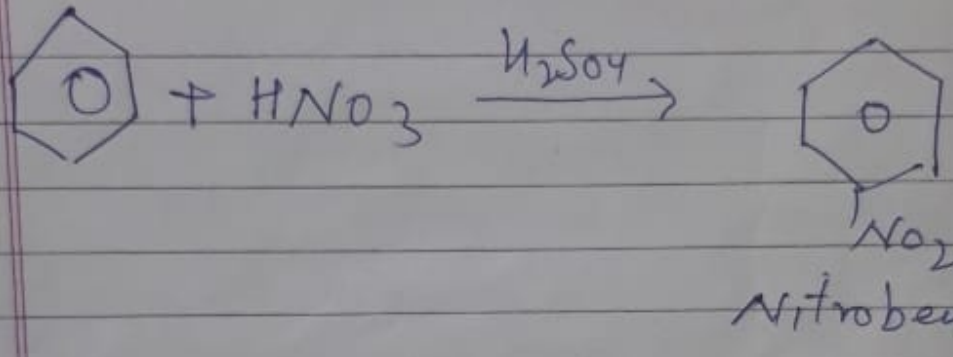
Benzene

G.C.W. (Chemistry dept). Sec-(A+B)
Sem-II date - 26-3-2020.

Rxn with mechanism of give Electrophilic Substitution Rxn. of benzene.

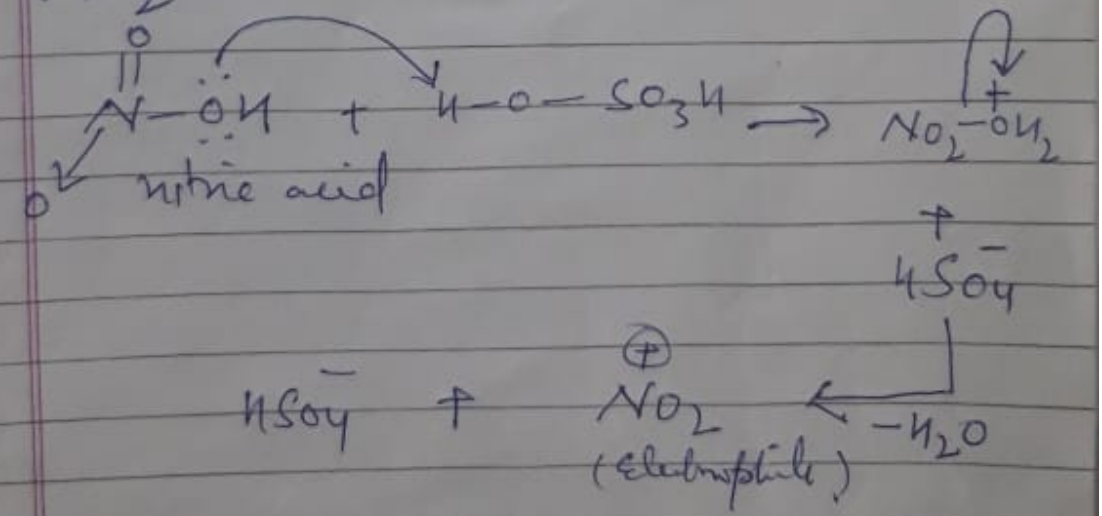
(1) Nitration of Benzene.



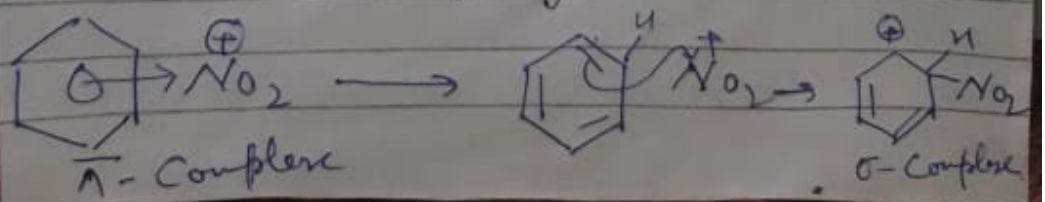
Nitrobenzene

Mech:→

Step-I Generation of electrophile NO_2^+ (Nitronium ion).



Step-II Attack of electrophile on benzene ring form π Complex

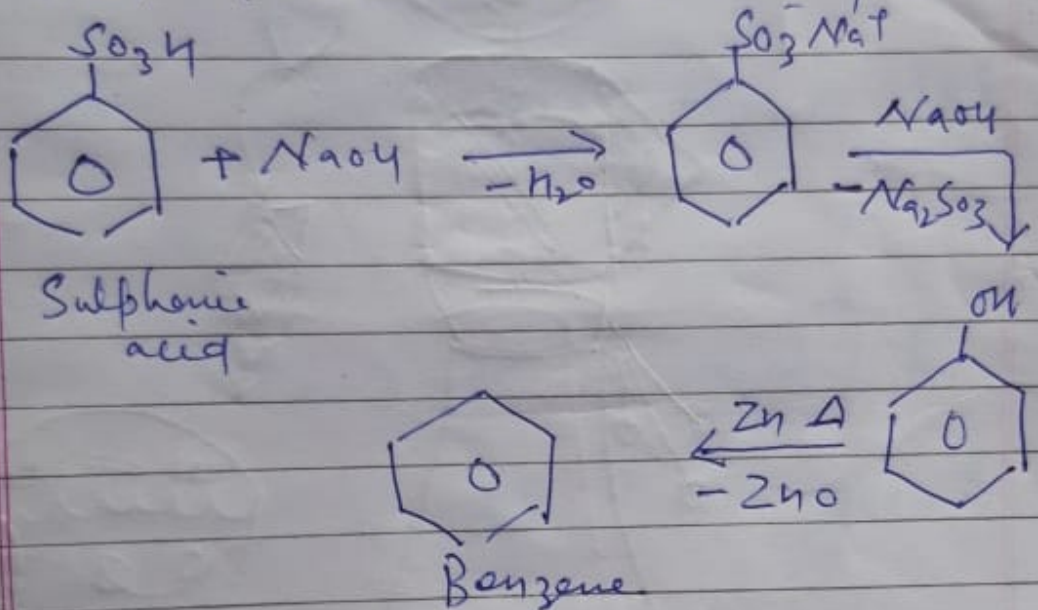


Chemistry dept. G.C.W Jammu.

Date 25-3-2020
Page No.

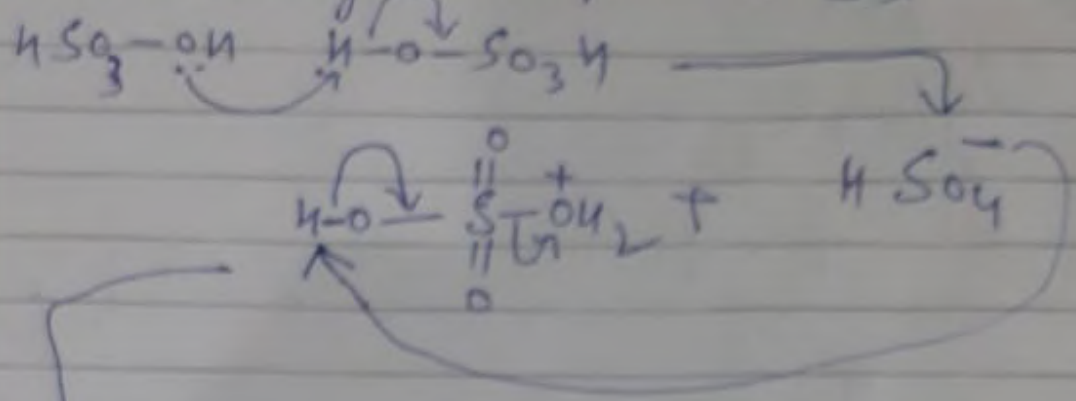
Preparation from benzene Sulphonic acid.

By heating Sulphonic acid with NaOH at 350°C so it produce Na_2SO_3 & Phenol. (Sodi Phenoxide) that treat Zn dust to produce



Mech of Sulphonation :-

Generation of electrophile (SO_3)

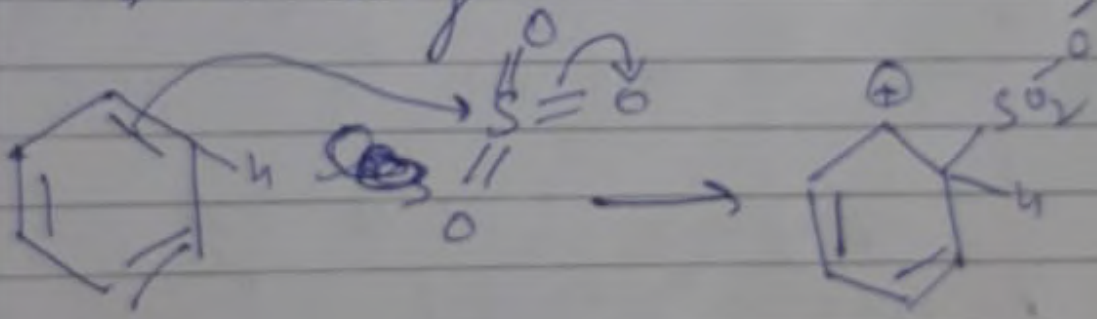


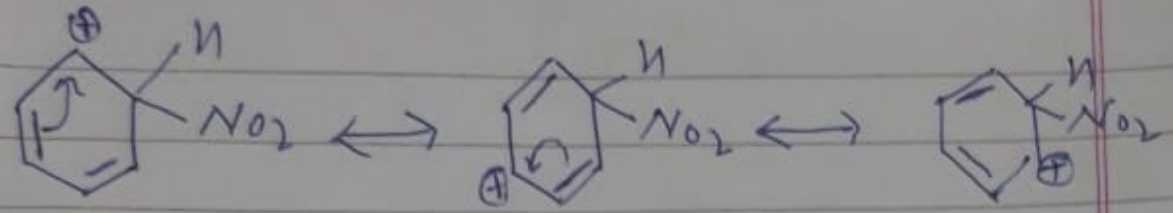
SO_3 + H_2SO_4

electrophile

Sulphur trioxide

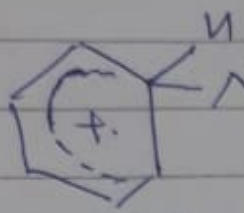
Step-2 :- Attack of SO_3 on benzene ring





Resonance stabilize resulting carbocation

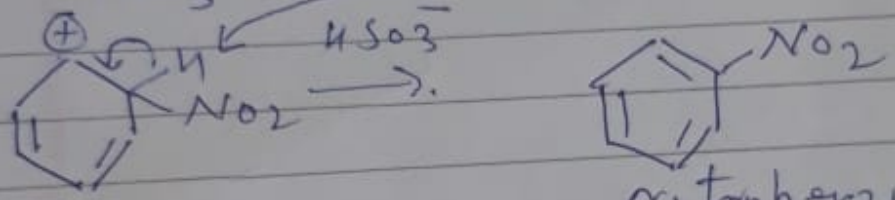
≡



Resonance hybrid str of carbocation

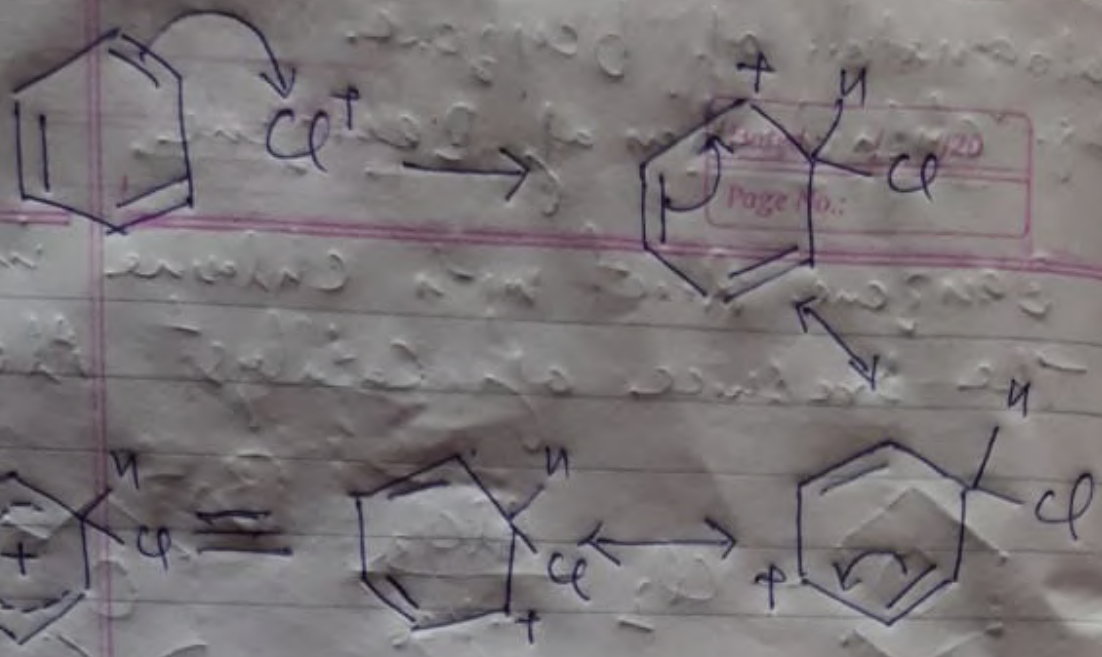
σ-Complex

Step-3 Relase of H^+ ion by accepting HSO_3^- ion



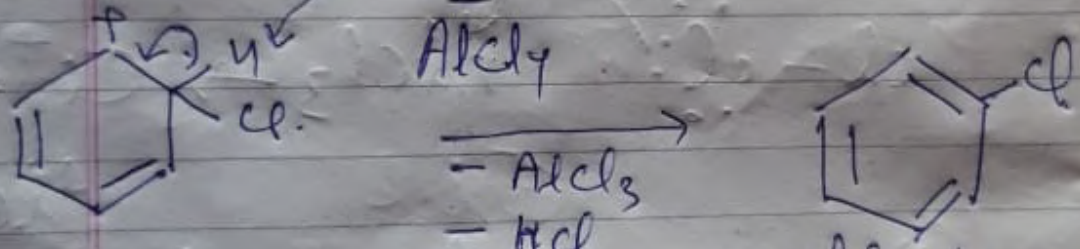
Nitrobenzene

(H_2SO_4 act as catalyst)



Resonance hybrid str.

Step - III Release of H⊕ to form chlorobenzene



Halogenation of benzene

Date - 29-3-2

e.g. Chlorination of Benzene

Dated : / /20
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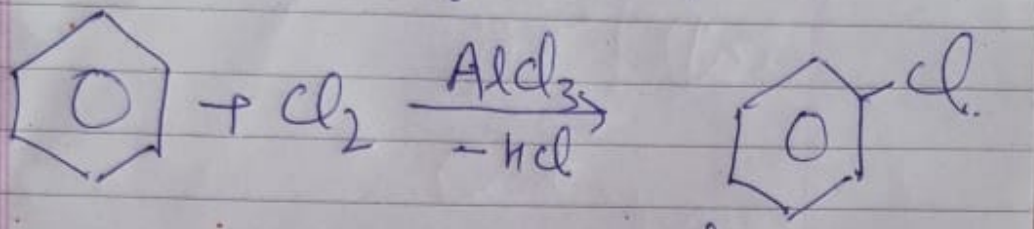
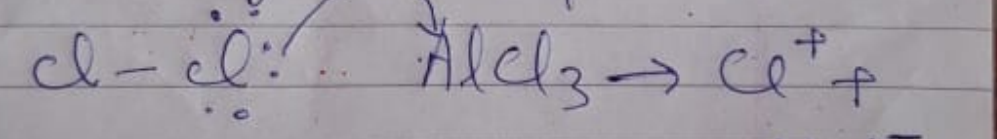
(1) Benzene React with chlorine in the presence of catalyst $AlCl_3$



Chloro-benzene

Mech:s.

Step-I Gen. of electrophile Cl^+

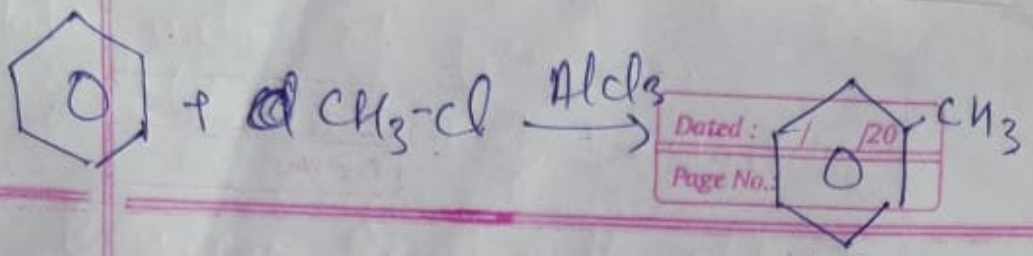


Because $AlCl_3$ is lewis acid and accept pair of $\bar{e}$ from Cl_2 molecule

Step-II Attack of Cl^+ on Benzene ring lead to the formation of Resonance Stable Carbocation.

Friedel-Craft's reaction (Alkylation) & acylation.

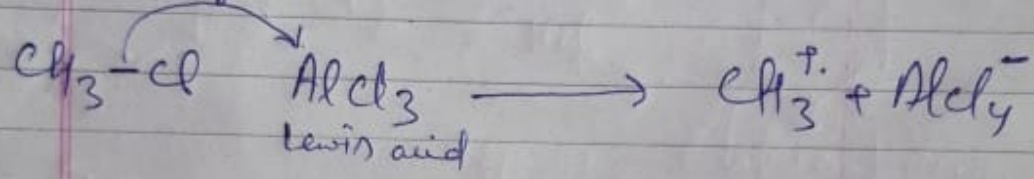
- Friedel craft's Alkylation: Rxn in which -H of benzene is replace by $-CH_3$ gp and catalysis by $AlCl_3$



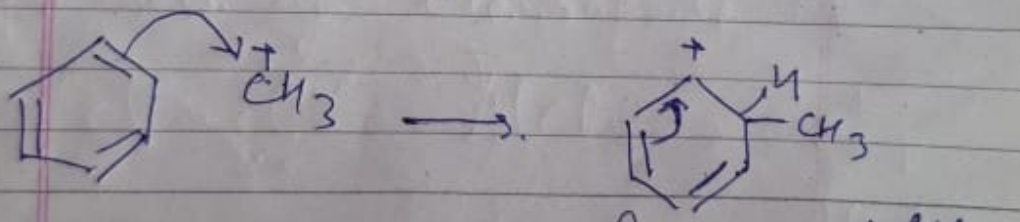
Methyl-Benzene.

Mech's:

Step-I Gen of electrophile CH_3^+ methyl carbocation

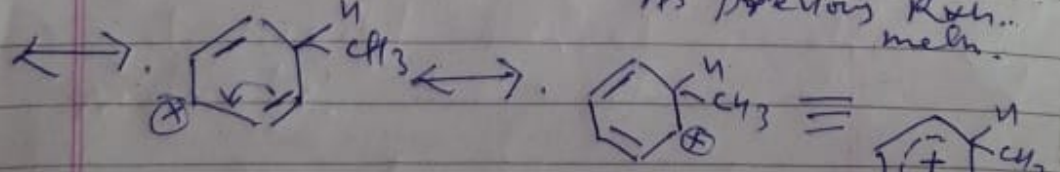


Step-II Attack of CH_3^+ on benzene.



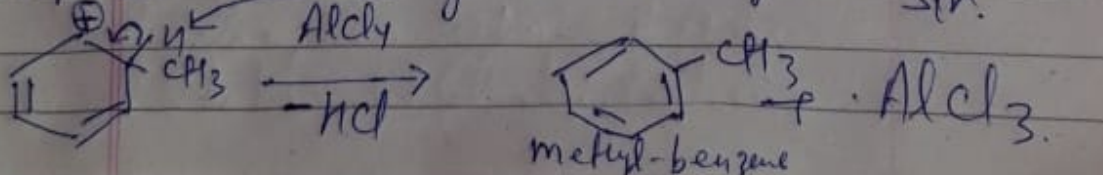
- Resonance stabilize carbocation

As previous Rxn. mech.

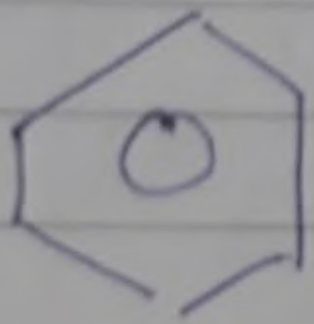


Res. hybrid

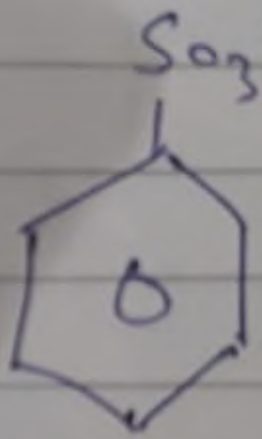
Step-③ Relase of H^+ ion to form str.



Sulphonation



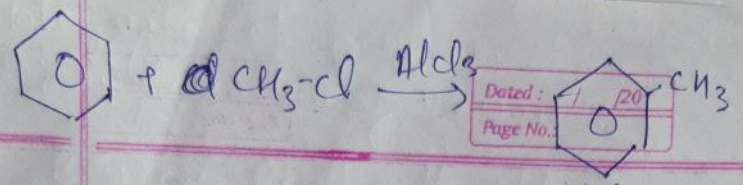
$+ H_2SO_4 \longrightarrow$



benzene sulphonic acid

Friedel-Craft's reaction (Alkylation) & acylation.

· Friedel craft's Alkylation: Rxn in which -H of benzene is replace by $-CH_3$ gp and catalysis by $AlCl_3$



Dated: / /20
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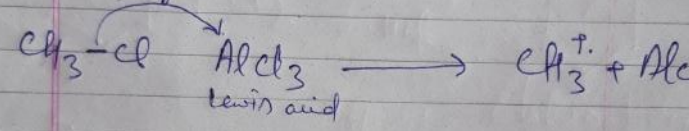
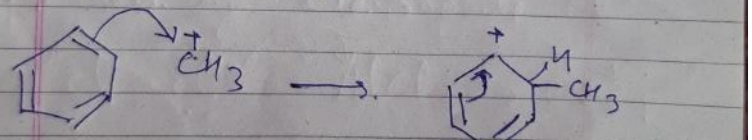
Methyl-Benzene.

Mech's.

Step-I Gen of electrophile CH_3^+ methyl carbocation

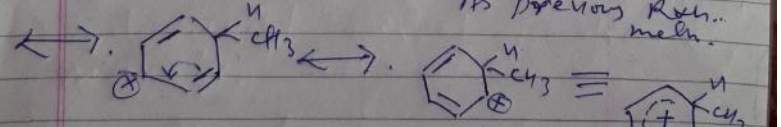


Step-II Attack of CH_3^+ on benzene



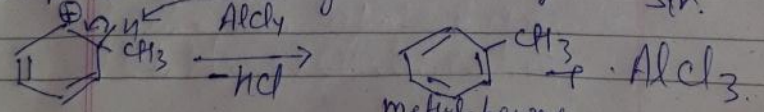
· Resonance stabilize carbocation

As previous Rxn. mech.

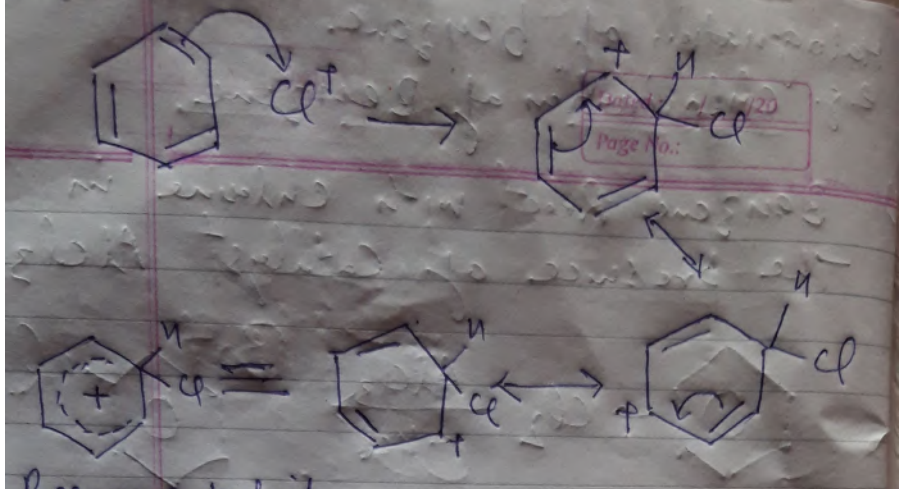


Res. hybrid str.

Step-③ Release of H⁺ ion to form

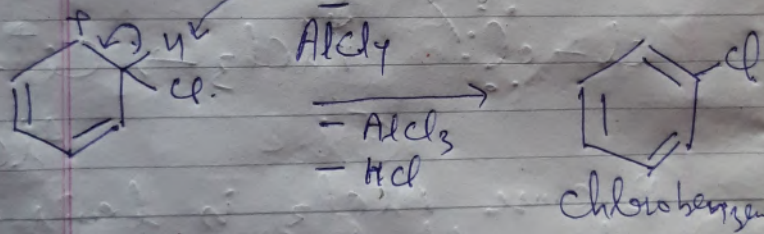


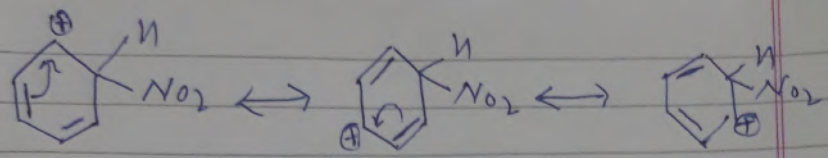
methyl-benzene



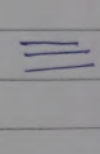
Resonance hybrid str.

Step-III Release of H^+ to form chlorobenzene





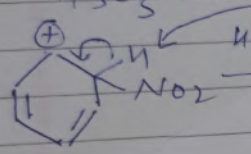
Resonance stabilize resulting carbocation

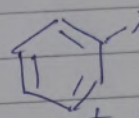


Resonance hybrid str of carbocation

σ-Complex

Step-3 Relase of H^+ ion by accepting HSO_3^- ion

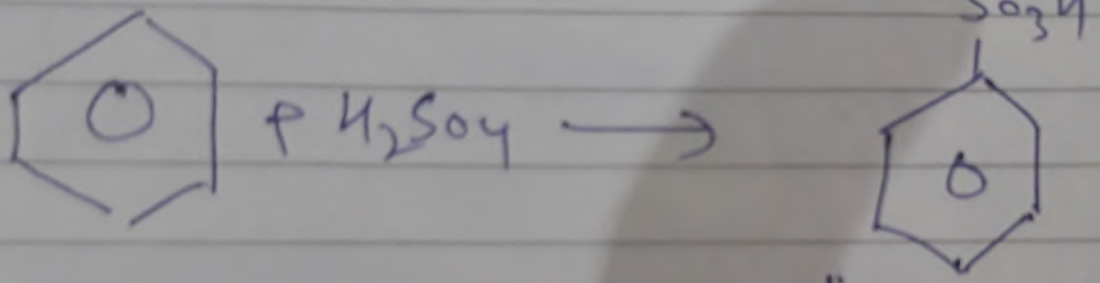




Nitrobenzene

(H_2SO_4 act as catalyst)

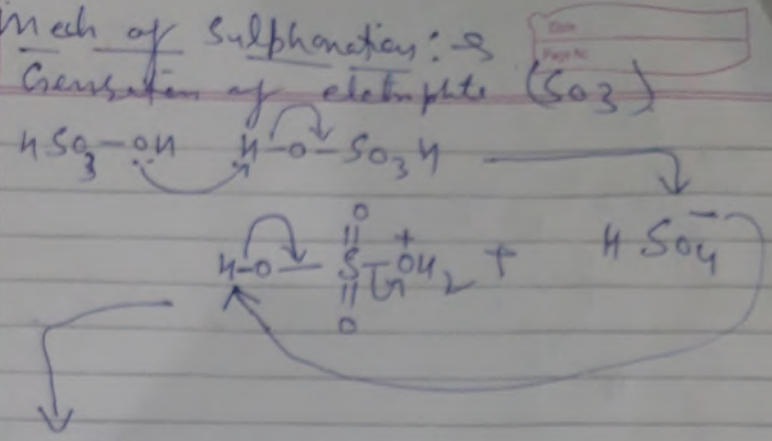
Sulphonation



benzene sulphonic acid

Mech of Sulphonation :-

Generation of electrophile (SO_3)

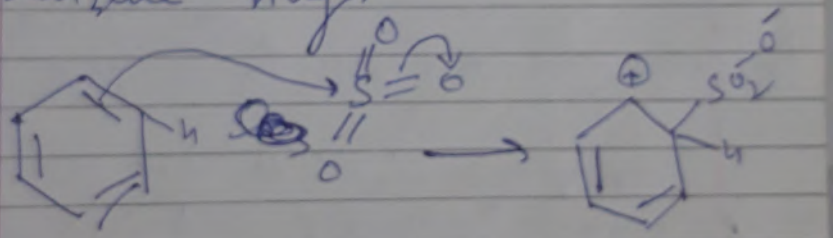


SO_3 + H_2SO_4

electrophile

Sulphur trioxide

Step-2 → · Attack of SO_3 on benzene ring

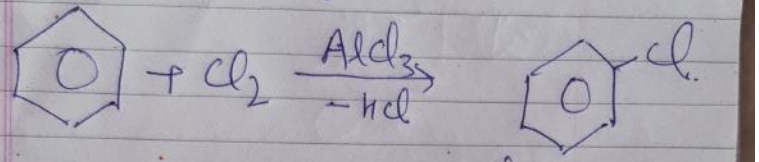


Date - 28-3-2

Halogenation of benzene.

e.g. Chlorination of Benzene

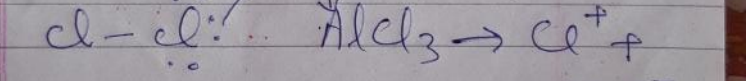
(1) Benzene React with chlorine in the presence of catalyst $AlCl_3$



chloro-benzene

Mech:-

Step-I Gen. of electrophile Cl^+



Because $AlCl_3$ is lewis acid and accept pair of $\bar{e}$ from Cl_2 molecule

Step-II Attack of Cl^+ on Benzene ring lead to the formation of Resonance Stable Carbocation.

Benzene.

G.C.W. (Chemistry dept). Sec-(A+B)
Sem-II date - 26-3-2020

Rxn with mechanism of give Electrophilic Substitution Rxn. of benzene.

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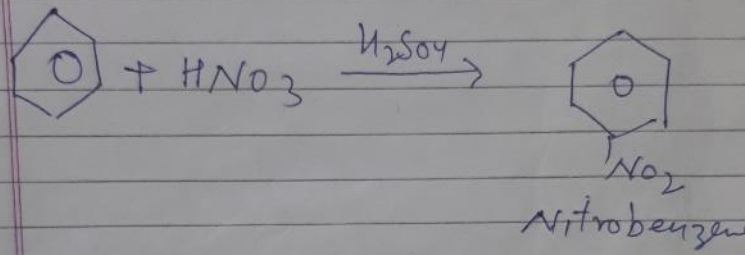
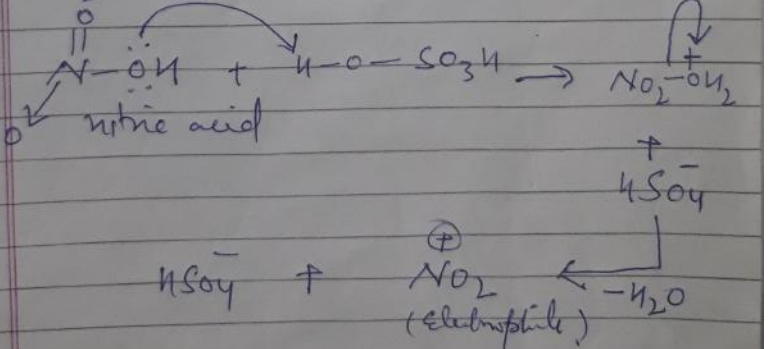


Nitrobenzene

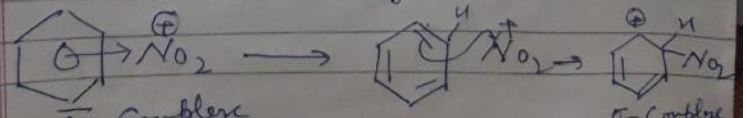
Mech:→

Step-I Generation of electrophile NO_2^+ (Nitronium ion).



(Electrophile)

Step-II Attack of electrophile on benzene ring form π Complex



Chemistry dept. G.C.W Jammu.

Date 25-3-2020
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Preparation from benzene Sulphonic acid.

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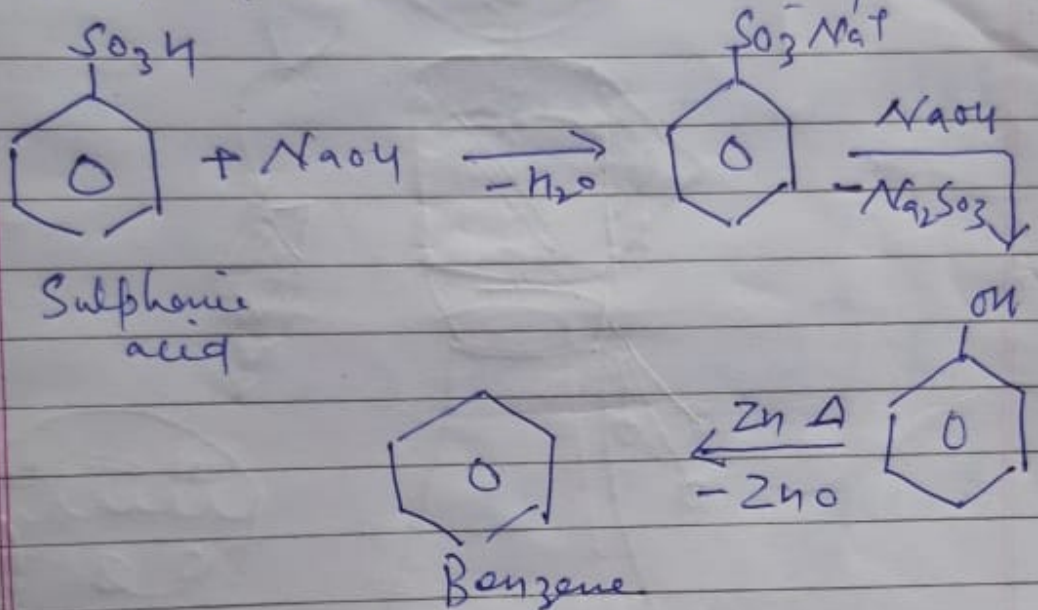

Owner's Man

Chemistry dept. G.C.W Jammu.

Date 25-3-2020
Page No.

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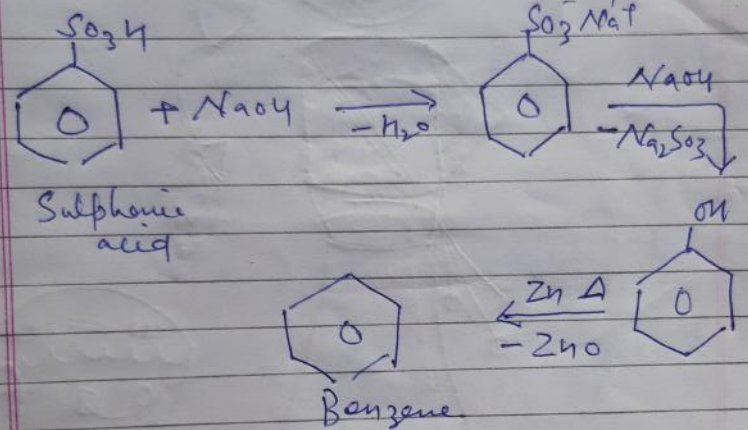

Sulphonic acid

Benzene