FREE NOTES · NCERT + JEE/NEET LEVEL

Amines

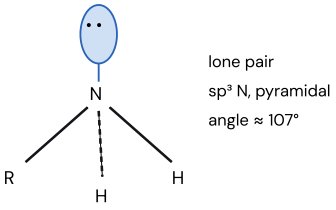
Structure, classification aur naming, banane ke tareeke, physical properties, basic nature, 1°/2°/3° amines ke reactions aur tests, diazonium salts aur unke uses.

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01 Structure & classification

Amines NH_3 ke derivatives hain jinme H ki jagah alkyl/aryl group. N sp^3 hai aur ek lone pair ⇒ **pyramidal**.

- **1°**: $R–NH_2$, **2°**: R_2NH, **3°**: R_3N. (Alcohols se alag: yahan N pe groups ginte hain.)
- Naming: alkanamine (ethanamine, N-methylethanamine, N,N-dimethylmethanamine). $C_6H_5NH_2$ = aniline (benzenamine).



Amine ki pyramidal shape

02 Banane ke tareeke

Tareeka	Reaction	Kya milta
Nitro compounds ka reduction	$ArNO_2$ + Fe/HCl (best) ya Sn/HCl ya H_2/Pd	$ArNH_2$
Halides ka ammonolysis	$R–X + NH_3$	1°, 2°, 3°, quaternary salt ka mixture
Nitriles ka reduction	$RCN + LiAlH_4$ ya H_2/Ni	RCH_2NH_2 (ek C zyada)
Amides ka reduction	$RCONH_2 + LiAlH_4$	RCH_2NH_2
Gabriel phthalimide	Phthalimide + KOH + RX, phir hydrolysis	Shuddh 1° aliphatic amine (aromatic nahi)
Hoffmann bromamide	$RCONH_2 + Br_2 + 4NaOH$	RNH_2 (**ek C kam**)

03 Physical properties

- Chhote aliphatic amines machhli jaisi badbu wali gas; aniline liquid jo hawa me kaala pad jaata (oxidation).
- 1° aur 2° H-bond banate ⇒ b.p.: **1° > 2° > 3°** (3° me N–H nahi).
- Amines ka b.p. alcohols se kam (N, O se kam electronegative ⇒ kamzor H-bond).
- Chhote amines paani me ghulte; alkyl bada ho to solubility ghatti.

04 Basic nature

N ka lone pair proton leta ⇒ amines **Lewis bases**. K_b zyada / pK_b kam ⇒ zyada strong base.

- Aliphatic amines NH_3 se strong (alkyl ka +I).
- **Paani me** order +I, ammonium ion ki H-bonding (solvation) aur bheed pe depend:
  $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2 > NH_3$
  $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > NH_3$
- **Aniline NH_3 se weak**: lone pair ring me phail jaata (resonance) aur anilinium ion me resonance kam.
- Ring pe EDG ($-CH_3$, $-OCH_3$) basicity badhate; EWG ($-NO_2$) ghatate. p-toluidine > aniline > p-nitroaniline.

05 Amines ke reactions

Reaction	Reagent	Nateeja
Salt banna	HCl	$RNH_3^+Cl^-$ (paani me ghulta)
Alkylation	R'X	2°, 3° amines, quaternary salt
Acylation	CH_3COCl / $(CH_3CO)_2O$, pyridine	Amide (sirf 1° aur 2°)
Benzoylation	C_6H_5COCl	N-benzoyl amide
Carbylamine	$CHCl_3$ + alc. KOH, garam	Isocyanide (gandi badbu): sirf **1° amines**
Nitrous acid	$NaNO_2$ + HCl	1° aliphatic: alcohol + N_2 gas; aromatic (273–278 K): **diazonium salt**

06 Hinsberg's test: 1°, 2°, 3° pehchano

Amine	+ Benzenesulphonyl chloride ($C_6H_5SO_2Cl$)
1°	N-alkylbenzenesulphonamide, **KOH me ghulta** (acidic N–H)
2°	N,N-dialkyl sulphonamide, **KOH me nahi ghulta** (N pe H nahi)
3°	Koi reaction nahi

Carbylamine test bhi 1° amines pehchanta.

07 Aniline: ring reactions

$-NH_2$ bahut **activating**, ortho/para directing.

- **Bromine water ⇒ 2,4,6-tribromoaniline** ka safed ppt. Mono-bromo chahiye to pehle **acetylate** karo (acetanilide activation kam karta), phir bromination, phir hydrolysis.
- **Nitration:** seedha nitration karo to tarry oxidation products aur ~47% **meta** product (acid me anilinium ion $-NH_3^+$ meta directing). Acetylation se bachao ⇒ zyada p-nitroaniline.
- **Sulphonation:** conc. H_2SO_4 ⇒ anilinium hydrogensulphate ⇒ garam ⇒ **sulphanilic acid** (zwitterion ke roop me).
- **Friedel-Crafts nahi hota:** aniline (base) $AlCl_3$ ke saath salt banata; N pe + charge aa ke ring deactivate.

08 Diazonium salts

$ArNH_2 + NaNO_2 + 2HCl$, **273–278 K** ⇒ $ArN_2^+Cl^-$ (diazotisation). Aryl diazonium salts kam temperature pe stable (resonance); alkyl wale nahi.

Reagent	Product	Naam
CuCl/HCl, CuBr/HBr, CuCN/KCN	ArCl, ArBr, ArCN	Sandmeyer
Cu powder + HX	ArX	Gatterman
KI	ArI	
HBF_4, garam	ArF	Balz-Schiemann
H_3PO_2 ya CH_3CH_2OH	ArH (benzene)	$-NH_2$ hatata
H_2O, garam	Phenol	
HBF_4 phir $NaNO_2$/Cu	Nitrobenzene	
Phenol (alkaline) / aniline (acidic)	p-Hydroxyazobenzene (orange) / p-aminoazobenzene (peela)	**Coupling** (dyes; N_2 bacha rehta)

09 JEE Extra + Tricks

JEE LEVEL

- Paani me basicity: $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2 > NH_3$; methyl me: $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > NH_3$. Aniline kamzor base (lone pair resonance me).
- Hinsberg test (benzenesulphonyl chloride): 1° ⇒ alkali me ghulta; 2° ⇒ na ghulne wala; 3° ⇒ reaction nahi.
- Carbylamine test ($CHCl_3$ + KOH): sirf 1° amines badboodaar isocyanide.
- Hofmann bromamide: amide se ek C kam wala amine. Gabriel phthalimide: sirf 1° aliphatic amines (aromatic nahi).
- Diazonium salts (0–5 °C): Sandmeyer (CuCl/CuBr/CuCN), Gattermann, phenol (orange dye) / aniline (peela dye) se coupling.
- Aniline + Br_2 water ⇒ 2,4,6-tribromoaniline; ek hi substitution ke liye pehle acetylate ($-NHCOCH_3$).

10 Solved questions

Q1. Benzamide se aniline banao.

Hoffmann bromamide: $C_6H_5CONH_2 + Br_2 + 4NaOH \rightarrow C_6H_5NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$.

Q2. Gabriel synthesis se aniline kyun nahi banta?

Aryl halides phthalimide anion ke saath nucleophilic substitution nahi karte.

Q3. Paani me basicity ka order: CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$, $C_6H_5NH_2$.

$(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > C_6H_5NH_2$.

Q4. Aniline se benzonitrile banao.

$NaNO_2/HCl$ (273 K) → $C_6H_5N_2^+Cl^-$ → CuCN/KCN → C_6H_5CN.

11 Mistakes & practice

- Kehna ki paani me 3° amine sabse strong base (bheed aur kam solvation use ghata dete).
- Bhoolna ki Hoffmann bromamide ek carbon kam karta.
- Aniline ke seedhe nitration me sirf o/p products expect karna.
- Diazotisation room temperature pe karna (salt toot jaata).

1. Carbylamine test kaun se amines dete?
2. $CH_3CONH_2 + Br_2 + NaOH$ ka product?
3. Aniline ammonia se zyada basic ya kam?
4. Bromination se pehle aniline ko acetylate kyun karte?
5. N_2^+ ko H se badalne ka reagent?

ANSWERS

1) Sirf 1° · 2) CH_3NH_2 · 3) Kam · 4) Activation kam karke mono-substitution ke liye · 5) H_3PO_2

12 Quick revision: exam se 5 minute pehle

BANANA

- Gabriel: shuddh 1° aliphatic.
- Hoffmann: ek C kam.
- Nitrile + $LiAlH_4$: ek C zyada.

BASICITY

- 2° > 1° > 3° (methyl, paani).
- Aliphatic > NH_3 > aniline.

TESTS

- Carbylamine: sirf 1°.
- Hinsberg: 1° KOH me ghulta, 2° nahi, 3° react nahi karta.

DIAZONIUM

- 273–278 K.
- Sandmeyer: CuX.
- Coupling ⇒ azo dyes.

Koi doubt? padhaiadda.netlify.app pe AI Doubt Solver se poocho, ya is chapter ka mock test do.