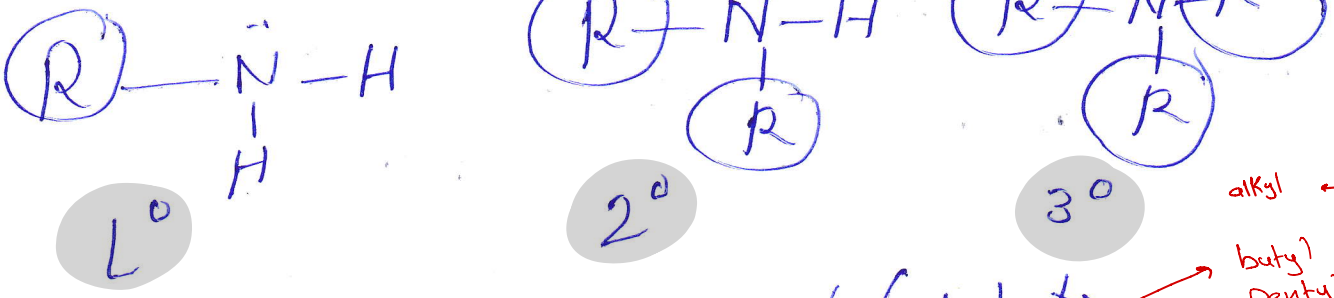
Chapter 11. Amines

① Organic bases derived from $\ddot{N}H_3$ → ammonia

↳ formal charge = 0

② Classification:



R: Could be alkyl or aryl (aliphatic or aromatic → direct attachment between N and phenyl)

alkyl ← R ال

butyl, pentyl

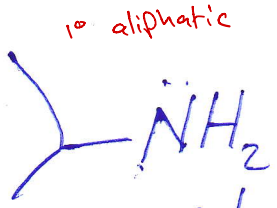
③ Naming:-

1° aliphatic

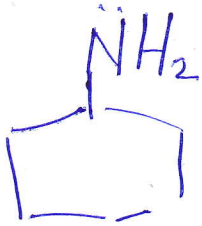
CH_3-NH_2

methyl amine

1° aliphatic



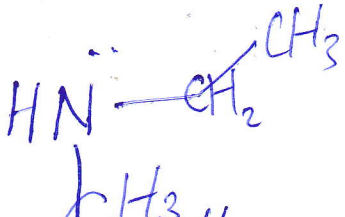
Isopropyl amine



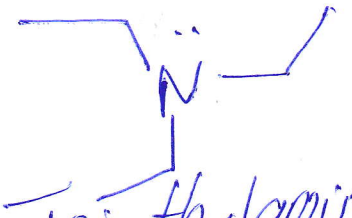
1° aliphatic

cyclohexyl amine

2° aliphatic

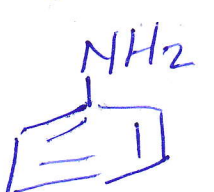


Ethyl methyl amine



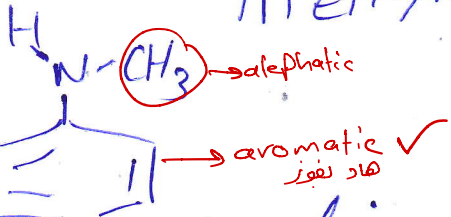
3°

Triethylamine



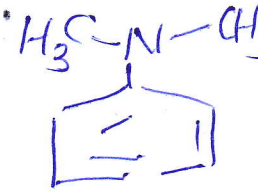
aniline

1° aromatic



N-methylaniline

2° "aromatic amine"



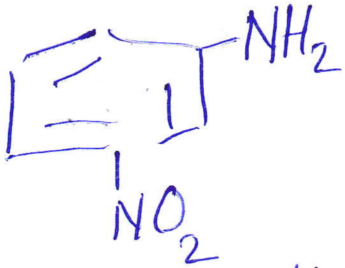
N,N-Dimethylaniline

"3° aromatic amines"

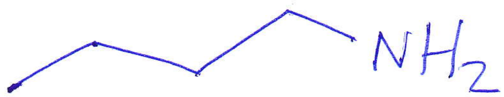
ethyl + methyl

N-ethyl-N-methyl aniline

1° aromatic



m-Nitroaniline



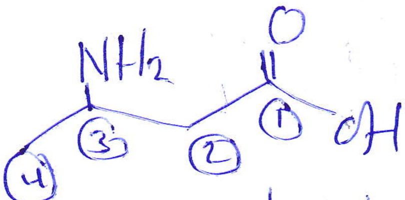
butylamine

Note: In the presence of other functional groups ⟶ NH_2 as substituent is called: amino.

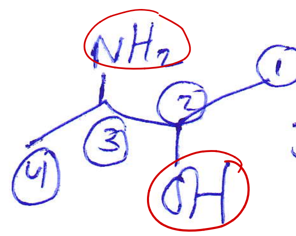
NH_2: amino
NO_2: nitro

اولويات الترقيم

1. carboxylic acid
2. aldehyde
3. Ketone
4. alcohol
5. amines



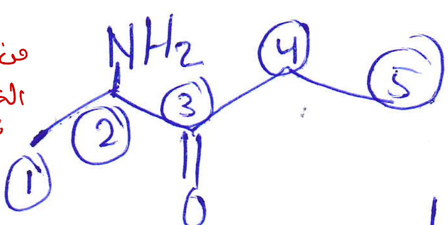
3-Aminobutanoic acid



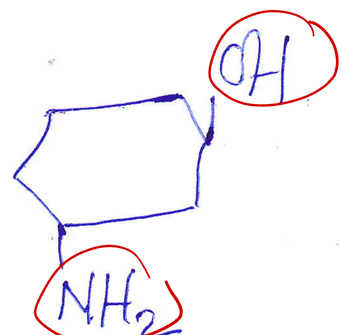
3-Amino-2-butanol

2, 3 : chiral center

من الجهتين الكيتون نفس الترقيم اذاً نرقم حيث اعطي ال NH_2 اقل ترقيم



2-Amino-3-pentanone



trans-3-Aminocyclohexanol

(4) physical properties:

a) Only 1° and 2° amines can form hydrogen bonding among molecules, while with water molecules ⟶ all amines can form hydrogen bonding.

لـ بين ال N تاعت ال amine
وال H تاعت المي

b) For boiling point,

carboxylic acid > Alcohols > Amines > Aldehydes, Ketones > alkanes

(لو مركبين من نفس النوع (مثلاً Amine مع Amine) بلجأ لعدد ذرات ال C)

↑C ↑B.P

واذ نفس عدد ذرات ال C بشوف ال branching

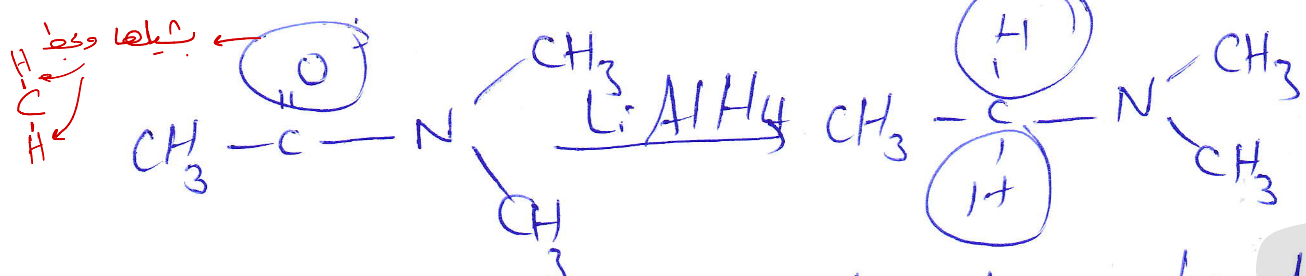
↑branching ↓B.P

for closer molar masses.

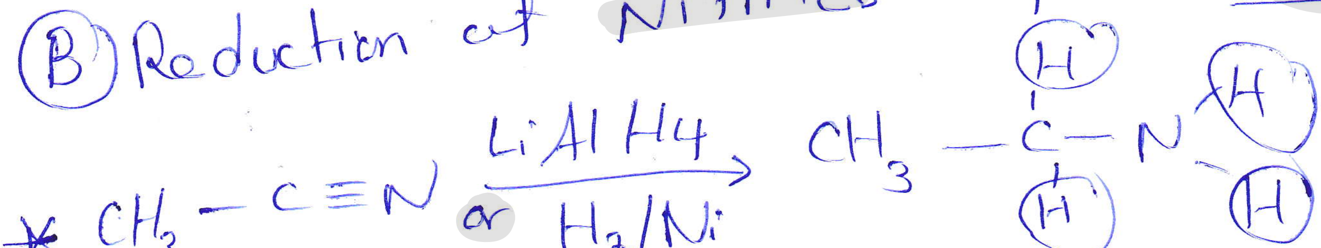
Amines are soluble in water for low M.m

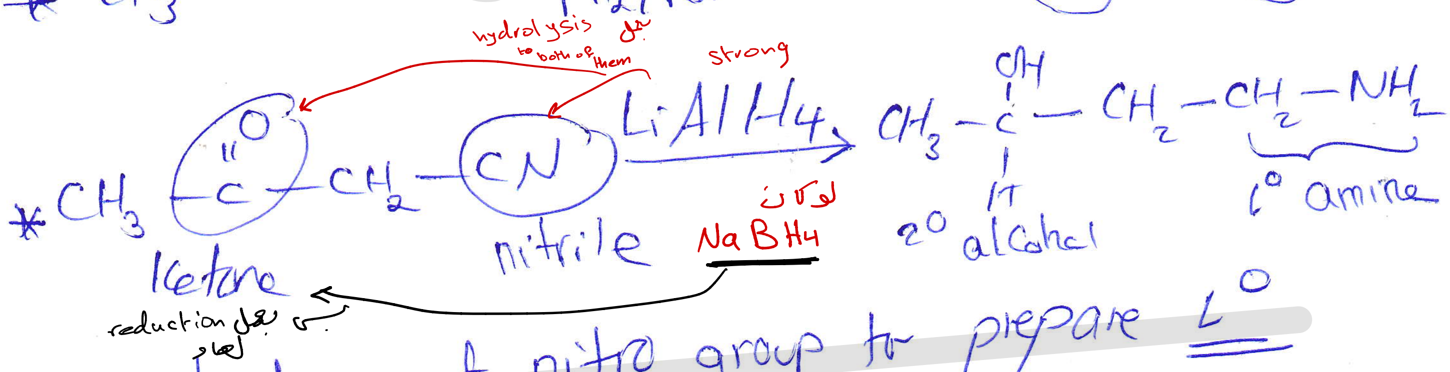
5) Synthesis of Amines:

A) Reduction of amides by $LiAlH_4$ (Cha. 10)

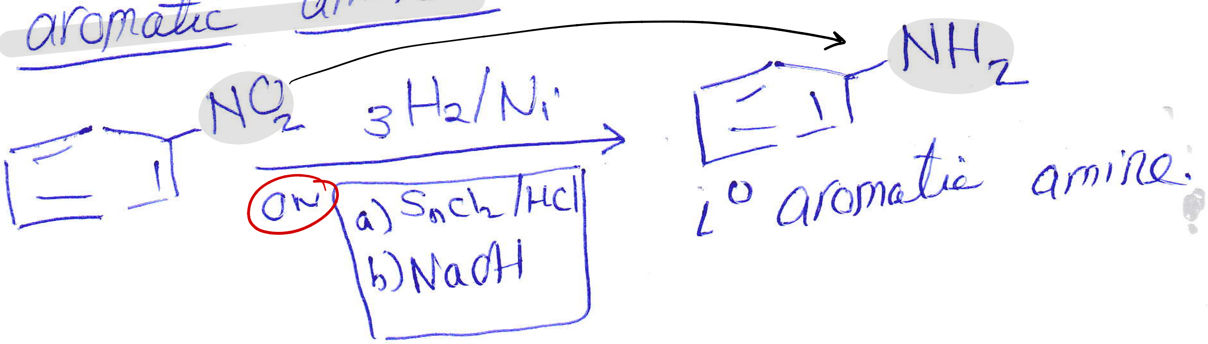


B) Reduction of Nitriles to produce 1° amines. (دائماً)

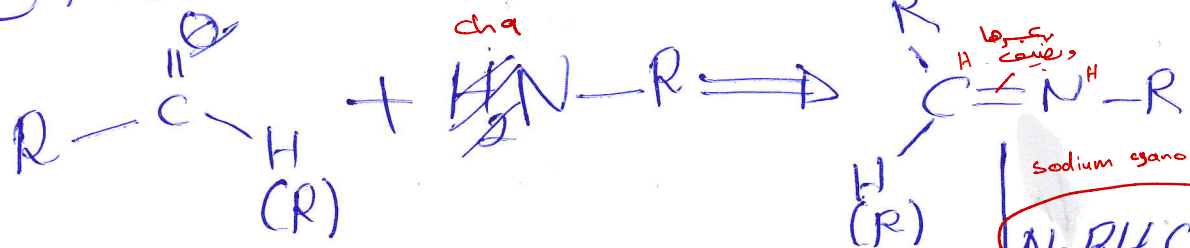


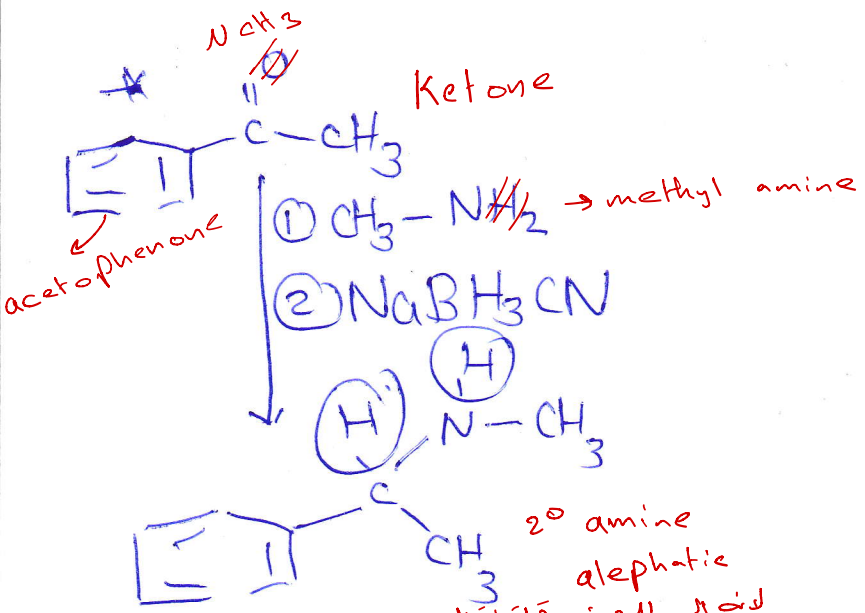


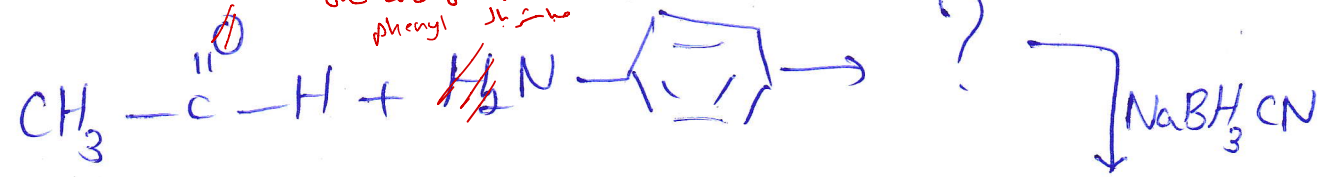
C) Reduction of nitro group to prepare 1° aromatic amines.

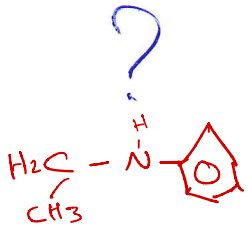


(D) Reductive amination of aldehydes/ketones



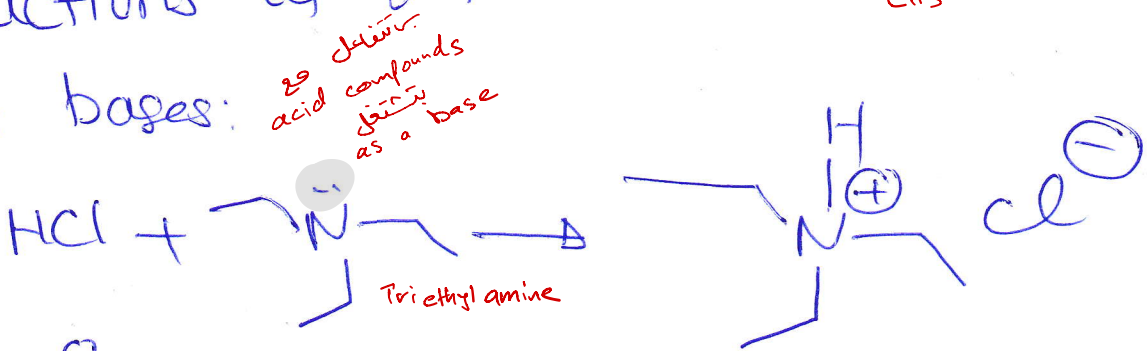


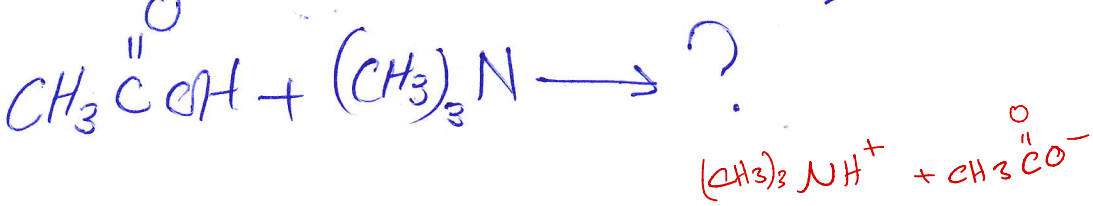




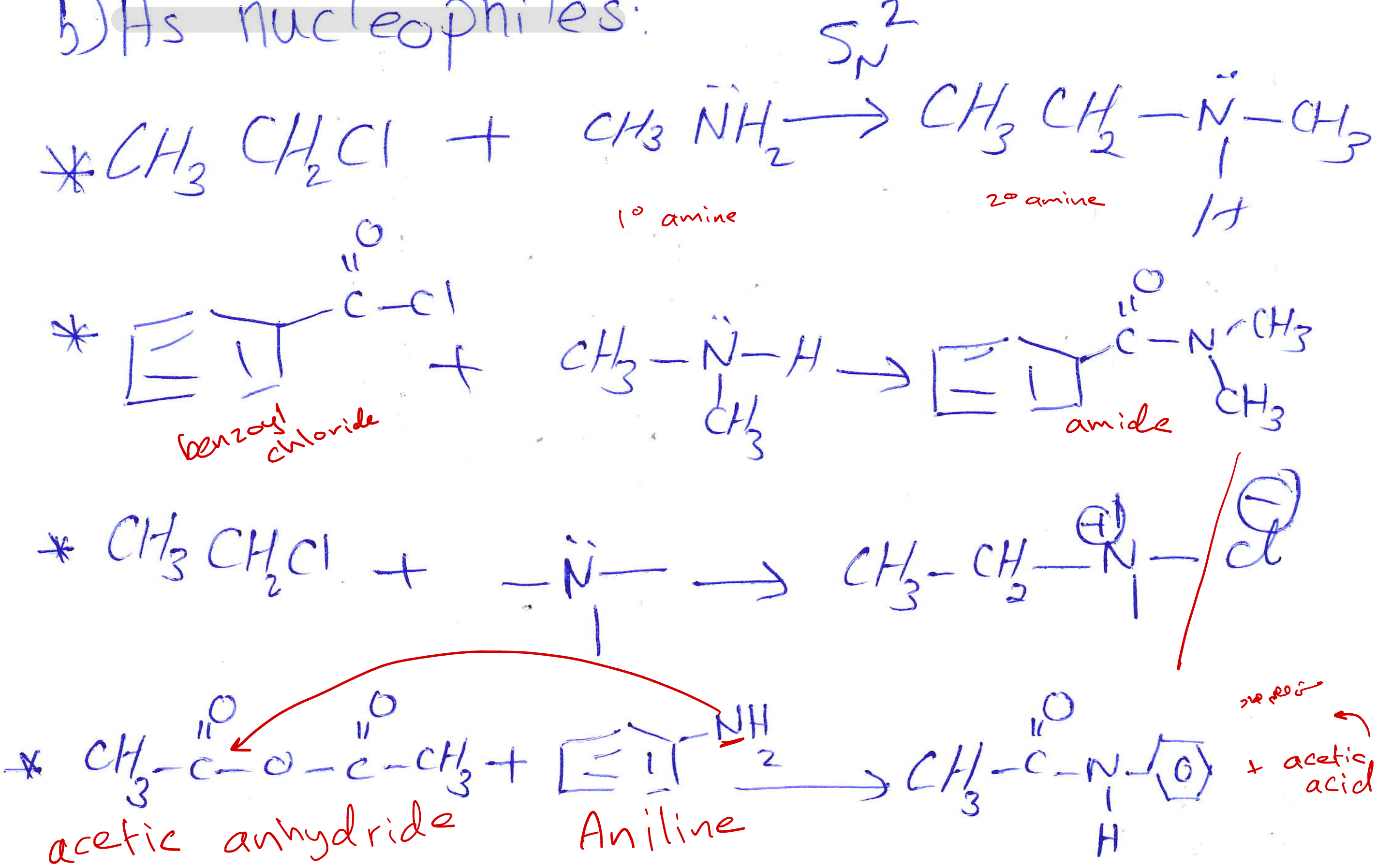
(6) Reactions of Amines:

(A) As bases:

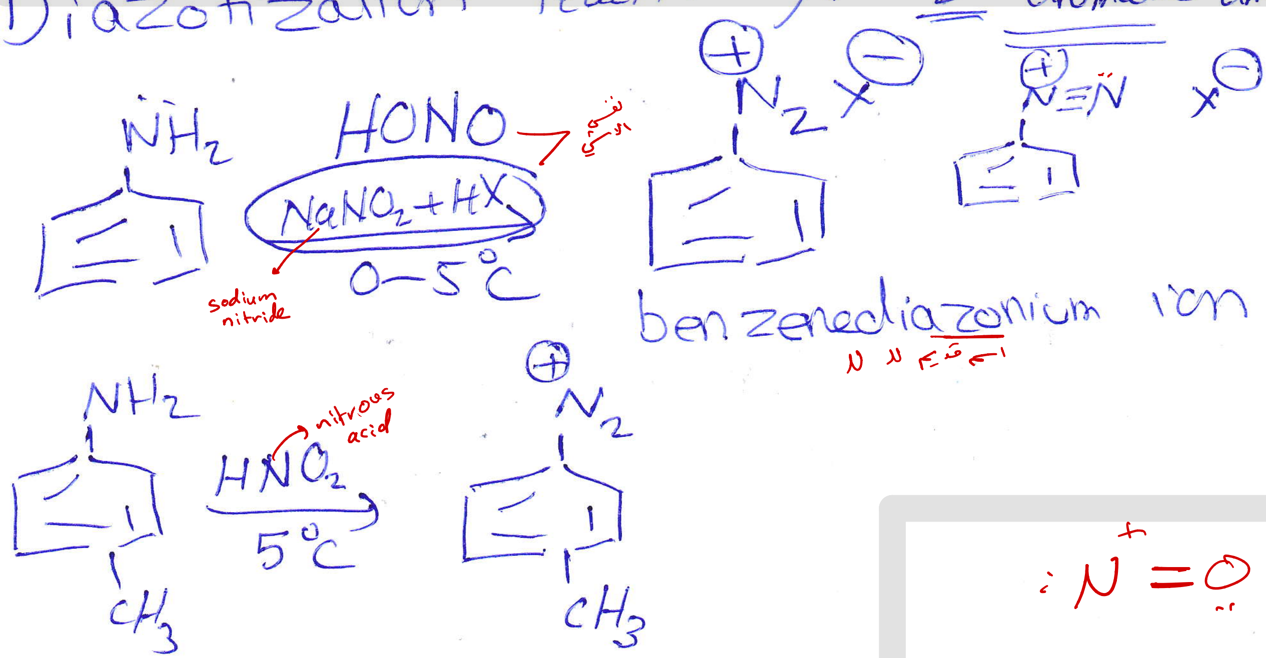




b) As nucleophiles:



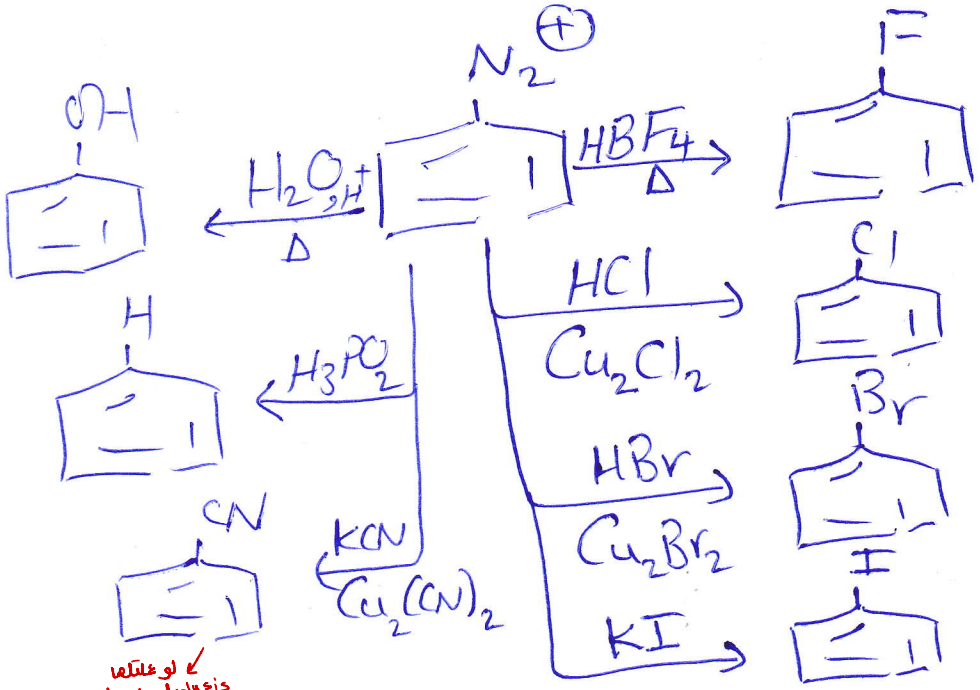
c) Diazotization reaction for 1° aromatic amine



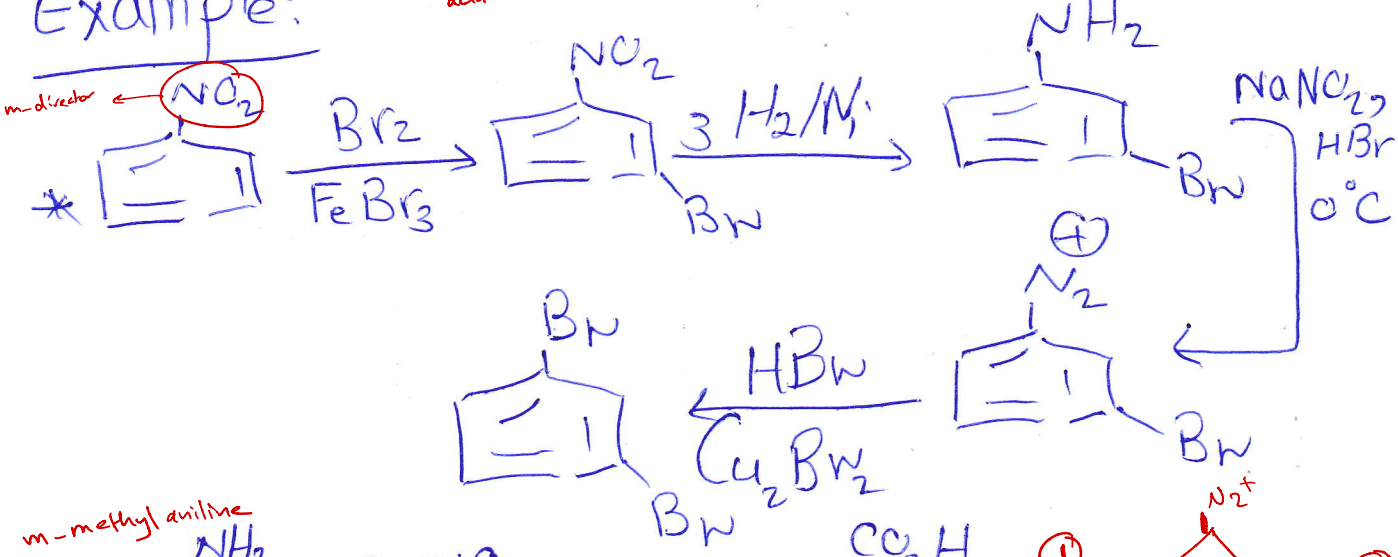
$:\overset{+}{N}=\ddot{O}:$

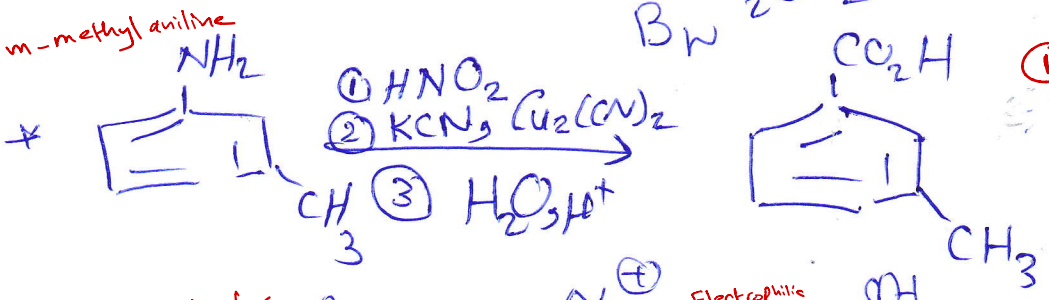
nitrosonium ion

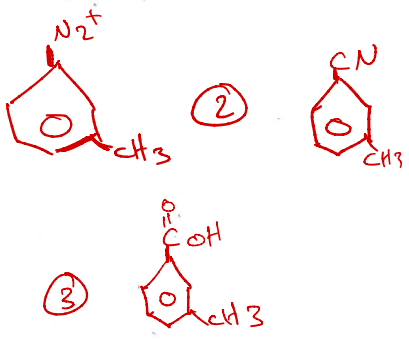
الدكتور حكى
احفظوه



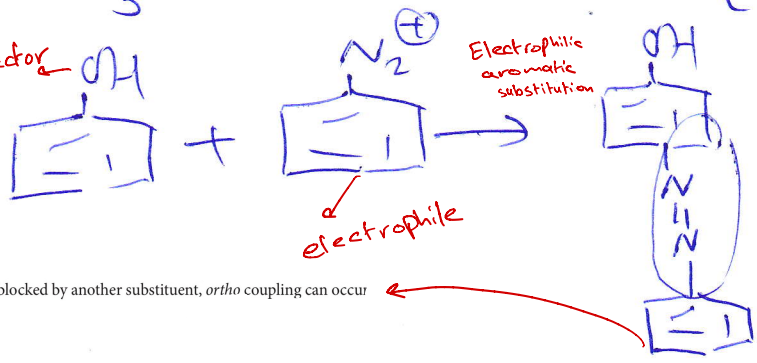
Example:





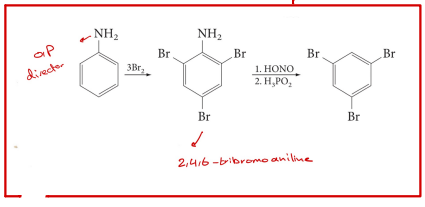


Note:



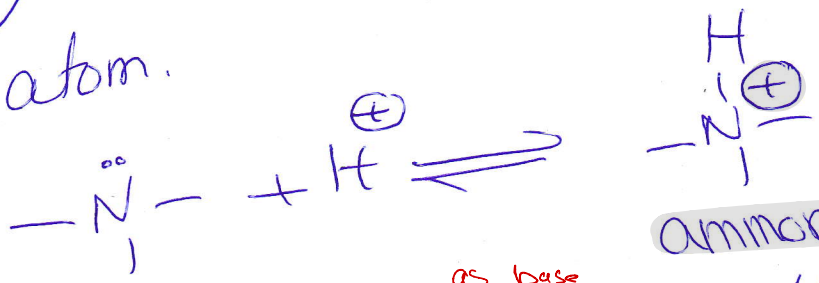
Azo dyes

but if the *para* position is blocked by another substituent, *ortho* coupling can occur



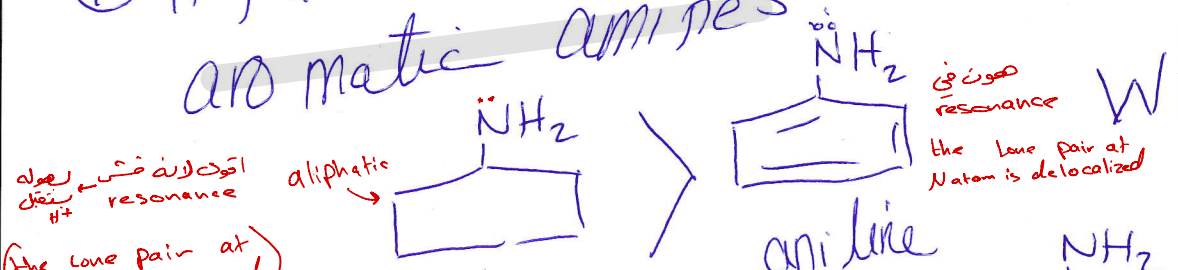
11.6 Basicity of amines.

* Amines can act as bases (accept H^+) due to the availability of lone pair of electrons at nitrogen atom.

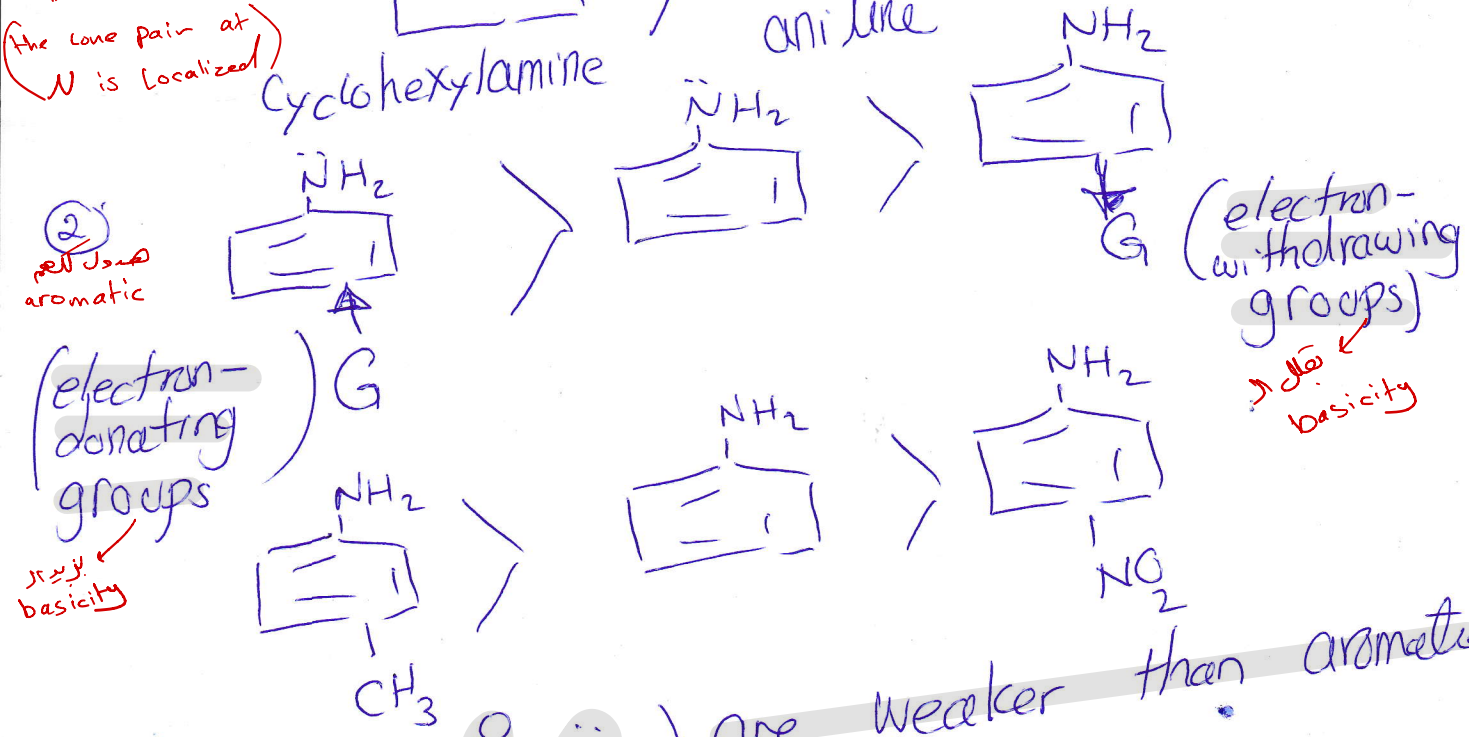


① Aliphatic amines are stronger (as base) than aromatic amines

Why??



② aromatic



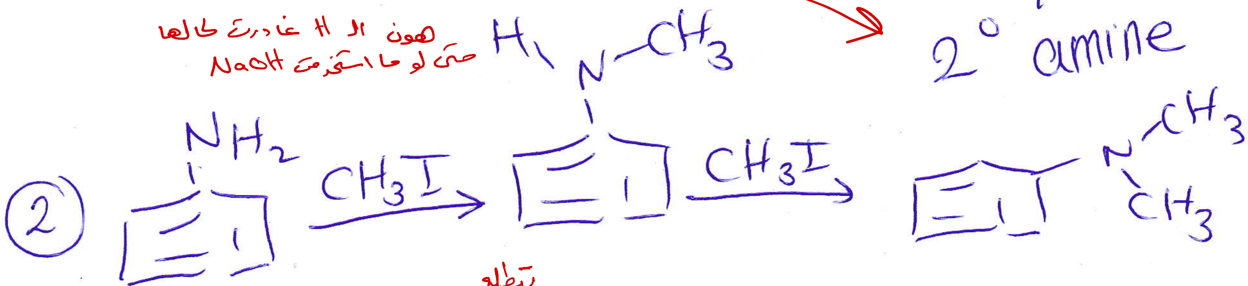
③ Amides ($R-\overset{O}{\overset{\|}{C}}-\ddot{N}-$) are weaker than aromatic amines.

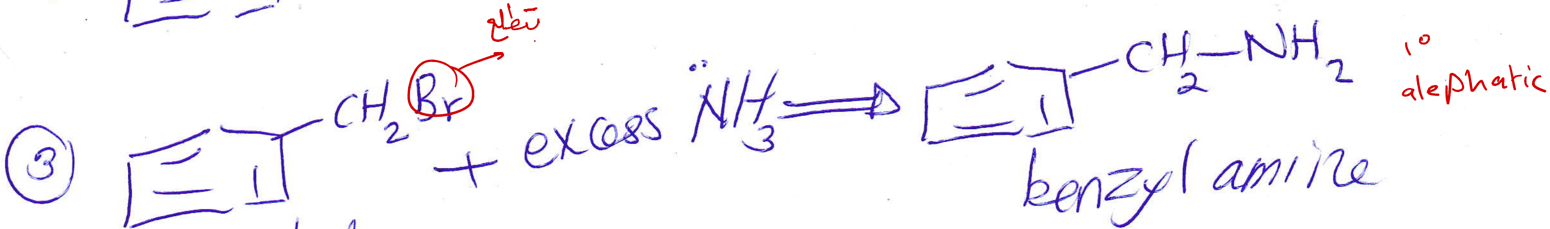
* Amines can be reacted/prepared by alkylation of amines.

① $CH_3CH_2\ddot{N}H_2 \xrightarrow[S_N2]{CH_3Br} CH_3CH_2\overset{+}{N}H_2-CH_3\ Br^{-} \xrightarrow{NaOH} CH_3CH_2\ddot{N}H-CH_3 + NaBr + H_2O$

1° amine → 2° amine

attacks the C والـ Br تطلع

② 

③ 

benzyl halide

④ $(CH_3)_3N + CH_3I \longrightarrow CH_3-\overset{+}{N}(CH_3)_3\ I^{-}$

there is no H to remove

quaternary ammonium salt طلع

⑤ Aniline + ? ⟶ N-Ethylaniline

CH_3CH_2Br

<u>Note:</u> Quaternary ammonium salt is:

$R_4N^{+}\ X^{-}$ → soluble in water

عملت 4 روابط