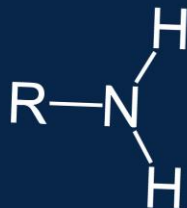
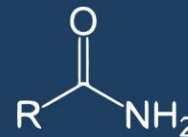


AMINES - L1



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 **LINK IN
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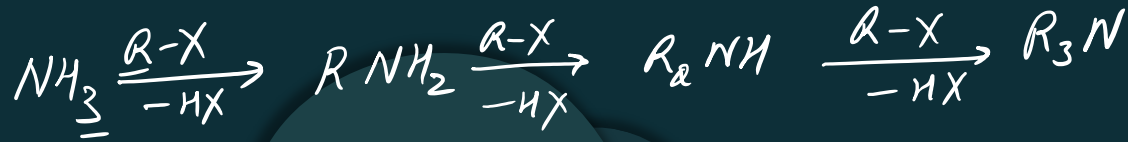




<https://t.me/neetaakashdigital>

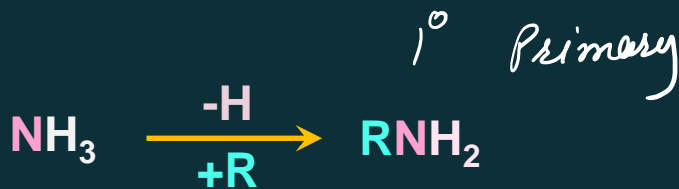


Amines

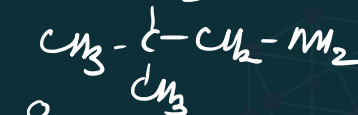
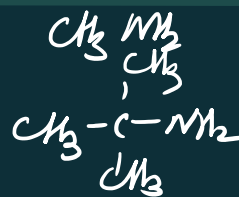


Amines are compounds in which one or more **hydrogen atoms of ammonia** have been **replaced by alkyl/aryl group(s)**.

Amines



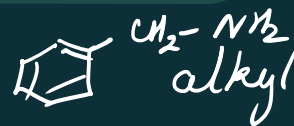
Degree of amine is decided by number of carbon attached to nitrogen



1° amine

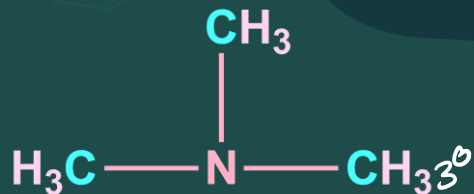


Alkylamines and Arylamines

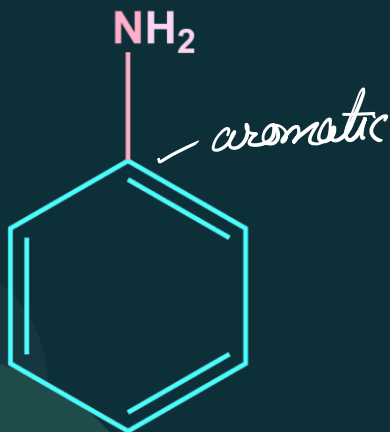


alkyl amine

Examples



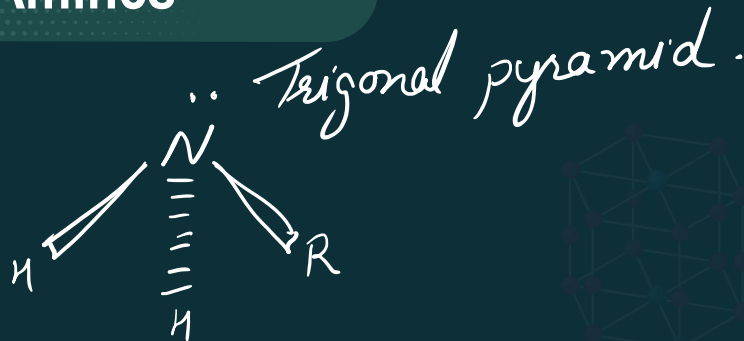
Examples



Structure of Amines



The **nitrogen atom** of most amines is like that of ammonia. It is **sp^3 hybridised**.



The three alkyl groups (or H atoms) occupy corners of a **tetrahedron**

The **sp^3** orbital containing the unshared electron pair is directed towards the other corner.

Structure of Amines

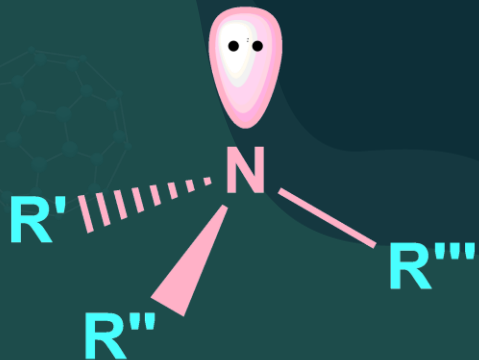


Shape

**Trigonal
pyramidal**

Bond angles are
close to 109.5° .

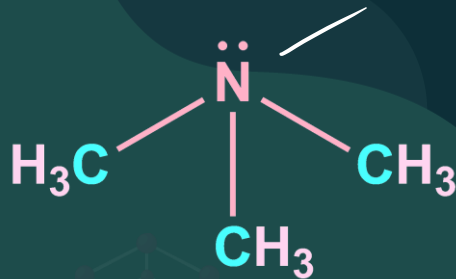
Due to the presence of
unshared pair of electrons,
the angle **C–N–E**, (**where E
is C or H**), is **less** than
 109.5°



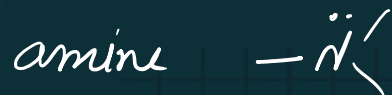
Structure of Amines



The bond angles for **trimethylamine** is **108.7°**.

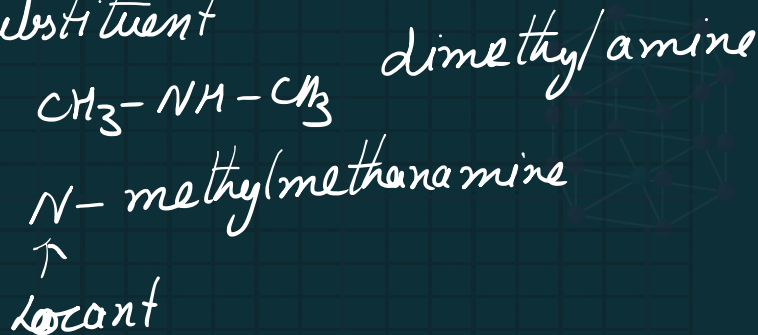


Nomenclature of Amines

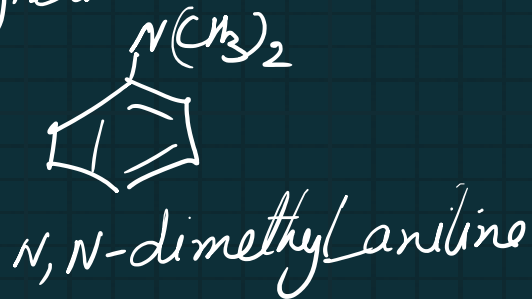


amine
main chain

amino
substituent

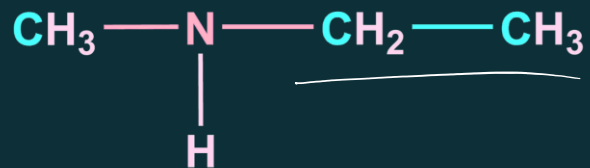


Nomenclature of Amines





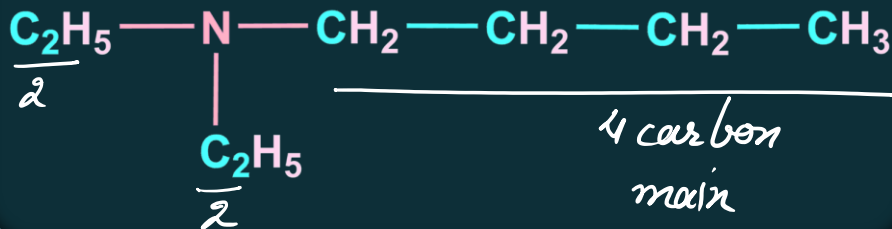
The **IUPAC** name of the compound is:



N-methylethanamine



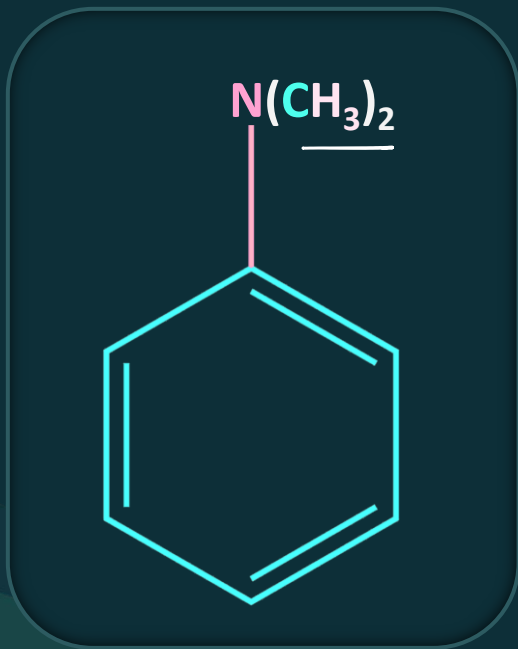
The **IUPAC** name of the compound is:



N,N-diethylbutanamine



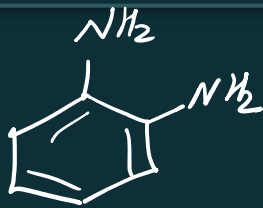
The **IUPAC** name of the compound is:



N,N-dimethylaniline



The structure for **Benzene-1,2-diamine** is:





Common Names



Common Names

1° amines



Isopropylamine



Ethylamine

2° amines



Ethylmethylamine

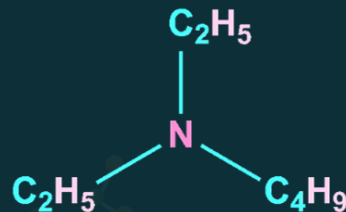


Ethylpropylamine

3° amines



Trimethylamine



Diethylbutylamine



Basic Character of Amines

Weak Lewis bases like ammonia

Amines are relatively **weak bases**.

Most are stronger bases than water but are far weaker bases than hydroxide ions and alkoxide ions.

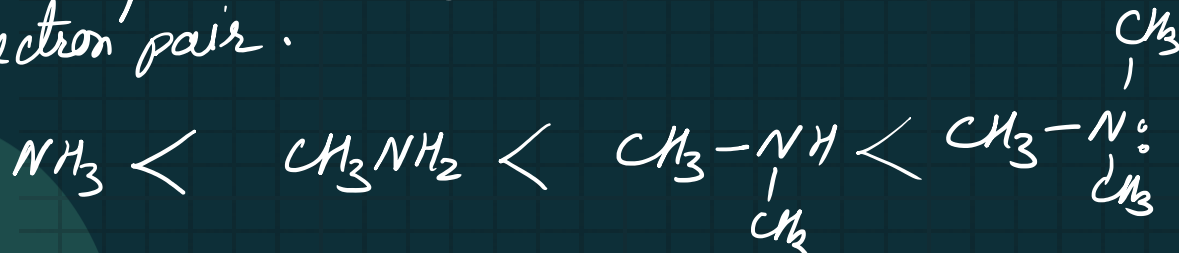
A convenient way to **compare** the basic strengths of amines is to compare their **K_b** or **pK_b** .



Basic Character of Amines



1. Non aqueous or gaseous phase \rightarrow Lewis base. ease of donating electron pair.



CH_3 is +I group \rightarrow increase electron density on nitrogen

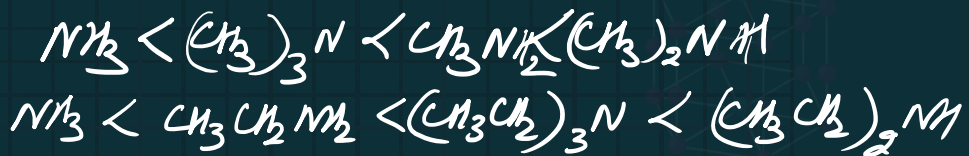
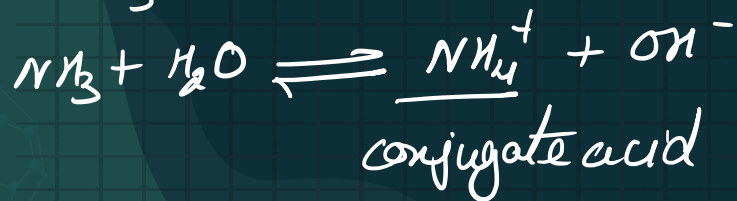
So increases the basic character.

Basic Character of Amines

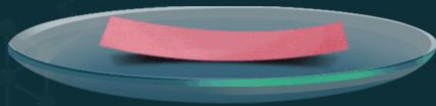


aq. medium \rightarrow There are two opposing factors.

- 1) inductive effect
 - 2) Hydration effect
- acting opposite to each other -



As number of alkyl groups increase, inductive effect increases but hydration decreases.



Basic Character of Amines



K_b

=

$$\frac{[\text{RNH}_3^+][\text{OH}^-]}{[\text{RNH}_2]}$$

$\text{p}K_b$

=

$$-\log K_b$$

Basic Character of Amines



The equilibrium for an amine that is relatively more basic will lie **more towards the right** in equation, than for an amine that is less basic.

$K_b \uparrow$ or $\text{p}K_b \downarrow$

Basicity \uparrow

Basic Character of Amines



Basic strength of amines
can be studied in

Gaseous
phase

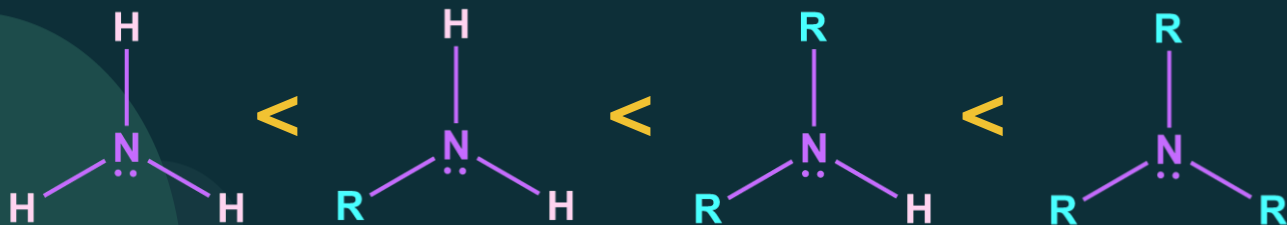
Aqueous
phase

or non aqueous

Basic Strength of 1°, 2°, and 3° Amines



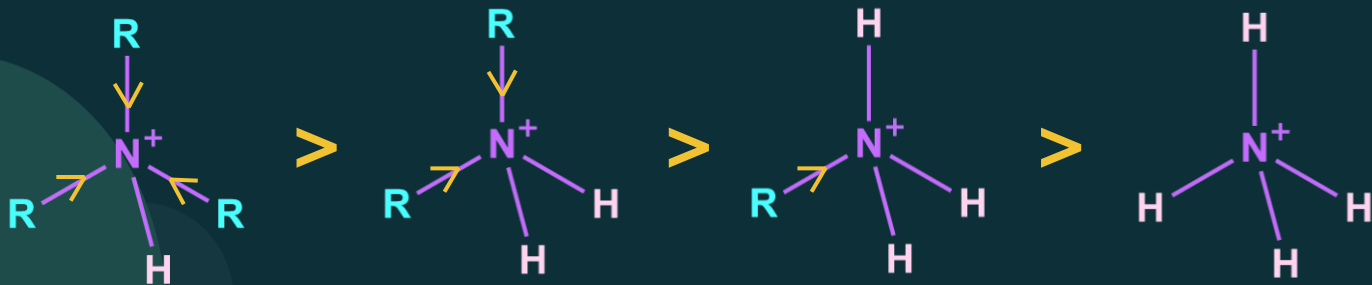
In gaseous phase,



where, R = Alkyl group

Stability of Conjugate Acids

in aq. medium



Basic Strength of Amines in Gaseous Phase



Basic Character of Amines



Basic strength of amines
can be studied in

Gaseous
phase

Aqueous
phase

Basic Strength of Amines



In **aqueous** phase,
the basic strength of
amines depend on:

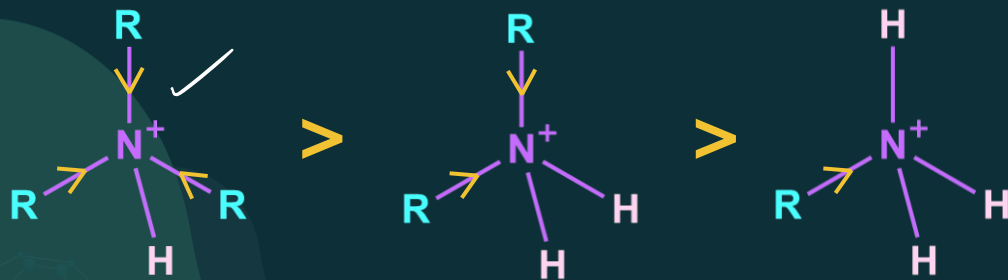
1

Electron donating
effect of alkyl group

2

Solvation effect

Electron Donating Effect of Alkyl Groups



Basic Strength of Amines



In **aqueous** phase,
the basic strength of
amines depend on:

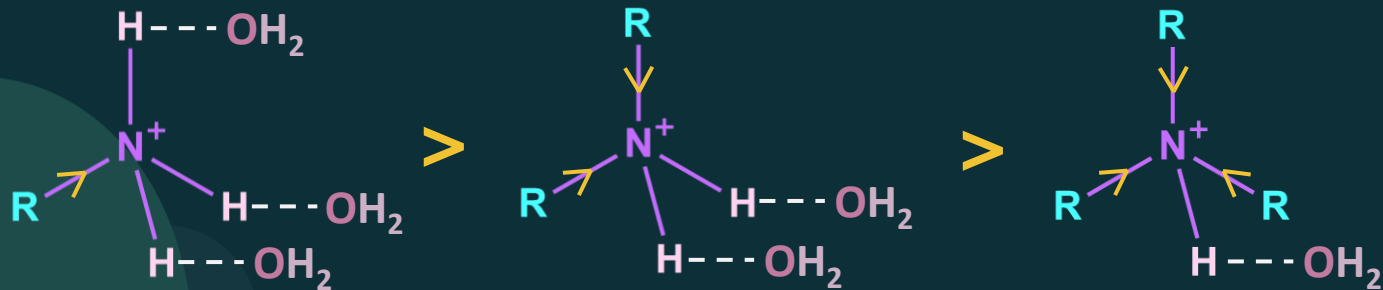
1

Electron donating
effect of alkyl group

2

Solvation effect

Solvation Effect



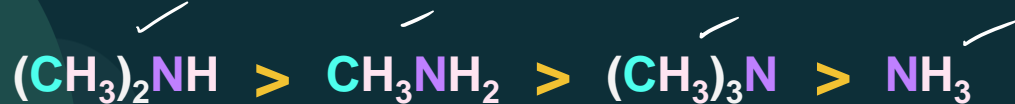
Basic Strength in Aqueous Phase



aliphatic amines are stronger bases than ammonia.

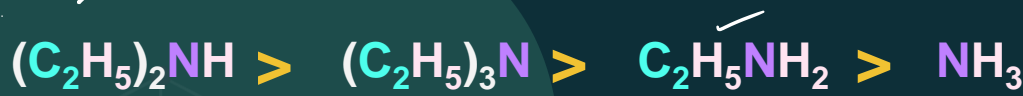
Case 1

When the alkyl group is $-\text{CH}_3$



Case 2

When the alkyl group is $-\text{C}_2\text{H}_5$

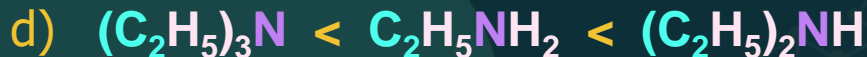
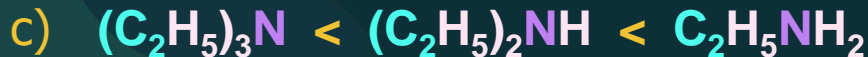




The **basic character** of Ethyl Amine, Diethyl amine and Triethyl amine in **chlorobenzene** is:

non aq medium \rightarrow same as vapour phase

[AIIMS 2011]





Basic character of Arylamines



Basic Character of Arylamines



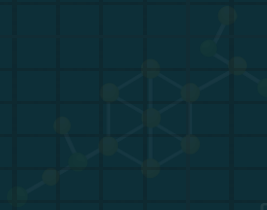
Electron pair is conjugated with benzene ring so is not easily donated.

Aromatic amines are **much weaker bases** than alkylamines.

Basic Character of Arylamines



1. Electron W.G on benzene ring decrease the basic character -
2. EDG increase the basic character -



Basic Character of Arylamines



E.g.: **Aniline**
 $pK_b = 9.42$

The **pK_b values** of the **aromatic amines** indicate that they are much weaker bases than the **alkyl amines**.

aliphatic

E.g.: **Cyclohexylamine**
 $pK_b = 3.66$

Basic character of Arylamines



NH₂



NH₂



pK_b

3.66

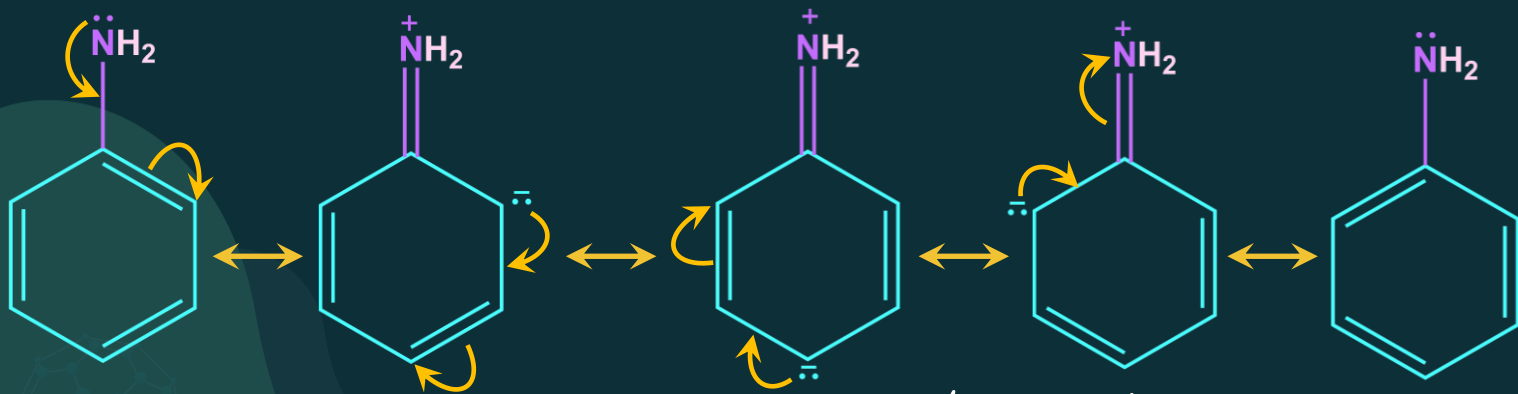
9.42

Basic character of Arylamines



Delocalisation of the electron pair makes it less available to a proton, and also **delocalisation** of the electron pair **stabilises aniline.**

Basic character of Arylamines



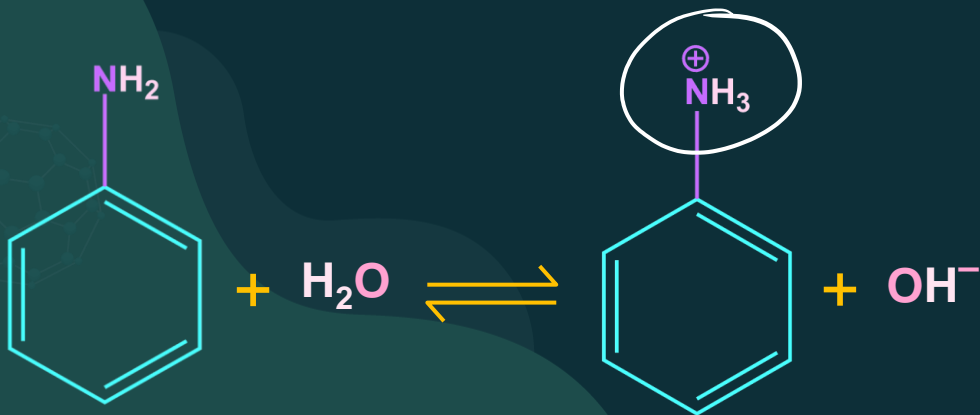
Electron density increases on ortho and para positions.



Basic character of Arylamines



When aniline **accepts a proton**,
it becomes an anilinium ion.



Basic character of Arylamines



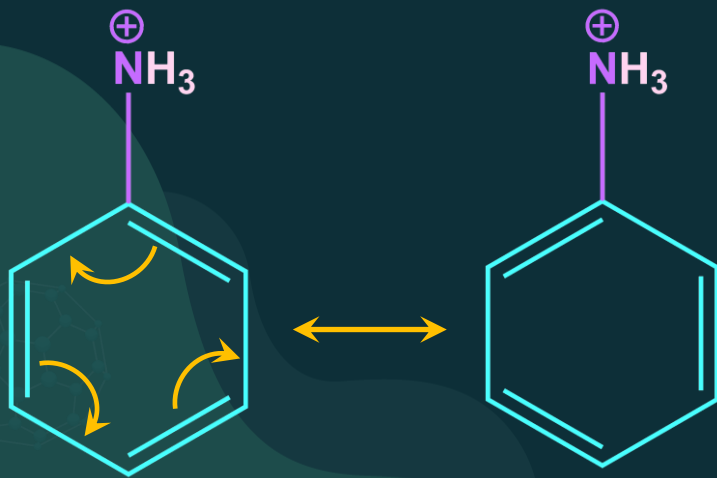
Once the electron pair of the nitrogen atom accepts the proton, it is **no longer available** to participate in resonance.



Only two resonance structures are possible for the anilinium ion.



Basic character of Arylamines



Basic character of Arylamines



aniline Resonance does stabilise the ~~anilinium~~ ion considerably, but does not stabilise the anilinium ion to **a great extent** as it does with aniline.



In Substituted Amines



Electron releasing
group

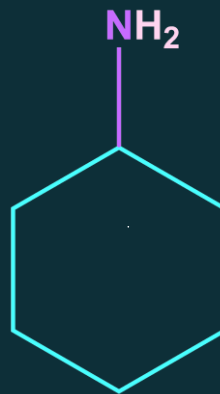
K_b value ↑

Electron withdrawing
group

K_b value ↓



Arrange the following in the order of their pK_b value?



Least basic

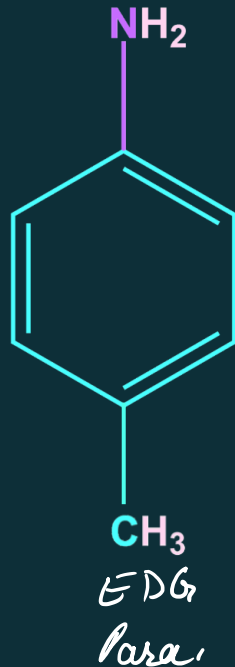
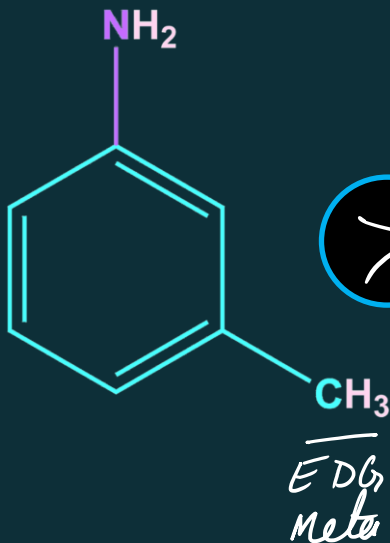
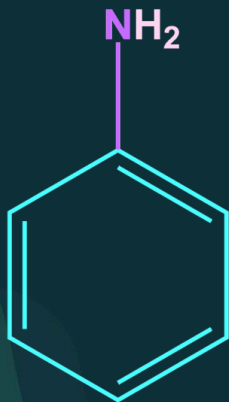
most basic



Arrange the following in the order of their pK_b value?



least basic



most basic

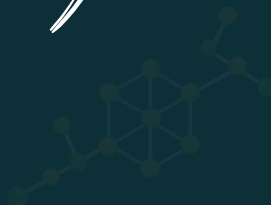


The **correct statement** regarding the basicity of arylamines is:



[NEET 2016]

- a) Arylamines are generally more basic than alkylamines because of aryl group. ✗
- b) Arylamines are generally more basic than alkylamines because the nitrogen atom in arylamines is sp -hybridised. ✗





The **correct statement** regarding the basicity of arylamines is:



[NEET 2016]

✓ c) Arylamines are generally less basic than alkylamines because the nitrogen lone-pair electrons is delocalised by interaction with the aromatic ring π electron system.

~~d) Arylamines are generally more basic than alkylamines because the nitrogen lone-pair electrons is not delocalised by interaction with the aromatic ring π electron system.~~





The **correct increasing order** of the basic strength for the following compounds is:



ii < i < iii

[NEET 2017]



(I)



(II)



(III)



The **correct increasing order** of the basic strength for the following compounds is:



[NEET 2017]

a) $\text{III} < \text{I} < \text{II}$

b) $\text{III} < \text{II} < \text{I}$

~~c) $\text{II} < \text{I} < \text{III}$~~

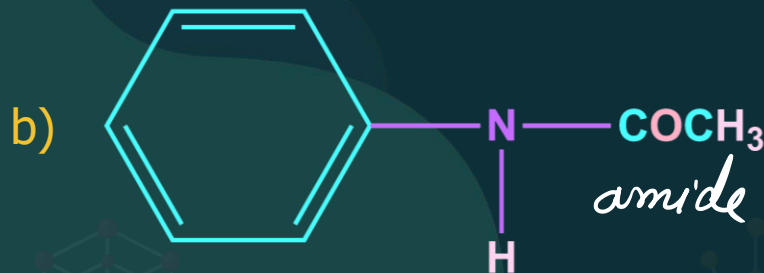
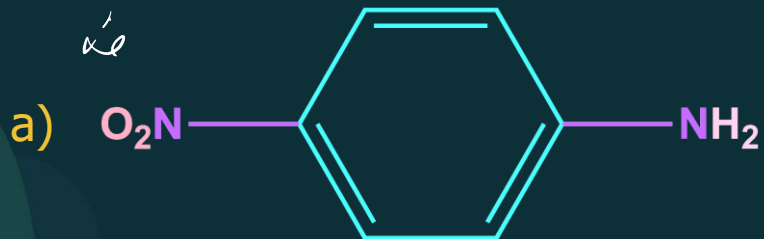
d) $\text{II} < \text{III} < \text{I}$



Which of the following is the **most basic**?



[NEET 2011]





Which of the following is the **most basic**?



[NEET 2011]

c)



d)





“Stay Positive, Work Hard. Make It Happen!”

THANK YOU