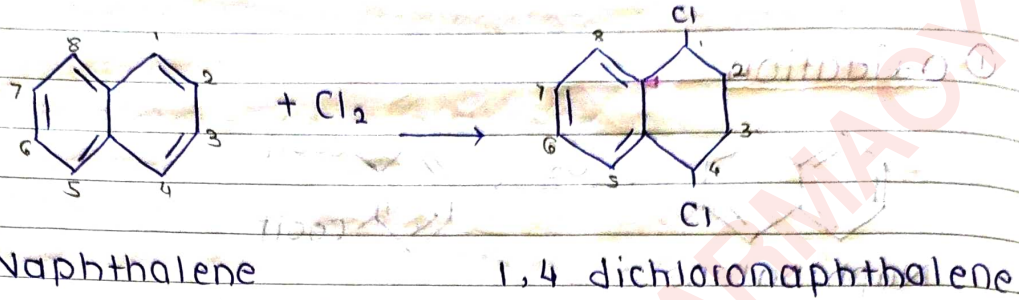
on nitration, naphthalene gives 1-nitro naphthalene which on oxidation gives 3 nitro-phthalic acid.

③ Reduction of Naphthalene



Decalene / Decaline

④ Addition of Chlorine in Naphthalene



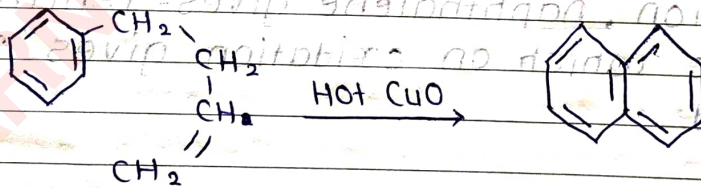
* Naphthalene

- Structure →



- Synthesis →

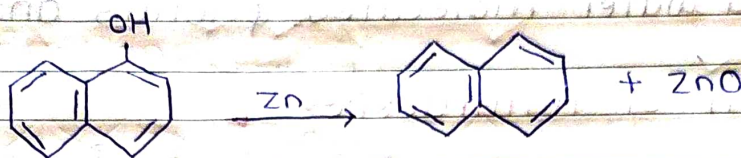
① From 4 phenyl 1 butene



4-phenyl-1-butene

When 4-phenyl-1-butene is passed over hot cuprous oxide it cyclises into naphthalene.

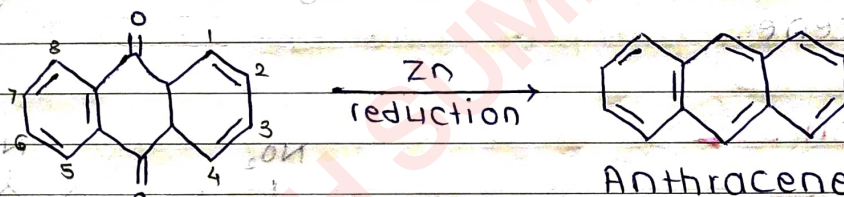
② From alpha Naphthol



α -naphthol Naphthalene

α -Naphthol on treatment with zinc dust gives naphthalene.

② Reduction of 9,10 Anthraquinone

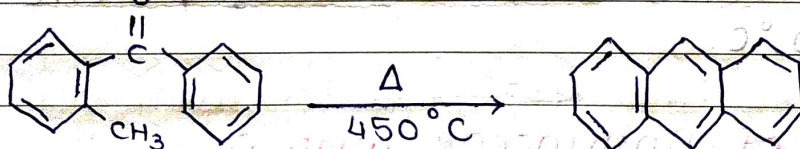


9,10 Anthraquinone

Anthracene

9,10 Anthraquinone on reduction in presence of zinc gives anthracene.

② Elbs Reaction

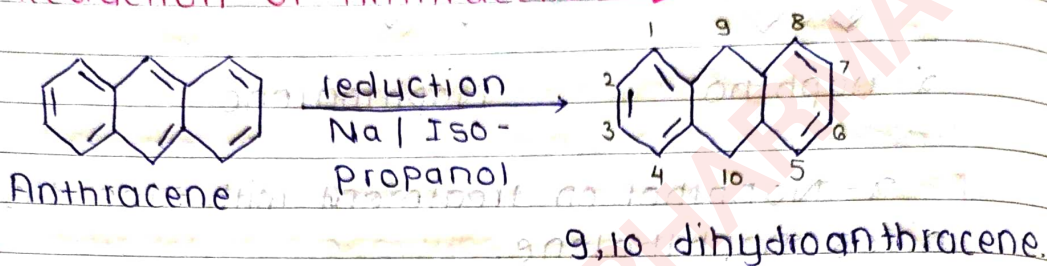


O-methyl benzophenone

Anthracene

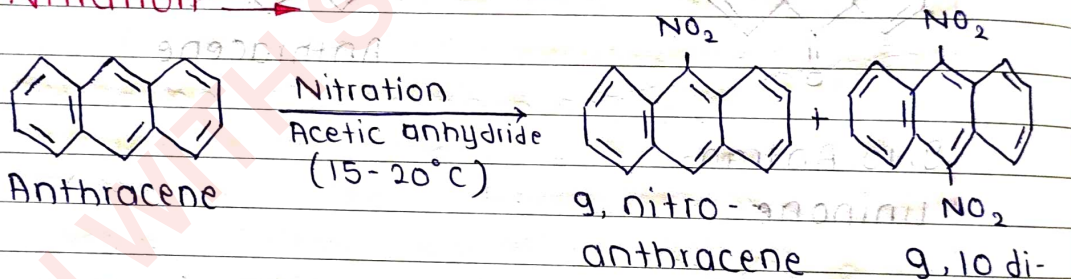
O-methyl benzophenone on heating at 450°C loses a water molecules & forms anthracene

③ Reduction of Anthracene



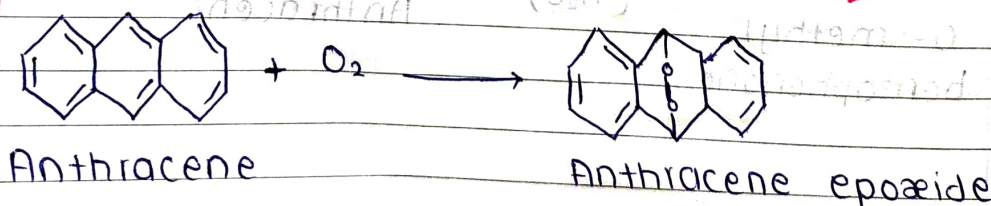
Anthracene undergoes reduction in presence of Sodium and iso-propanol to give 9,10 dihydroanthracene.

④ Nitration



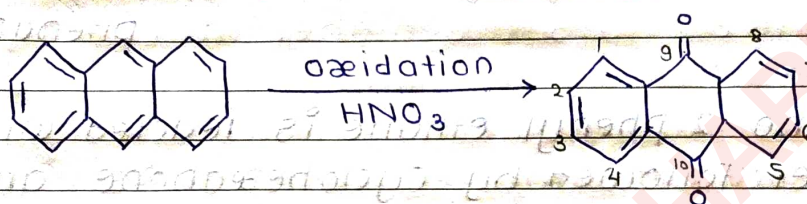
Anthracene forms a mixture of 9 nitroanthracene and 9,10 dinitroanthracene. When treated with Con. HNO_3 & acetic anhydride at $15-20^{\circ}\text{C}$.

⑤ Reaction of Anthracene with O_2



Anthracene reacts with O_2 to give anthracene epoxide.

⊙ Oxidation of Anthracene

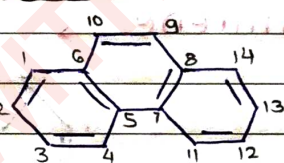


Anthracene

9,10-anthraquinone

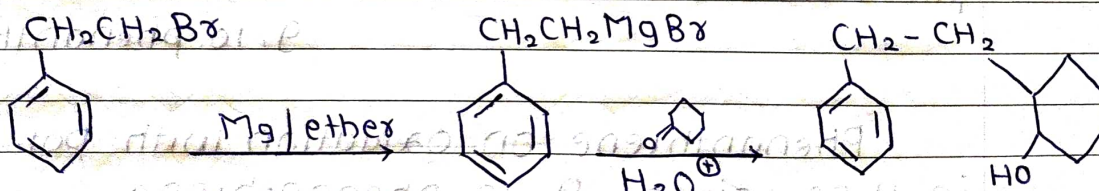
Anthracene undergoes oxidation in presence of nitric acid HNO_3 to give 9,10-anthraquinone

* Phenanthrene



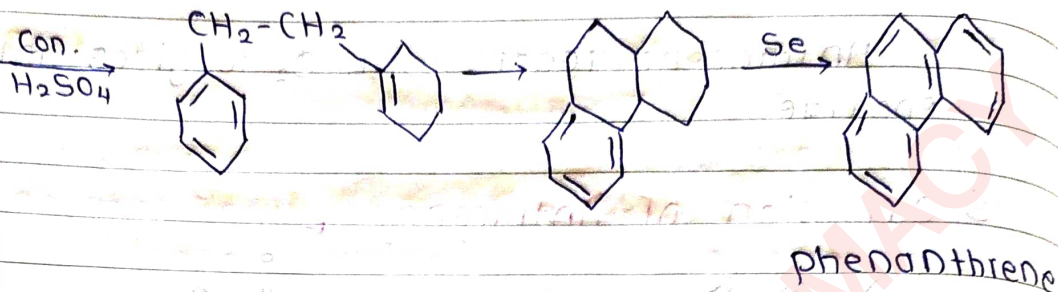
• Synthesis

⊙ Bagert - Cook Synthesis



1-bromo 2-phenyl ethane

Product

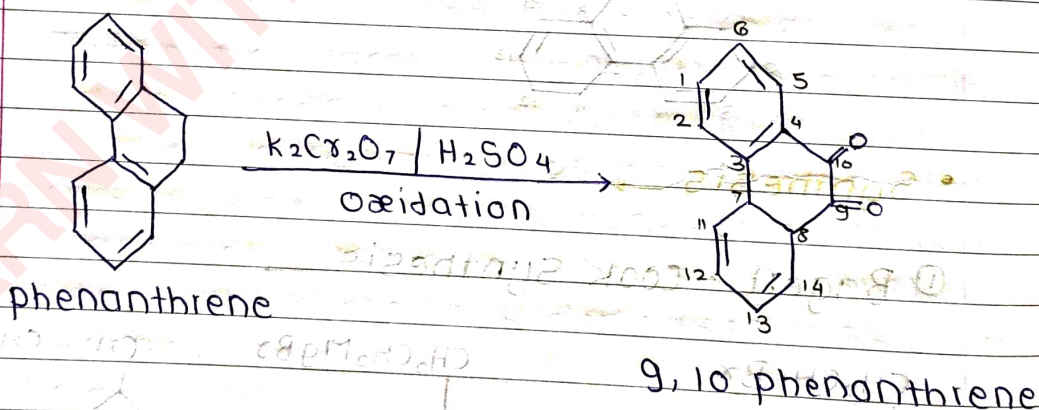


1-bromo-2-phenylethane is reacted with Mg in ether followed by cyclohexanone and hydrolysis undergoes ring closure. The intermediate formed undergoes aromatization and gives phenanthrene.

Reactions of phenanthrene →

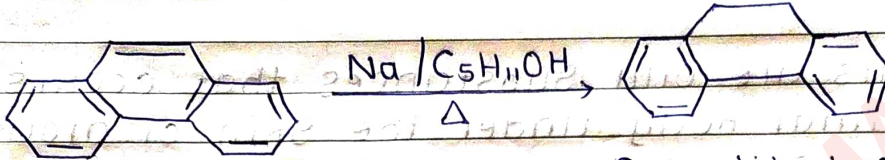
- (i) Oxidation
- (ii) Reduction

⑦ Oxidation of phenanthrene →



Phenanthrene on oxidation with pot. dichromate in H_2SO_4 gives 9,10 phenanthrene.

⑧ Reduction



Phenanthrene $\xrightarrow{\text{Na / C}_5\text{H}_{11}\text{OH}, \Delta}$ 9,10-dihydrophenanthrene

Phenanthrene undergoes reduction in presence of Na in pentanol to give 9,10-dihydrophenanthrene.