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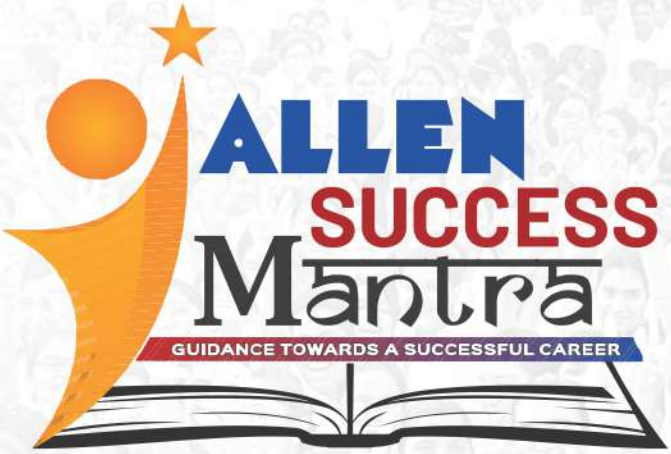

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Nutshell review & preview of
ORGANIC REAGENTS

1. Alcoholic KOH
R—X → Alkene ; Elimination

2. Aluminium Ethoxide

$RCH{=}O \longrightarrow R{-}\underset{\underset{O}{\|}}{C}{-}O{-}CH_2R$ (Tischenko Reaction)

(Aldehyde) (Ester)

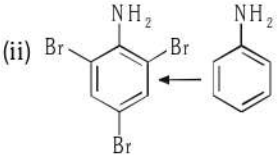
3. Aqueous KOH/NaOH
R—X → ROH
Nucleophilic substitution reaction also used for Cannizzaro reaction with aldehyde.

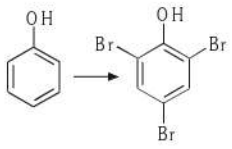
4. Baeyer's Reagent (Alkaline cold dilute $KMnO_4$)

$RCH{=}CHR' \longrightarrow \underset{\underset{OH}{|}}{RCH}{-}\underset{\underset{OH}{|}}{CHR'}$ (Syn)

alkene ⟶ 1, 2 diol
(used to detect unsaturation)

5. Bromine water
(i) used to detect unsaturation;

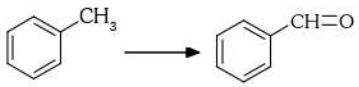
(ii) 
2,4,6-tribromoaniline

(iii) 
2,4,6-tribromophenol

6. Benedict's solution
Used to detect aldehyde group RCHO → RCO_2^-
[ketone gives -ve test]

7. Cu_2Cl_2 + NH_4OH
Used to Detect Terminal Alkyne
Red Precipitate observed

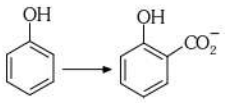
8. CrO_2Cl_2



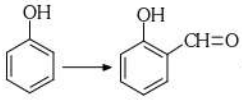
Etard reaction

9. CrO_3
(i) $RCH_2OH \rightarrow RCHO$,
(ii) $R_2CHOH \rightarrow R_2C{=}O$
(iii) R_3COH → no reaction

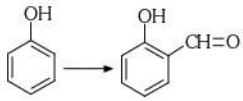
10. CCl_4 + OH^- (Reimer Tiemann)


+ p-Product

11. CO + HCl + $AlCl_3$

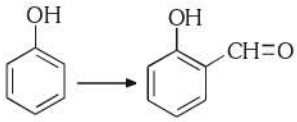

+ p-Product

Gatterman koch reaction

12. HCN + HCl + $AlCl_3$ 

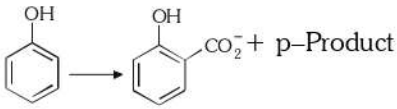
Gatterman Aldehyde Synthesis

13. $CHCl_3$ + KOH

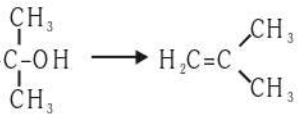
(i) 
Reimer Tiemann reaction

(ii) $RNH_2 \rightarrow RNC$ **(Carbyl amine reaction)**
(used to detect 1° Amine) (Isocyanide test)

14. CO_2 + OH^- (high temp. + Pressure)


Kolbe's reaction

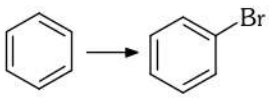
15. Cu/Δ
(i) $RCH_2OH \rightarrow RCHO$,
(ii) $R_2CHOH \rightarrow R_2C{=}O$

(iii) 

16. 2,4 – D.N.P.
used to detect carbonyl group (orange ppt observed)

17. DMSO
Polar aprotic solvent: favour S_N2 mechanism

18. Fe+ $Br_2/FeBr_3$



19. Fehling solution

used to identify – CH=O group.
PhCHO gives –ve test
Observation: red ppt of Cu_2O formed

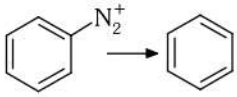
20. Grignard Reagent

Follows (i) Acid base reaction (ii) NAR (iii) NSR

21. $H_2(Pd/CaCO_3)$ Quinoline (Lindlar catalyst)

R—C≡C—R→ R—CH=CH—R (cis)

22. H_3PO_2



23. HN_3 + H_2SO_4

$$R-\underset{\underset{O}{\|}}{C}-OH \longrightarrow RNH_2$$

(Schmidt Reaction)

24. H_3PO_4/Δ

H_3PO_4 ⇒ Same as H_2SO_4/Δ

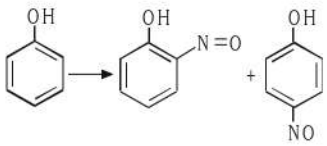
25. H_2SO_4/Δ

$$R\underset{\underset{OH}{|}}{C}H-CH_3 \longrightarrow RCH=CH_2$$

Saytzeff product; C^+ mechanism;
Rearranged alkene can be formed

26. HNO_2 ($NaNO_2$ + HCl)

(i) $RNH_2 \rightarrow R—OH$;
(ii) $PhNH_2 \rightarrow PhN_2^+$ (0 – 5°C)
(iii) $PhNH_2 \rightarrow PhOH$ (high temperature)

(iv) 

27. HIO_4 (Periodic acid)

$$RCH(OH)-CH(OH)-R' \longrightarrow RCH=O + R'CH=O$$

Oxidative cleavage of diol

28. H_2(Ni) can reduce

(i) $R-\underset{\underset{O}{\|}}{C}-R \longrightarrow R_2CHOH$

(ii) $R-\underset{\underset{O}{\|}}{C}-H \longrightarrow RCH_2OH$

(iii) RCN → RCH_2NH_2; –C≡C– → $–CH_2–CH_2–$,
–HC=CH– → $–CH_2—CH_2–$

29. $H_2(Pd/BaSO_4)$
Quinoline

$$R-\underset{\underset{O}{\|}}{C}-Cl \longrightarrow RCH=O$$

(Rosenmund reduction)

30. Jones Reagent (CrO_3 + dil. H_2SO_4 + acetone)

(i) $RCH_2OH \rightarrow RCH=O$; (ii) $R_2CHOH \rightarrow R_2C=O$

31. $KHSO_4$ Dehydrating Reagent

$$CH_2(OH)-CH(OH)-CH_2-OH \longrightarrow CH_2=CH-CH=O$$

32. $K_2Cr_2O_7/H^+$

(i) $RCH_2OH \rightarrow RCO_2H$; (ii) $R_2CHOH \rightarrow R_2C = O$

33. MnO_2

(i) $CH_3—CH=CH—CH_2—OH \rightarrow CH_3—CH=CH—CH=O$
(ii) $PhCH_2OH \rightarrow PhCH=O$
To oxidise allylic / benzylic hydroxyl group into corresponding carbonyl.

34. $NaHCO_3$

$$RCO_2H \xrightarrow{NaH^{14}CO_3} RCO_2Na + {}^{14}CO_2 \uparrow$$

35. $NaHSO_3$

$$R-\underset{\underset{O}{\|}}{C}-R \rightarrow RC(OH)(SO_3^-Na^+)$$

[White crystals, soluble in water used to separate carbonyl from noncarbonyl compound]

36. NaOH(aq)

(i) R—X → R—OH

(ii) $R-\underset{\underset{O}{\|}}{C}-OR' \xrightarrow[(H_2O)]{NaOH} R-\underset{\underset{O}{\|}}{C}-O^- + R'OH$

Basic hydrolysis of ester

(iii) $HCHO \xrightarrow{OH^-} HCO_2^- + CH_3OH$ (cannizaro)

(iv) $H_3C.CH>O \xrightarrow[E]{OH^-} H_3C.CH>CH.CH>O$
(Aldol condensation)

37. Ninhydrin
Detection of amino acid
Observation : Purple coloured ion

38. NaOR
Strong base :

(i) $RCH(X)-CH_2-R \longrightarrow RCH=CH-R$
(Saytzeff Product : E_2 elimination)

(ii) $H_3C-C(=O)-OEt \longrightarrow H_3C-C(=O)-CH_2-C(=O)-OEt$
(claisen condensation) (β keto ester)

39. NaOH + X_2 or NaOX

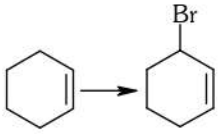
(i) $RC(=O)-CH_3 \xrightarrow{.CHI_3} RCO_2^-$ (Haloform reaction)

(ii) $R-C(=O)-NH_2 \longrightarrow RNH_2$ (Hoffman Degradation)

40. NaOH + CaO
$RCO_2H \rightarrow RH$

41. MnO / 300°C
used for $-CO_2$ & $-H_2O$ in carboxylic acid.

42. NBS

(i)  ; (ii) $PhCH_3 \rightarrow PhCH_2—Br$

43. $NaNO_2$ + HCl
$RNH_2 \rightarrow R—OH$

44. $NaNH_2$ in paraffin
Non-terminal Alkyne →Terminal Alkyne
(2–Butyne → 1–butyne)

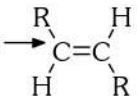
45. Na/EtOH
Reduce all except c/c double & triple bond

46. Zn(Hg) + HCl [Clemmensen's reduction]

$R-C(=O)-R \longrightarrow R-CH_2-R$

47. NH_2 –NH_2/OH^- [Wolf Kishner reduction]
R–CO–R → R–CH_2–R

48. Na in Liq. NH_3 [Birch reduction]

$R-C\equiv CR \longrightarrow$ 
(trans alkene)

49. OsO_4 + H_2O

$RCH=CHR \longrightarrow RCH(OH)-CH(OH)-R$
(syn addition)

50. O_3 : $R-CH=CH-R \xrightarrow[H_2O/Zn]{O_3} R-CHO + R-CHO$ (Ozonolysis process)

51. Oxirane followed by H^+
$RMgX \rightarrow RCH_2—CH_2—OH$

52. PCC
(i) $RCH_2OH \rightarrow RCHO$,
(ii) $R_2CHOH \rightarrow R_2C=O$
(iii) $R_3COH \rightarrow$ no reaction
(Mild oxidizing reagent)

53. P(red) + Br_2

(i) $CH_3CO_2H \rightarrow H_2C(Br)-CO_2H$ (HVZ reaction)

(ii) $ROH \rightarrow R—Br$

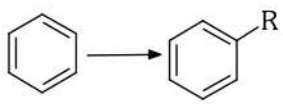
54. P (red) + HI
$CH_3CO_2H \rightarrow CH_3—CH_3$
$CH_3CH=O \rightarrow CH_3—CH_3$
$CH_3CH_2OH \rightarrow CH_3—CH_3$
(strong reducing agent can reduce any oxygen or halogen containing compound to alkane)

55. Perbenzoic acid [Baeyer Villiger Oxidation]

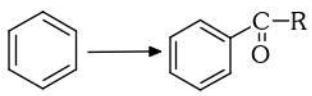
$R-C(=O)-R' \longrightarrow R-C(=O)-OR'$

R' having more migrating tendency than R

56. RCl+$AlCl_3$ [Friedel craft alkylation]



57. RCOCl + $AlCl_3$ [Friedel craft acylation]

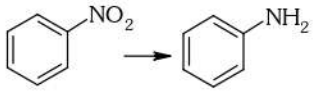


58. $ROH + R-\underset{\underset{O}{\|}}{C}-OH \xrightarrow[H_2SO_4]{conc.} R-\underset{\underset{O}{\|}}{C}-OR$

Ester formed (Esterification reaction)

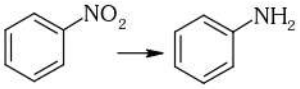
59. $SnCl_2$ + HCl

(i) $R-N=N-R' \rightarrow RNH_2 + R'NH_2$

(ii) 

(iii) $RCN \rightarrow RCH=O$ [Stephen reduction]

60. Sn + HCl

(i) 

(ii) $RCN \rightarrow R\text{–}CH_2NH_2$

61. Silver salt RCOOAg (Hunsdiecker reaction)

$Br_2/CCl_4/\Delta \rightarrow RBr + CO_2 + AgBr$

62. AgOH/moist Ag_2O; $R_4\dot{N}\bar{X} \downarrow R_4\dot{N}\bar{O}H$

63. $SOCl_2$

$R-\underset{\underset{O}{\|}}{C}-OH/R-OH \longrightarrow R-\underset{\underset{O}{\|}}{C}-Cl/R-Cl$

64. Tollens Reagent Test

(i) Terminal alkyne gives
(ii) Aldehyde Group gives
(iii) Ketone gives –ve test
(iv) α-hydroxy ketone gives
(v) HCOOH gives
(vi) Hemi acetal gives
(vii) PhNH–OH gives

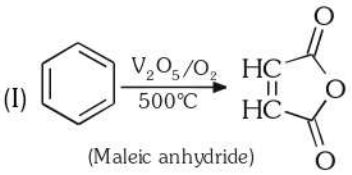
65. Benzene sulphonyl chloride

It is used to distinguish and separate (Hinsberg reagent) 1°, 2° and 3° amines.

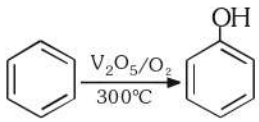
66. Tetra ethyl lead (TEL)

Used as antiknock compound

67. V_2O_5

(I) 

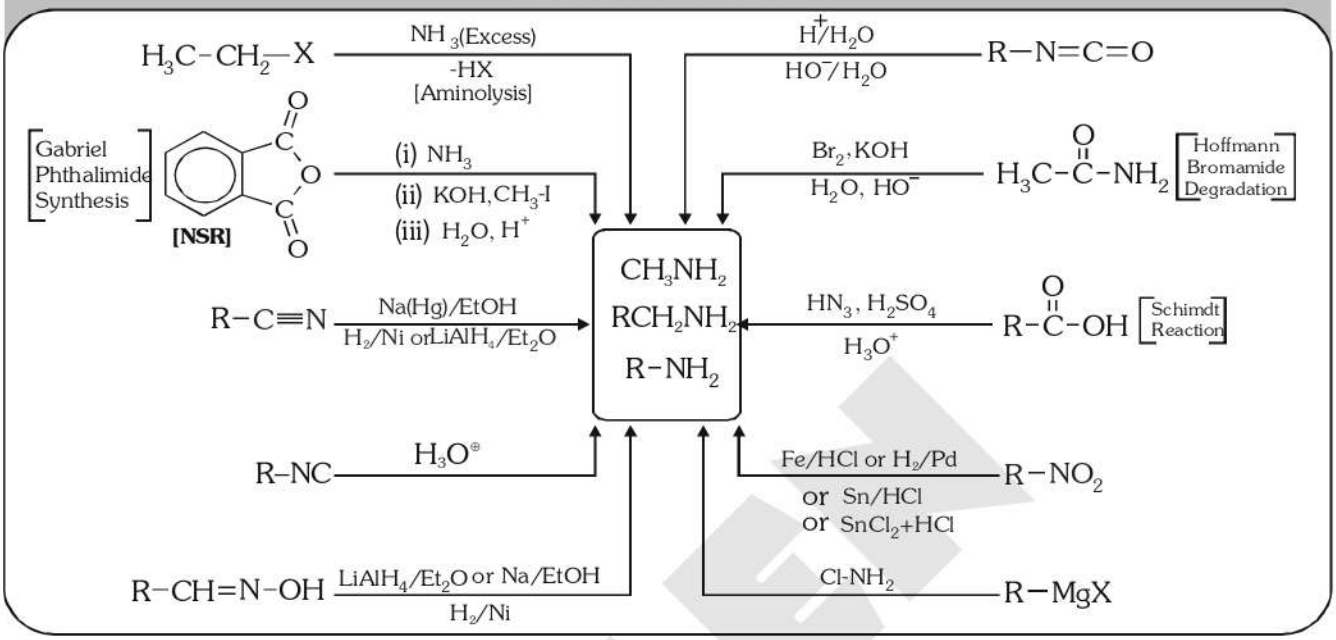
(Maleic anhydride)

(II) 

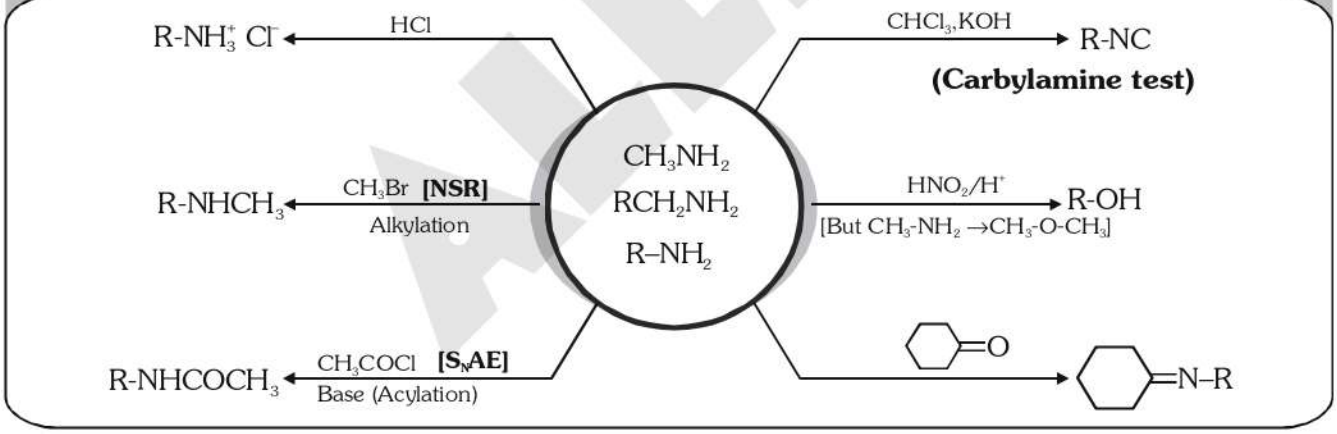
IMPORTANT NOTES

AMINES

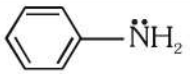
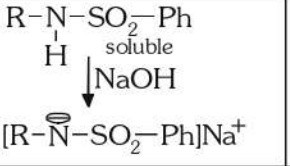
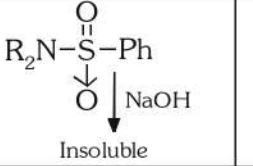
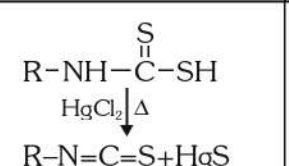
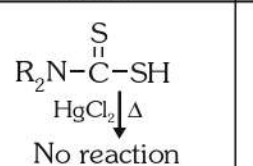
PREPARATION



REACTION

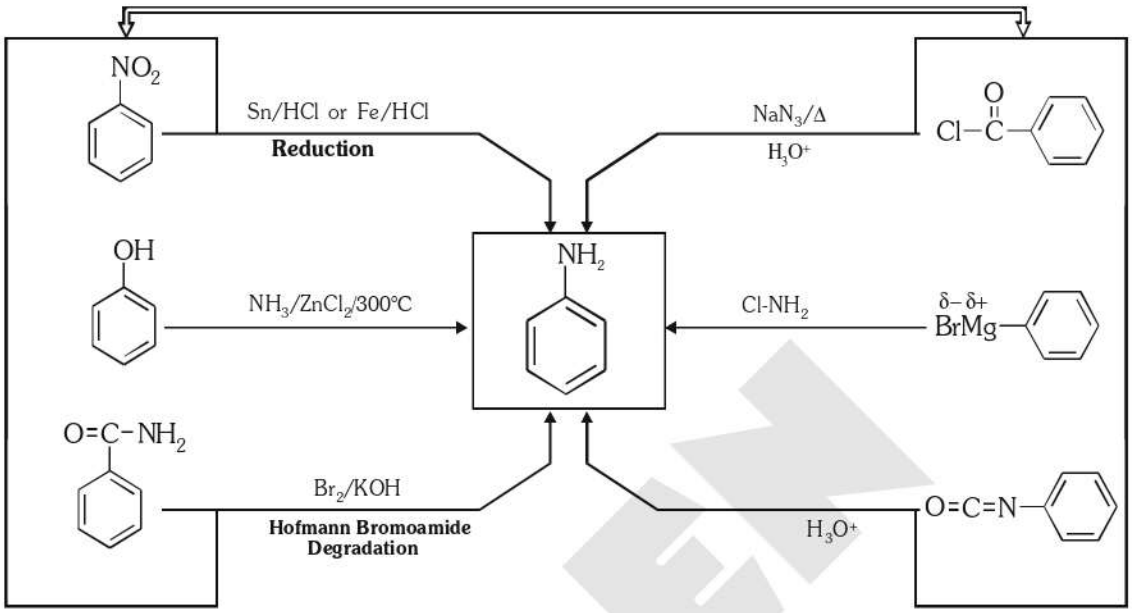


TEST

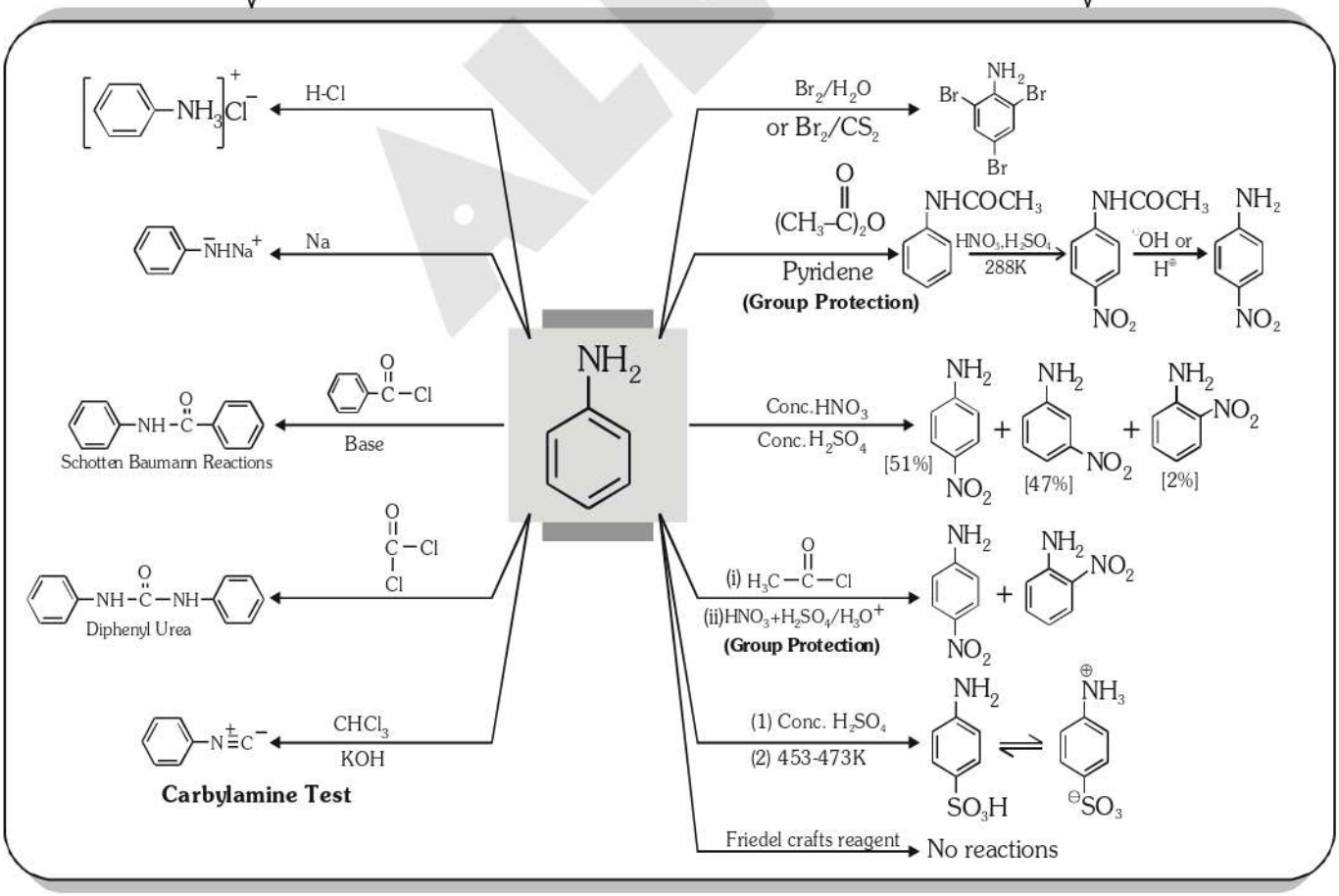
Reagent	$R-\ddot{N}H_2$(1°)	$R_2\ddot{N}H$(2°)	$R_3\ddot{N}$(3°)	
$Ph-SO_2Cl$ (Hinsberg reagent)			No reaction	
$\Delta/HgCl_2$ Mustard oil test			No reaction	

ANILINE

PREPARATION

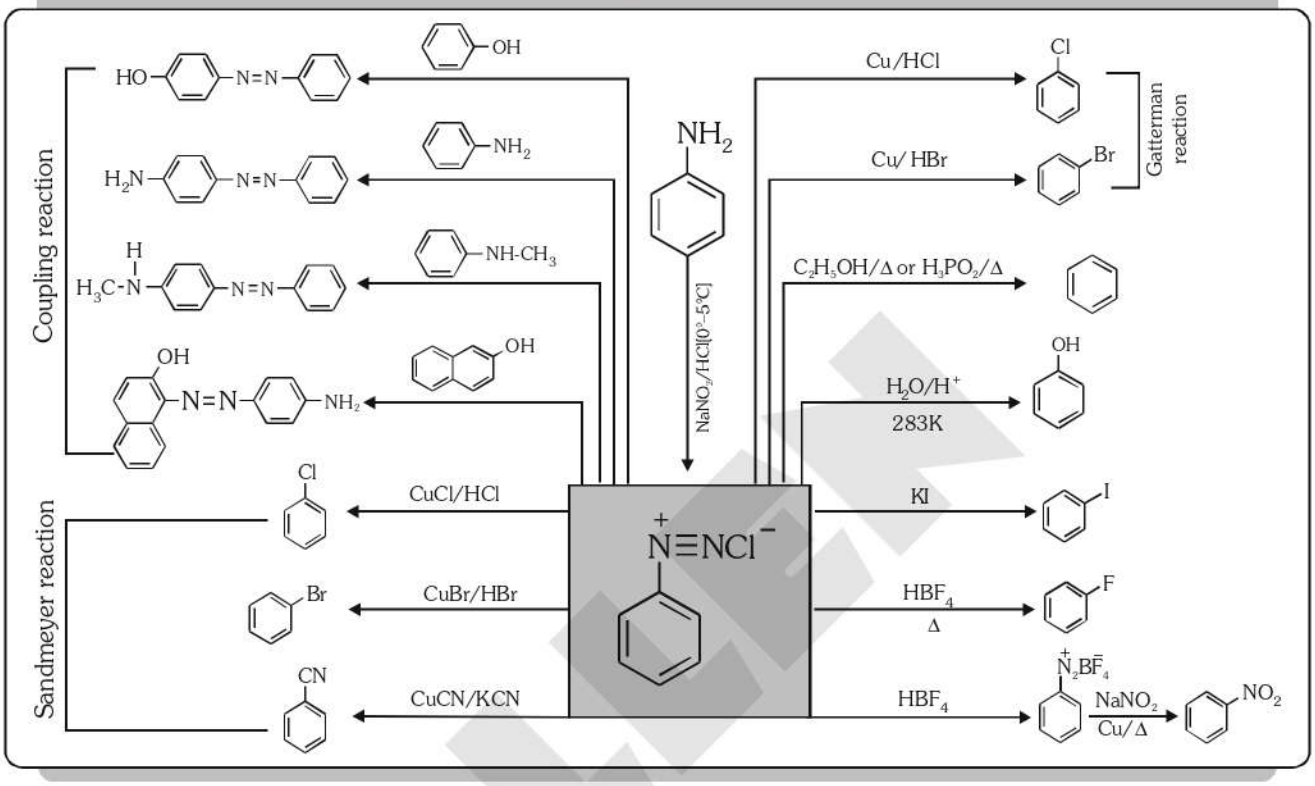


REACTION



BENZENE DIAZONIUM CHLORIDE

REACTION



FrSR	Free Radical Substitution reaction
ESR	Electrophilic Substitution reaction
NSR	Nucleophilic Substitution reaction
S_NAE	Substitution Nucleophilic (addition elimination)
FrAR	Free radical addition reaction
NAR	Nucleophilic addition reaction
EAR	Electrophilic addition reaction
FrER	Free Radical Elimination reaction