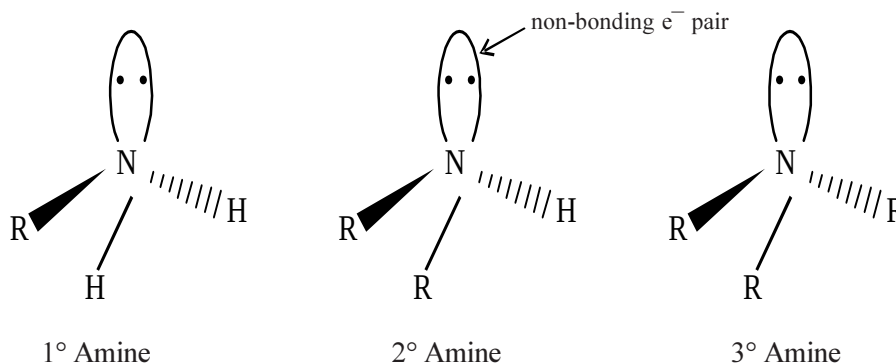


• **Structure of amine compound**

On replacing the hydrogen of the ammonia by hydrocarbon group amine is formed.



- hybridization of N : sp^3
- shape of amine compounds : **trigonal bi pyramidal**
- R – N – H or R – N – R bond angle : 109.5°

Example : bond angle of tri methyl amine : 108°

Classification of amine compounds

• **Alkyl amine:-** (aliphatic amine)

- On replacing the hydrogen present in ammonia by alkyl group is connected with nitrogen then is called alkyl amine.

(i) **Primary aliphatic amine (1°)**

General formula : $(R - NH_2)$ R = alkyl group

Example : $CH_3CH_2 - NH_2$ alkyl group

(ii) **Secondary aliphatic amine (2°)**

General formula : $R - NH - R$

Example: $CH_3CH_2 - NH - CH_2CH_3$ di ethyl amine

(iii) **tertiary aliphatic amine (3°)**

$$\begin{array}{c} R \\ | \\ R - N - R \end{array}$$
 General formula :

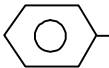
Example : $(CH_3CH_2)_3N$ triethyl amine

• **Aryl amine (aromatic amine)**

- On replacing the hydrogen present in ammonia by aryl group is connected with nitrogen then is called aryl amine.

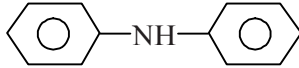
(i) **primary aromatic amine (1°)**

General formula : Ar-NH_2 $\text{Ar} = \text{aryl group}$

Example :  NH_2 phenyl amine

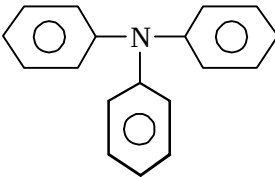
(ii) **secondary aromatic amine (2°)**

General formula : Ar-NH-Ar , OR Ar-NH-R

Example :  **di phenyl amine**

(ii) **tertiary aromatic amine (3°)**

General formula : $(\text{Ar})_3\text{N}$

Example :  triphenyl amine

• **Nomenclature of amine compounds :**

• **Common nomenclature:**

(i) **Primary alkyl amine**

At the end of the name of the alkyl group connected with nitrogen word 'amine' is placed.

Example : $\text{CH}_3\text{NH}_2 \rightarrow$ methyl amine

(ii) **Secondary alkyl amine**

- After writing the names of both alkyl groups connected to the nitrogen (in alphabetical order) word '**amine**' is placed.
- If both the groups are same the prefix 'di' is placed.

Example : $\text{CH}_3 - \text{NH} - \text{CH}_2\text{CH}_3 \rightarrow$ ethyl methyl amine

$\text{CH}_3 - \text{NH} - \text{CH}_3 \rightarrow$ dimethyl amine

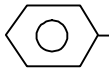
(iii) **Tertiary alkyl amine**

- After writing the names of three alkyl groups connected to the nitrogen (in alphabetical order) word '**amine**' is placed at the end.

Example : $\text{CH}_3 - \text{N} - \text{CH}_3$ trimethyl amine
 |
 CH_3

Example : $\text{CH}_3 - \text{N} - \text{CH}_2\text{CH}_3$ ethyl methyl propyl amine
 |
 $\text{CH}_2\text{CH}_2\text{CH}_3$
 (E) (M) (P)

(iv) **Primary aryl amine**

Example :  NH_2 aniline

(v) Secondary aryl amine

Example :  N – methyl aniline

(vi) tertiary aryl amine

Example :  N,N – dimethyl aniline

- **IUPAC, nomenclature**

(i) Primary alkyl amine

- **alkane name on the basis of number of carbon + amine**

Example : $\text{CH}_3\text{CH}_2\text{NH}_2 \rightarrow$ ethan-2-amine = ethanamine

- If number of carbon atoms are three or more than three, carbon having -NH₂ group is given least possible number.

Example : $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{NH}_2 \rightarrow$ propan - 1 - amine

(ii) **secondary alkyl amine**

- To indicate the position of group symbol 'N' is used.

Example : $\text{CH}_3 - \text{NH} - \text{CH}_2\text{CH}_3 \rightarrow \text{N-methyl ethanamine}$

(iii) **tertiary alky amine**

- To indicate the position of group symbol 'N' is used.

$$\begin{array}{c} \text{CH}_3 - \text{N} - \text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_2\text{CH}_2\text{CH}_3 \end{array} \rightarrow \text{N - ethyl - N - methyl propan - 1 - amine}$$

(iv) **Primary aryl amine :**

 Nc1ccccc1 benzenamine

(v) **secondary aryl amine :**

 N- methyl benzenamine

(vi) tertiary aryl amine

 N-ethyl, N-methyl benzenamine

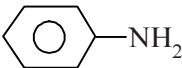
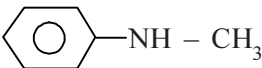
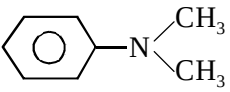
- IUPAC nomenclature of the compounds having more than one – NH₂ group.

- (i) $\text{H}_2\text{N} - \text{CH}_2 - \text{CH}_2 - \text{NH}_2 \rightarrow$ ethane - 1, 2 - diamine

- (ii) $\text{H}_2\text{N}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}_2 \rightarrow$ propane-1,3-diamine

- (iii) $\text{H}_2\text{N}-\text{CH}_2-\underset{\substack{| \\ \text{NH}_2}}{\text{CH}}-\text{CH}_2-\text{NH}_2 \rightarrow$ propane - 1, 2, 3- triamine

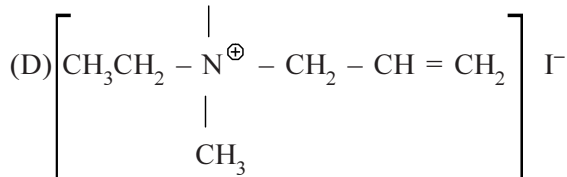
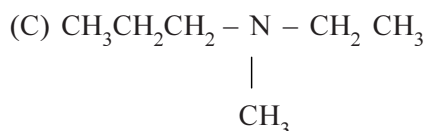
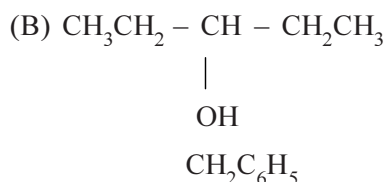
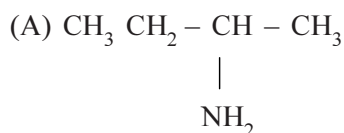
• Nitrogen containing amine compounds:

No.	Structural formula	Common name	IUPAC, name	Type	Boiling point
(1)	$\text{CH}_3 \text{NH}_2$	Methyl amine	Methanamine	1°	280 K
(2)	$\text{CH}_3\text{CH}_2\text{NH}_2$	Ethyl amine	ethanamine	1°	290 K
(3)	$\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$	Propyl amine	propan-1-amine	1°	322 K
(4)	$\begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}_3 \\ \\ \text{NH}_2 \end{array}$	Iso propyl amine	propan-2-amine	1°	306 K
(5)	$\text{CH}_3-\text{NH}-\text{CH}_3$	di methyl amine	N-methylmethanamine	2°	280 K
(6)	$\text{CH}_3 \text{CH}_2-\text{NH}-\text{CH}_2 \text{CH}_3$	di ethyl amine	N-ethyl thanamine	2°	329 K
(7)	$\text{CH}_3\text{CH}_2\text{CH}_2-\text{NH}-\text{CH}_2\text{CH}_2\text{CH}_3$	di propyl amine	N-propyl propan-1-amine	2°	383 K
(8)	$\text{CH}_3-\text{NH}-\text{CH}_2 \text{CH}_3$	Ethyl methyl amine	N-methyl ethanamine	2°	309 K
(9)	$\text{CH}_3-\text{NH}-\text{CH}_2\text{CH}_2\text{CH}_3$	Methyl propyl amine	N-methyl propan-1-amine	2°	335 K
(10)	$\begin{array}{c} \text{CH}_3-\text{N}-\text{CH}_3 \\ \\ \text{CH}_3 \end{array}$	trimethyl amine	N-N-dimethyl ethanamine	3°	276 K
(11)	$\begin{array}{c} \text{CH}_3\text{CH}_2-\text{N}-\text{CH}_2\text{CH}_3 \\ \\ \text{CH}_2\text{CH}_3 \end{array}$	triethyl amine	N, N-dimethyl ethanamine	3°	363 K
(12)	$\begin{array}{c} \text{CH}_3\text{CH}_2-\text{N}-\text{CH}_3 \\ \\ \text{CH}_3 \end{array}$	ethyl dimethyl amine	N-N-dimethyl ethanamine	3°	310 K
(13)	$\begin{array}{c} \text{CH}_3-\text{N}-\text{CH}_2\text{CH}_3 \\ \\ \text{CH}_2\text{CH}_3 \end{array}$	diethyl methyl amine	N-ethyl-N-methyl ethanamine	3°	339 K
(14)	$\begin{array}{c} \text{CH}_3-\text{N}-\text{CH}_2\text{CH}_3 \\ \\ \text{CH}_2\text{CH}_2\text{CH}_3 \end{array}$	Ethyl methyl propyl amine	N-ethyl N-methyl propan-1-amine	3°	367 K
(15)		Phenyl amine	Benzanamine Or aniline	1°	457 K
(16)		N-methyl phenyl amine	N-methyl benzanamine	2°	469 K
(17)		N-N- dimethyl phenyl amine	N, N-dimethyl benzanamine	3°	467 K

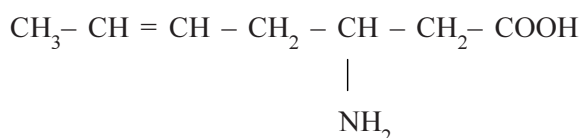
- $$\begin{array}{c}
 \text{O} \\
 || \\
 \text{CH}_3 - \text{N} - \text{C} - \text{CH}_3 \\
 | \\
 \text{C}_2\text{H}_5
 \end{array}$$
- What is the IUPAC name of the compound $\text{CH}_3 - \text{N} - \text{C} - \text{CH}_3$?
 (A) N-acetyl - N- methyl ethanamine (B) N- ethyl - N- methyl ethanamine
 (C) N-acetyl - N- ethyl ethanamide (D) acetyl ethyl methyl amine
 - Which of the following is the structure of nitrolic acid ?
 (A) $\text{R}_2\text{C} = \text{N} \cdot \text{OH}$ (B) $\text{R}_2\text{C} - \text{NO}_2$ (C) $\text{R} - \text{C} = \text{N} \cdot \text{OH}$ (D) $\text{R}_2\text{N} - \text{N} = \text{O}$

$$\begin{array}{cc}
 \begin{array}{c} | \\ \text{NO}_2 \end{array} & \begin{array}{c} | \\ \text{NO}_2 \end{array}
 \end{array}$$
 - Mention the hybridization of N-atom and spatial arrangement of methyl group around it in the compound $(\text{CH}_3)_3\text{N}$.
 (A) sp^3 , pyramidal (B) sp^3 , tetrahedral
 (C) sp^2 , trigonal planar (D) sp^3 , trigonal planar
 - In which of the following compound strength of intermolecular hydrogen bond is more ?
 (A) methyl amine (B) phenol (C) methanal (D) methanol
 - What is the C-N-C bond angle in trimethyl aniline ?
 (A) $109^\circ 28'$ (B) 107° (C) 108° (D) 108.5°
 - Which of the following is 2° amine ?
 (A) 1-methyl cyclohexyl amine (B) triethyl amine
 (C) tertiary butyl amine (D) N-methyl aniline
 - How many primary amines are possible for the molecular formula $\text{C}_3\text{H}_9\text{N}$?
 (A) 1 (B) 2 (C) 3 (D) 4
 - How many primary amines are possible for the molecular formula $\text{C}_4\text{H}_{11}\text{N}$?
 (A) 1 (B) 2 (C) 3 (D) 4
 - How many amine isomers are possible for the compound having molecular formula $\text{C}_3\text{H}_9\text{N}$?
 (A) 1 (B) 2 (C) 3 (D) 4
 - Mention the correct IUPAC name for $\text{CH}_2 = \text{CH} \cdot \text{CH}_2 - \text{NH} - \text{CH}_3$.
 (A) allyl methyl amine (B) 2 - amino - 4 - pentene
 (C) 4 - amino pent - 1 - ene (D) N - methyl prop - 2 en - 1 - amine

11. Which of the following compound loses optical activity due to nitrogen inversion (substitution) ?



12. Mention the IUPAC name of the following :

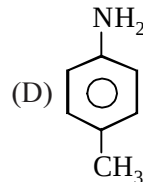
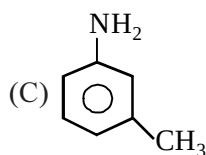
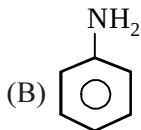
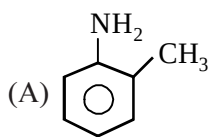


- (A) 5 - amino - hept-2 - enoic acid
 (B) 3 - amino - hept - 5 - enoic acid
 (C) 5 - amino -hex - 2 - ene - carboxylic acid
 (D) β - amino - hept - 6 - enoic acid

13. Which of the following is the most basic?

- (A) aniline
 (B) o - nitro aniline
 (C) p - nitro aniline
 (D) m - nitro aniline

14. Which of the following is the most basic ?



15. How many isomers having one benzene ring are possible for compound having molecular formula $\text{C}_7\text{H}_9\text{N}$?

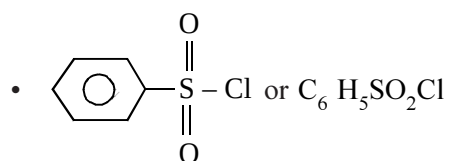
- (A) 3
 (B) 4
 (C) 5
 (D) 6

Answers : 1. (B), 2. (C), 3. (A), 4. (D), 5. (C), 6. (D), 7. (B), 8. (D), 9. (D), 10. (D), 11. (C), 12. (B), 13. (A), 14. (D), 15. (C)

• **Separation of primary secondary and tertiary amine**

• **Hinsberg's reaction :**

- $1^\circ, 2^\circ, 3^\circ$ alkyl or aryl amine can be separated by **Hinsberg's reagent**.



Name : Benzene sulphonyl chloride (Hinsberg'reagent)

- $\text{H}_3\text{C}-\text{C}_6\text{H}_4-\text{SO}_2\text{Cl}$ p-toluene sulphonyl chloride

(i)
$$\text{R}-\text{NH}_2 + \text{ClSO}_2-\text{C}_6\text{H}_5 \xrightarrow{-\text{HCl}} \text{R}-\text{NH}-\text{SO}_2-\text{C}_6\text{H}_5 \xrightarrow[\text{-H}_2\text{O}]{\text{aqueous KOH}} \text{R}-\text{N}^-\text{SO}_2-\text{C}_6\text{H}_5 \text{K}^+ \xleftarrow[\text{HCl}]{\text{neutralization by}} \text{R}-\text{NH}_2$$

Primary amine **secondary sulphonamide**

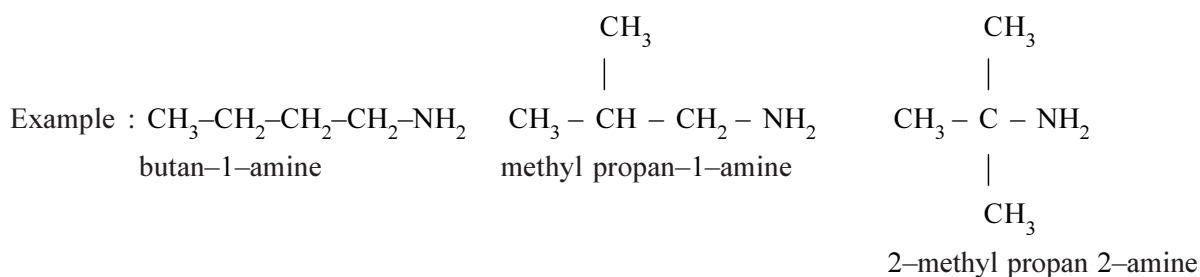
(ii) 
Secondary amine tertiary sulphonamide

$$\text{R}_2\text{NH} \xleftarrow[\text{HCl}]{\text{neutralization by}} \text{insoluble substance} \xleftarrow{\hspace{1.5cm}}$$

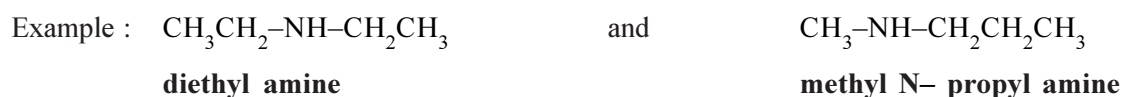
(iii)
$$\begin{array}{c} \text{R} \\ \diagdown \\ \text{R}-\text{N} \\ \diagup \\ \text{R} \end{array} + \text{ClSO}_2-\text{C}_6\text{H}_5 \rightarrow \text{no reaction takes place soluble in HCl} \xrightarrow[\text{KOH}]{\text{neutralization by}} \text{R}_3\text{N}$$

tertiary amine

- **Chain isomerism :**
- Observed in the aliphatic amines having four or more than four carbon atom.



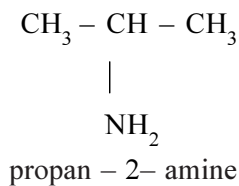
- **Metamerism**
- Observed in secondary aliphatic amine compounds



- **Position isomerism:**

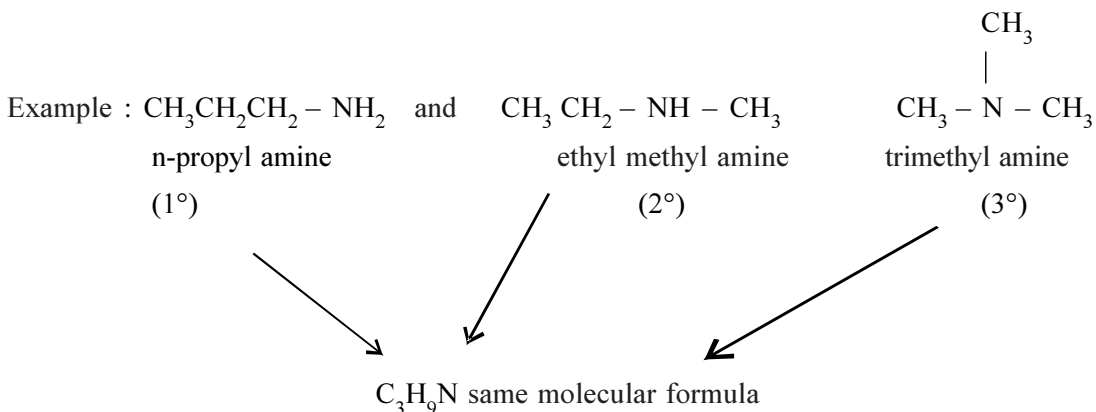
- Observed in primary aliphatic amine compounds:

Example : $\text{CH}_3\text{CH}_2\text{CH}_2-\text{NH}_2$
diethyl amine-1-amine



- **Functional group isomerism :**

- Observed in the 1°, 2°, 3° amines having same molecular formula



- **Physical properties of amine compounds:**

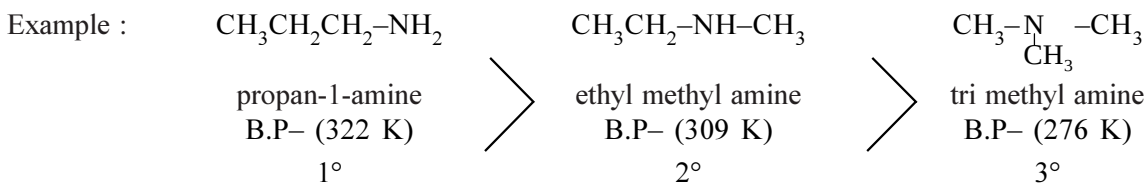
- **colour and smell :**

- Pure amines are colourless but on exposure to air for prolonged time it turns red due to oxidation.
- Aliphatic amines having lesser C atoms are in gaseous state and possess smell like ammonia.
- Amines having more than three C atoms are in liquid state and possess smell like fish.

- **Boiling point:**

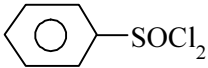
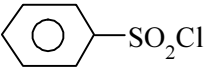
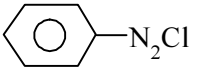
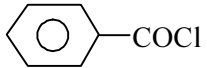
	Alkane	<	amine	<	acohol
Example :	Ethane	<	Ethanamine	<	ethanol
	(184 K)		(290 K)		(351 K)
	↓		↓		↓
	Non polar		N ^{δ-} -H ^{δ+} bond		O ^{δ-} -H ^{δ+} bond
			less polar		more polar

- In isomeric alkyl amines having same molecular formula from primary to tertiary boiling point decreases.



- 1°, 2° and 3° aliphatic amines forms H-bond with water. Hence compounds with lesser molecular mass are soluble in water.
- Methyl amine and ethyl amine are in gaseous state, they dissolve quickly in the water. In market their 34 % concentration aqueous solutions are sold.

- If number of C atoms are six or more than solubility is very less.
- Aliphatic amines are less soluble in organic solvents such as benzene, alcohol and ether.
- Aromatic amines are insoluble in water because bigger hydrocarbon part does not have tendency to form H-bond in water.

16. Which of the following can be distinguished by dye test ?
 (A) ethyl amine and acetamide (B) ethyl amine and aniline
 (C) urea and acetamide (D) methyl amine and ethyl amine
17. Which of the following is Hinsberg's reagent?
 (A) benzenesulphonyl chloride (B) benzene sulphonic acid
 (C) phenyl isocyanide (D) benzene sulphonamide
18. Which of the following substance will give test with benzene sulphonyl chloride?
 (A) N,N- di methyl ethanamine (B) tri methyl amine
 (C) methyl ethyl amine (D) di methyl ethyl amine
19. Which of the following is the structural formula of the Hinsberg's reagent?
 (A)  (B)  (C)  (D) 
20. Which reagent is used to separate 1°, 2°, and 3° amine in recent time?
 (A) p-chloro benzene sulphonyl chloride (B) p- toluene benzene sulphonic acid
 (C) p- toluene sulphonyl chloride (D) p- chloro toluene sulphonic acid
21. In which of the following type of amine compounds metamerism is observed?
 (A) 1° (B) 2° (C) 3° (D) all the given
22. Which type of isomerism is observed in propan-1-amine and propan-2-amine?
 (A) metamerism (B) position (C) functional group (D) chain
23. What is the correct increasing order of boiling point for given three compounds
 (i) C₂H₆ (ii) CH₃CH₂NH₂ (iii) C₂H₅OH ?
 (A) i < ii < iii (B) iii < i < ii (C) ii < iii < i (D) i < iii < ii
24. Methyl amine and ethyl amine are sold as aqueous solution in the market by its % concentration.
 (A) 5 % (B) 20 % (C) 40 % (D) 34 %
25. Which of the following decreasing order of boiling point is correct for the isomeric or having same molecular formula amine compounds ?
 (A) 3° > 2° > 1° (B) 2° > 3° > 1° (C) 1° > 2° > 3° (D) 3° > 1° > 2°

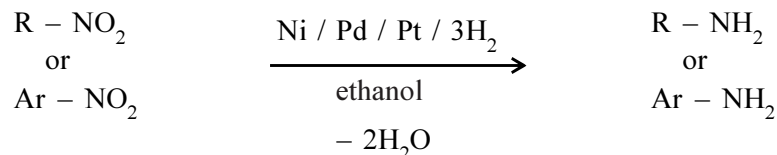
Answers : 16. (B), 17. (A), 18. (C), 19. (B), 20. (C), 21. (B), 22. (B), 23. (A), 24. (D), 25. (C)

- **Preparation of amine compounds**

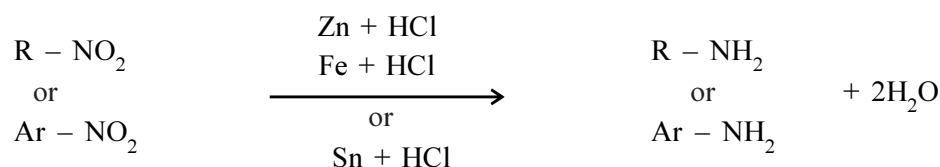
- Reduction of nitro compounds

- **By catalytic reduction:**

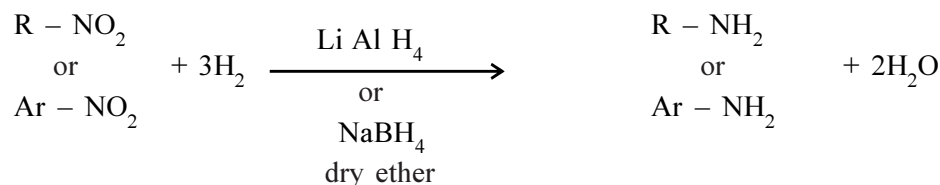
- By passing dihydrogen gas in presence of catalyst nickel, palladium, or platinum amine compounds are formed.



- **By reaction between active metals such as Fe, Sn and Zn with concentrated HCl**

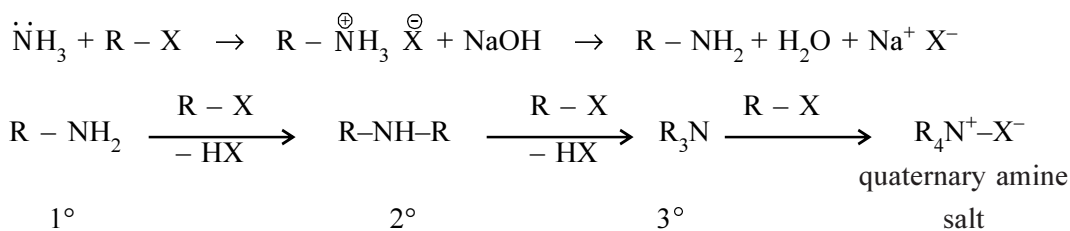


- **By reduction with LiAlH_4 or NaBH_4**

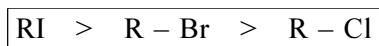


- **Ammonolysis of amine compounds (Hoffman's ammonolysis)**

- On reaction between alkyl halide and ammonia in airtight tube at 373 K amine form.
- **Limitations**
- Mixture of primary, secondary tertiary and quaternary amine salt are formed.
- Aryl halides cannot be formed by this reaction because for nucleophilic substitution reaction aryl halides are less reactive than alkyl halide.
- **General reaction :**



- Reactivity order of halide with amine is



- **Reduction of nitrile (cyanide) or isonitrile (iso cyanide)**

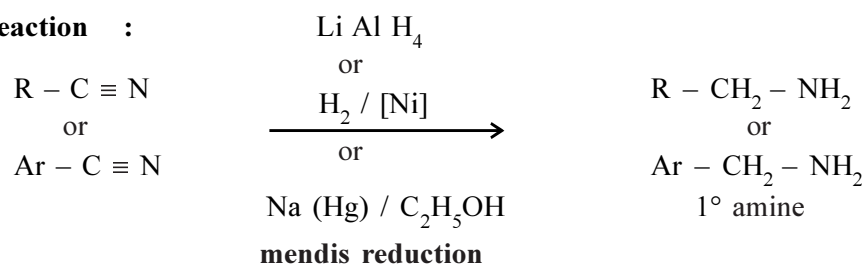
- **Reduction of nitrile (1° amine formed)**

- **Reducing agent :** • **LiAlH_4 (Lithium aluminium hydride)**

- H_2 / raney nickel

- $\text{Na(Hg)/C}_2\text{H}_5\text{OH}$

↑
(known as Mendis reduction)

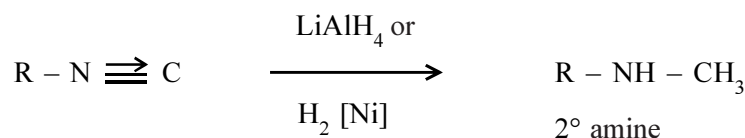
General reaction :**• Synthetic importance (Step-up reaction)**

- Useful to prepare 1° amine having one more carbon than given alkyl halide.

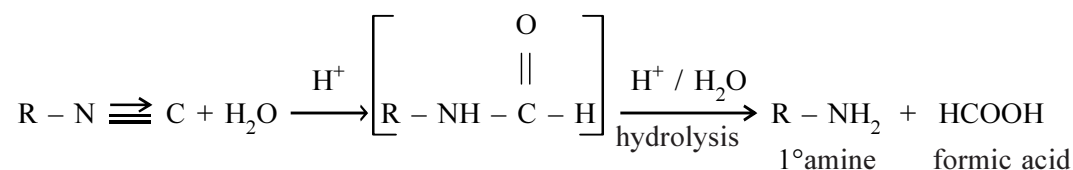
Example



- By reduction of isocynide 2° amine forms.

**• Limitations :**

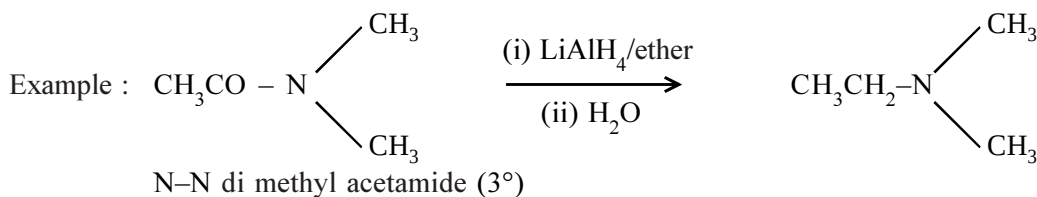
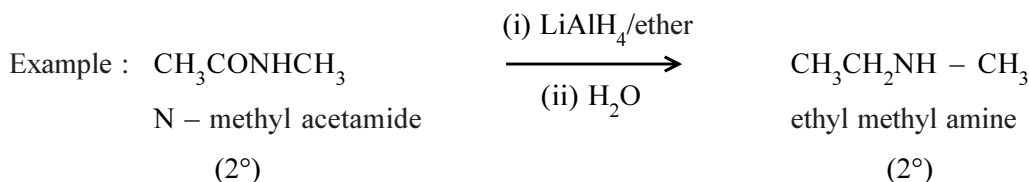
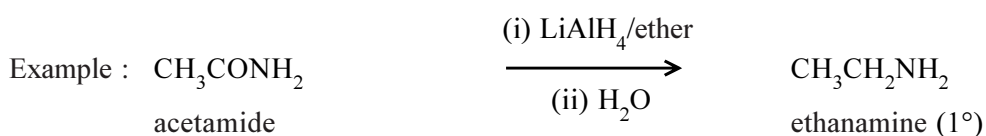
Useful to prepare the 2° amine which has one methyl (–CH₃) group.

• By hydrolysis of isocyanide compounds 1° amine forms (step down reaction)

1° amine formed in this reaction has one C less than the isocyanide compound.

• Reduction of amide:

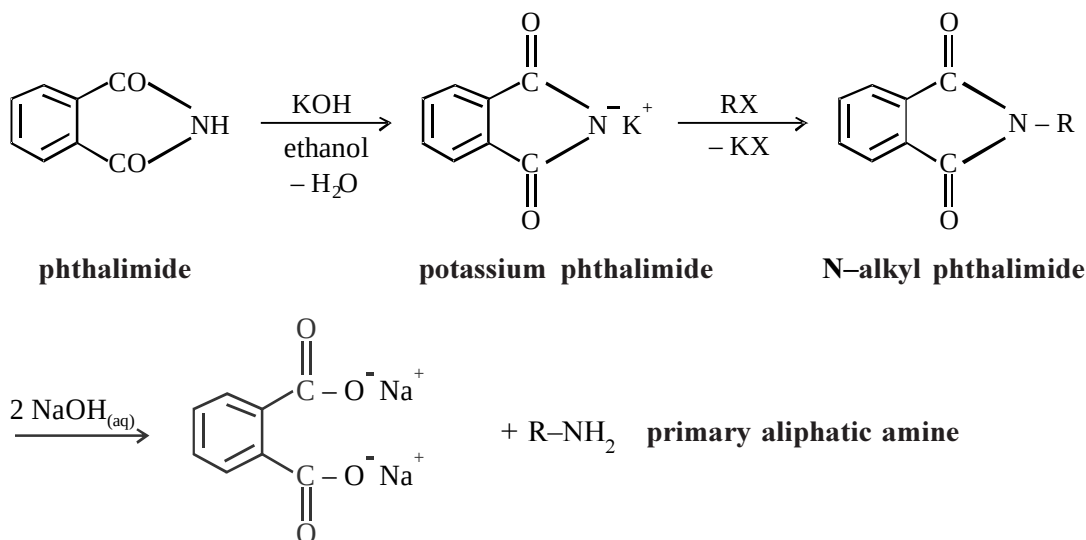
On reduction of amide by lithium aluminium hydride 1°, 2° and 3° amine forms.



- **Example**

- **Gabriel phthalimide synthesis :**

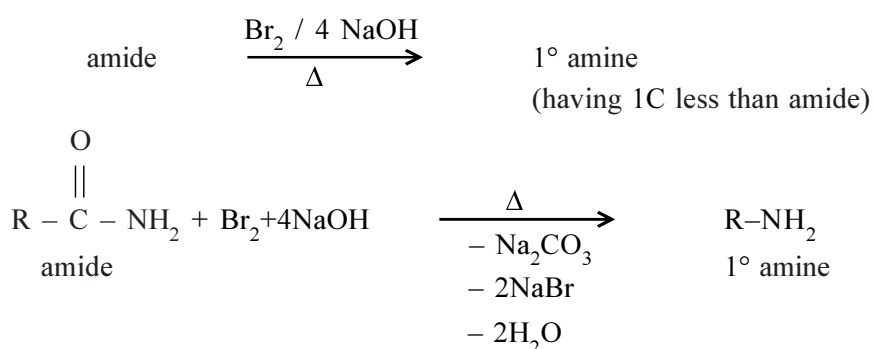
[preparation of primary aliphatic and aryl alkyl amine]



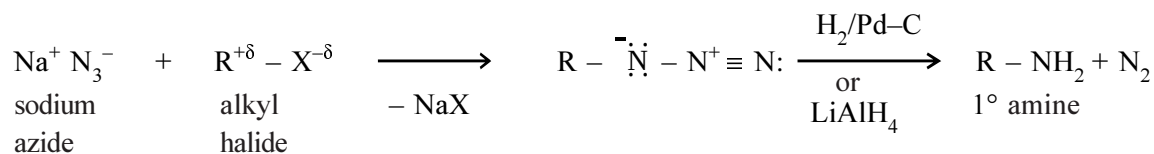
- By this reaction benzyl amine is formed.

- **Limitations :** primary aromatic amine (e.g. aniline, toluidine) cannot be synthesized by this method because in mild conditions nucleophilic substitution reaction of aryl halide with potassium phthalimide is difficult.

- **Hoffmann bromamide reaction: (Hoffmann degradation) (1° amine formed)**

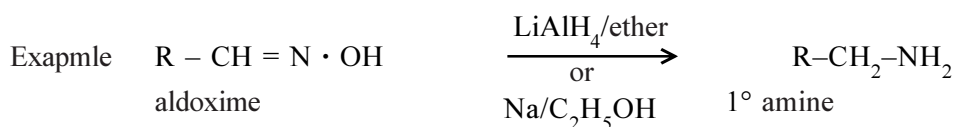


- **Reduction of azide :**



- **Reduction of oxime : (1° amine formed)**

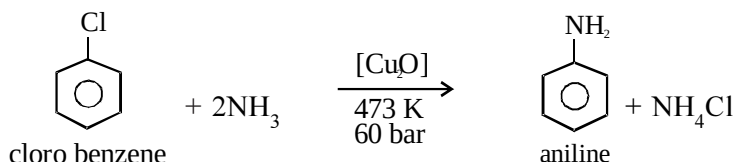
- On reduction of oxime of aldehyde and ketone by lithium aluminium hydride/ether or sodium/ethanol **1° amine** formed.





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• **Aminolysis reaction :**



Physical properties and uses :

- Pure aniline is bad smelling colourless liquid.
- On exposure to air it get oxidize and turns into red colour.

Uses :

- In the production of dyes, drugs, rasins and varnishes
- As solvent
- Vulcanization of rubber.

26. Which of the following reaction not gives amine product ?

- (A) $\text{R} - \text{X} + \text{NH}_3 \rightarrow$ (B) $\text{R} - \text{CH} = \text{N} \cdot \text{OH} + [\text{H}] \xrightarrow{\text{Na/C}_2\text{H}_5\text{OH}}$
- (C) $\text{R} - \text{CN} + \text{H}_2\text{O} \xrightarrow{\text{H}^+}$ (D) $\text{R} - \text{CONH}_2 \xrightarrow{\text{LiAlH}_4}$

27. Which of the following amide do not gives Hoffman bromide reaction ?

- (A) ethanamide (B) propanamide (C) benzenamide (D) acetanilide

28. Which of the following amine cannot be formed by Gabriel Phthalimide reaction ?

- (A) benzyl amine (B) ethyl amine (C) aniline (D) methyl amine

29. By which of the following reaction benzyl amine can be prepared ?

- (A) $\text{C}_6\text{H}_5\text{CONH}_2 \xrightarrow{\text{LiAlH}_4/\text{ether}}$ (B) $\text{C}_6\text{H}_5\text{CN} \xrightarrow{\text{LiAlH}_4/\text{ether}}$
- (C) Phthalimide $\xrightarrow[\text{(iii) aqueous NaOH, } \Delta]{\text{(I) KOH (ii) C}_6\text{H}_5\text{CH}_2\text{Br}}$ (D) above all type

30. Which of the following on reaction with aniline gives benzenilide as product ?

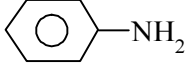
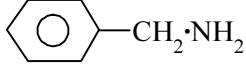
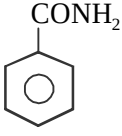
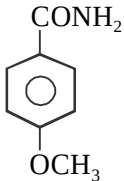
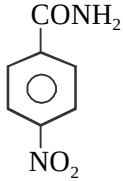
- (A) acetic anhydride (B) benzenemide (C) acetyl chloride (D) benzoyl chloride

31. 1° amine on heating with CS_2 in presence of excess reaction HgCl_2 gives isocyanate compounds. By which this reaction is known ?

- (A) Hoffman bromide reaction (B) Perkin reaction
- (C) Hoffman mustard reaction (D) Carbylamine test

32. Which of the following do not gives primary amines ?

- (A) acetamide $\xrightarrow{\text{Br}_2/\text{KOH}}$ (B) ethanenitrile $\xrightarrow{\text{LiAlH}_4}$
- (C) methyl isocyanide $\xrightarrow{\text{LiAlH}_4}$ (D) acetamide $\xrightarrow{\text{LiAlH}_4}$

33. Gabriel phthalamide synthesis method is useful for which of the following ?
 (A) 1° aromatic amine (B) 1° aliphatic amine
 (C) 2° aliphatic amine (D) 2° aromatic amine
34.  compound can be produced by reduction of which amide compound ?
 (A) hexanamide (B) pentanamide (C) heptanamide (D) butanamide
35. For which of the following compound Gabriel phthalimide reaction is important?
 (A)  (B) 
 (C) $\text{CH}_3 - \text{NH} - \text{CH}_3$ (D) $\text{CH}_3 - \text{N}(\text{CH}_3) - \text{CH}_3$
36. Which of the following gives Hoffmann reaction very easily ?
 (A)  (B)  (C)  (D) 
37. Which of the following reaction is known as Mendis reaction ?
 (A) $\text{R} - \text{C} \equiv \text{N} \xrightarrow{\text{LiAlH}_4} \text{R} - \text{CH}_2 \cdot \text{NH}_2$
 (B) $\text{Ar} - \text{C} \equiv \text{N} \xrightarrow{\text{H}_2[\text{Ni}]} \text{Ar} - \text{CH}_2\text{NH}_2$
 (C) $\text{R} - \text{C} \equiv \text{N} \xrightarrow{\text{NaHg}/\text{C}_2\text{H}_5\text{OH}} \text{R} - \text{CH}_2\text{NH}_2$
 (D) all the given
38. Which of the following reaction gives 2° amine products ?
 (A) By reduction of nitrile (B) By reduction of isocyanide
 (C) By hydrolysis of isocyanide (D) By Hoffmann bromide reaction
39. $\text{NaN}_3 + \frac{(i) \text{R} - \text{X}}{-\text{NaX}} \rightarrow ?$ In the given reaction which amine product will be obtained ?
 (ii) LiAlH_4
 $\quad \quad \quad -\text{N}_2$
 (A) 3° amine (B) 2° amine
 (C) 1° amine (D) Both (A) and (B)
40. Find the X in the reaction $\text{CH}_3\text{CHO} + \text{NH}_2\text{OH} \xrightarrow{-\text{H}_2\text{O}} \text{CH}_3 - \text{CH} = \text{N} \cdot \text{OH} \xrightarrow{\text{LiAlH}_4/\text{ether}}$
 (A) methanamine (B) ethanamine
 (C) dimethyl amine (D) none of the given

41. Which are the reactant and catalyst for the Schmit reaction for preparation of 1° aliphatic and aromatic amine compounds ?
 (A) N_3H and conc H_2SO_4 (B) Na metal and $\text{C}_2\text{H}_5\text{OH}$
 (C) Ni metal and H_2 (D) all the given
42. Which reducing agent is useful to convert imine into 1° amine ?
 (A) $\text{H}_2[\text{Ni}]$ (B) NaBH_3CN (C) $\text{N}_3\text{H}/\text{conc. H}_2\text{SO}_4$ (D) (A) and (B)
43. Which catalyst is used to produce aniline industrially by ammonolysis of chlorobenzene ?
 (A) KCN (B) Al_2O_3 (C) $\text{K}_2\text{O} + \text{Al}_2\text{O}_3$ (D) Cu_2O
44. Which of the following do not form isopropyl amine ?
 (A) $(\text{CH}_3)_2\text{CO} + \text{NH}_2\text{OH} \xrightarrow{\text{LiAlH}_4}$
 (B) $(\text{CH}_3)_2\text{CO} + \text{NH}_3 \xrightarrow{\text{H}_2/\text{Ni}}$
 (C) $\begin{array}{c} \text{CH}_3 \\ \diagdown \\ \text{CH} - \text{OH}_{(\text{g})} \\ \diagup \\ \text{CH}_3 \end{array} + \text{NH}_{3(\text{g})} \xrightarrow{\text{Al}_2\text{O}_3, 633\text{K}}$
 (D) $\begin{array}{c} \text{CH}_3 \\ \diagdown \\ \text{CH} - \text{Br} \\ \diagup \\ \text{CH}_3 \end{array} + \text{NaNH}_2 \rightarrow$
45. What is the correct order of reactivity of the alkyl halide in the ammonolysis with amine ?
 (A) $\text{R} - \text{I} > \text{R} - \text{Br} > \text{R} - \text{Cl}$ (B) $\text{R} - \text{Cl} > \text{R} - \text{Br} > \text{R} - \text{I}$
 (C) $\text{R} - \text{Br} > \text{R} - \text{I} > \text{R} - \text{Cl}$ (D) $\text{R} - \text{I} > \text{R} - \text{Cl} > \text{R} - \text{Br}$

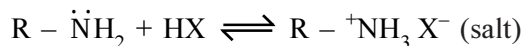
Answers : 26. (C), 27. (D), 28. (C), 29. (D), 30. (D), 31. (C), 32. (C), 33. (B), 34. (A), 35. (B), 36. (C), 37. (C), 38. (B), 39. (C), 40. (A), 41. (A), 42. (D), 43. (D), 44. (D), 45.) (A)

• **Chemical reactions of amine compounds :**

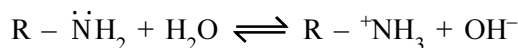
• **Basic property of amine compounds :**

Amine compounds act as Lewis base because in amine compound on nitrogen atom non-bonding e^- pair is present.

• **Reaction with acid :**



• **Reaction with water :**



$$K = \frac{[\text{R} - ^+\text{NH}_3][\text{OH}^-]}{[\text{R} - \ddot{\text{N}}\text{H}_2][\text{H}_2\text{O}]}$$

$$K [\text{H}_2\text{O}] = \frac{[\text{R} - ^+\text{NH}_3][\text{OH}^-]}{[\text{R} - \ddot{\text{N}}\text{H}_2]}$$

$$K_b = \frac{[R - \overset{+}{N}H_3][OH^-]}{[R - \overset{+}{N}H_2]}$$

$$pK_b = -\log K_b$$

- Strength of amine as base can be determined on the basis of value of K_b or pK_b .
- Greater the value of K_b (smaller value of pK_b) greater is the strength of amines.
- For ammonia pK_b value is 4.75.
- For aliphatic amines pK_b values are between 3 to 4.22.
- For aromatic amines pK_b values are more than 4.22.

Sr. No.	Name of amine	Molecular formula	K_b	pK_b
1.	Methanamine	CH_3NH_2	4.5×10^{-4}	3.38
2.	Ammonia	NH_3	1.8×10^{-5}	4.75
3.	N- methyl ethanamine	$(CH_3) NH$	5.4×10^{-4}	3.27
4.	N, N- dimethyl methanamine	$(CH_3)_3N$	0.6×10^{-4}	4.22
5.	Ethanamine	$CH_3 CH_2NH_2$	5.1×10^{-4}	3.29
6.	N- ethyl ethanamine	$(CH_3CH_2)_2NH$	10.0×10^{-4}	3.00
7.	N,N-diethyl ethanamine	$(CH_3CH_2)_3N$	5.6×10^{-4}	3.25
8.	Benzenamine	$C_6H_5-NH_2$	4.2×10^{-10}	9.38
9.	Phenyl methanamine	$C_6H_5 CH_2NH_2$	2.0×10^{-5}	4.70
10.	N-methyl aniline	$C_6H_5 NHCH_3$	5.0×10^{-10}	9.70
11.	N,N- di methyl aniline	$C_6H_5 - N \begin{array}{l} \diagup CH_3 \\ \diagdown CH_3 \end{array}$	11.5×10^{-10}	8.92

• **Relation between basic strength and structure of amine:**

- Basicity of amine depends on tendency to gain proton easily from acid and by converting into positive ion.
- If corresponding cation of amine is more stable then amine is more basic.

• **Basic strength of aliphatic amines**

(i) Due to (+I) effect of alkyl group alkanamine is stronger base than ammonia.

(ii) comparison of basicity of primary, secondary and tertiary alkanamine :

- As going from tertiary amine to the primary amine (+I) effect of alkyl group decreases hence in gaseous state basicity of amine is as follows :

(For non-aqueous solutions)

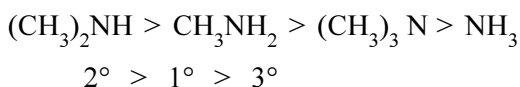


- In order to determine the basicity in aqueous solutions factors like (+I) effect, solvation effect and steric hindrance of alkyl group plays an important role.

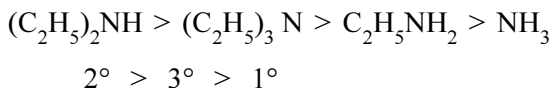
For aqueous solutions order of basicity is as follows :

Ammonia > 1° amine > 2° amine > 3° amine

- Basicity order of amines having substituted methyl group is :**

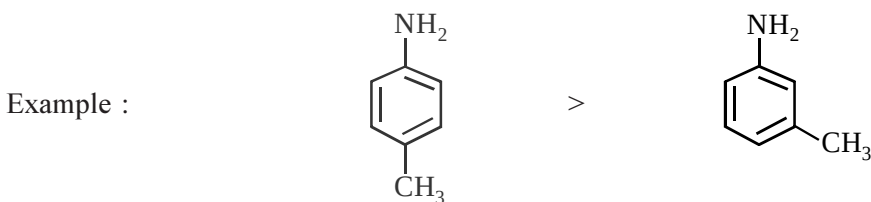


- Basicity order of amines having substituted ethyl group is :**



• **Basicity of aromatic amine (aryl amine)**

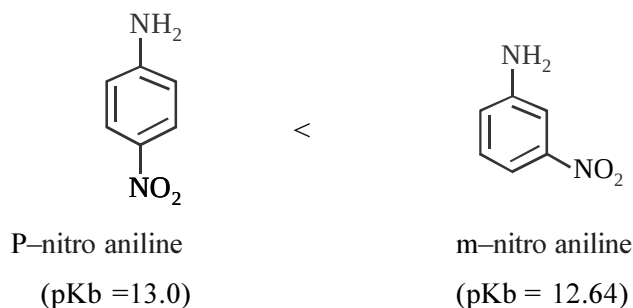
- Aryl amines are less basic than ammonia because due to resonance in aniline non-bonding e^- pair presence on N atom get delocalized on benzene ring hence for protonation non-bonding e^- pair is not easily available on N.**
- Basicity order of amine compound is as follows
3° amine > 2° amine > 1° amine > NH_3 > aniline
- For substituted aniline**
 - If e^- donor groups like $-\text{CH}_3, -\text{OCH}_3, -\text{NH}_2$ etc. are present then strength as the base increases.
 - If e^- attracting groups like $-\text{NO}_2, -\text{SO}_3\text{H}, -\text{COOH}, -\text{X}, -\text{CN}$ etc. are present then strength as the base decreases.
- If e^- donor group is present on para position then its basicity is more than in the meta-position.



p-toluidine, $\text{pK}_b = 9.21$

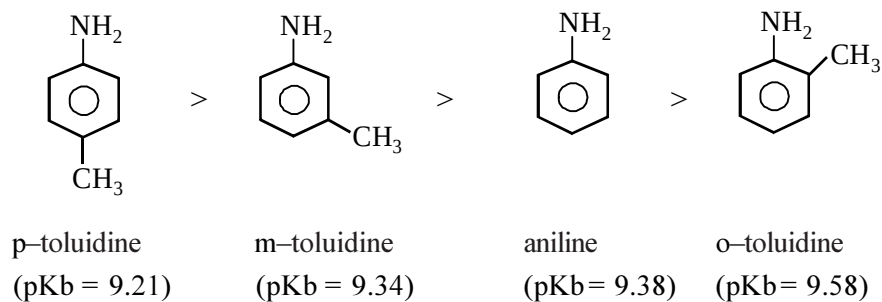
m-toluidine, $\text{pK}_b = 9.34$

- If e^- attracting groups are present at meta- position then it's basicity is more than at para-positions.

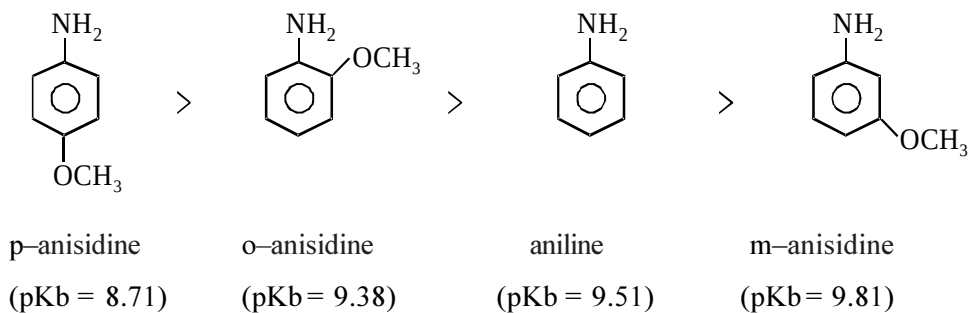


- Due to ortho effect basicity of amine decreases.
- For some important substituted aniline derivative basicity order is :

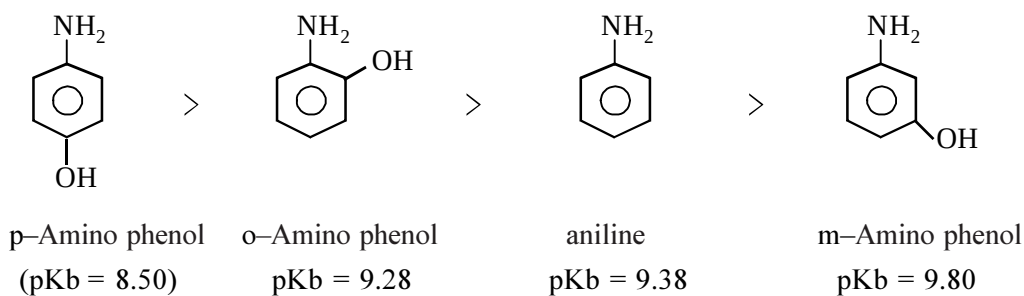
• For toluidine :



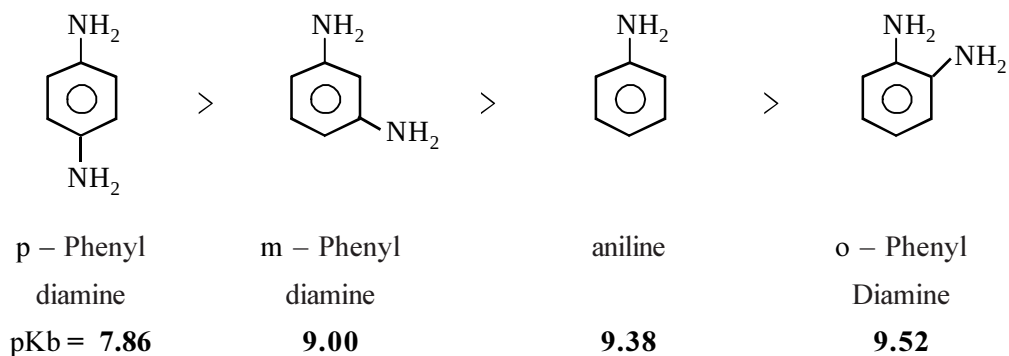
• For anisidine:



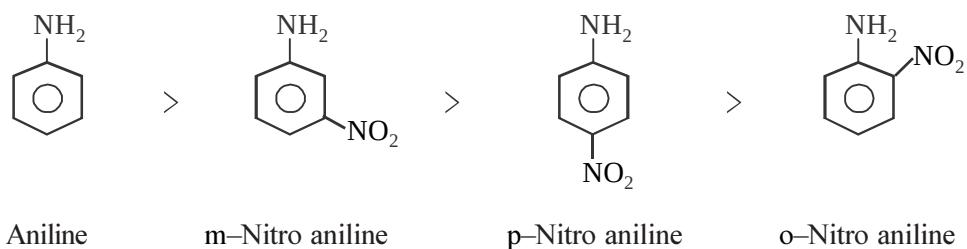
• For Amino phenol :



• For Phenyl Diamine :



• For nitro aniline :



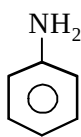
pK_b=9.38

12.64

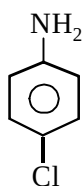
13.0

13.22

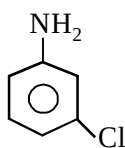
• For chloro aniline :



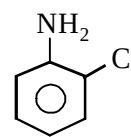
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Anilin

p-Chloro aniline

m-Chloro aniline

o-Chloro aniline

pK_b, = 9.38

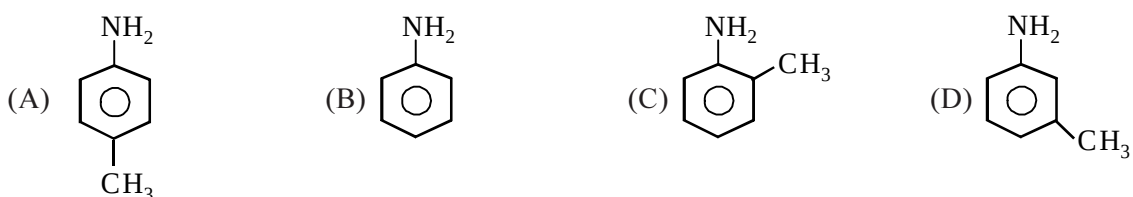
10.0

11.52

13.30

46. Values of pK_b for some of the bases are given below. On the basis of it choose the least basic.
- (A) 4.40 (B) 4.32 (C) 2.85 (D) 10.68
47. In aqueous solution which of the following is correct order for basicity ?
- (A) $\text{NH}_3 < \text{C}_6\text{H}_5\text{NH}_2 < (\text{C}_2\text{H}_5)_2\text{NH} < \text{C}_2\text{H}_5\text{NH}_2 < (\text{C}_2\text{H}_5)_3\text{N}$
- (B) $\text{C}_6\text{H}_5\text{NH}_2 < \text{NH}_3 < (\text{C}_2\text{H}_5)_3\text{N} < \text{C}_2\text{H}_5\text{NH}_2 < (\text{C}_2\text{H}_5)_2\text{NH}$
- (C) $\text{C}_6\text{H}_5\text{NH}_2 < \text{NH}_3 < \text{C}_2\text{H}_5\text{NH}_2 < (\text{C}_2\text{H}_5)_3\text{N} < (\text{C}_2\text{H}_5)_2\text{NH}$
- (D) None of the above
48. For the following compounds select the correct order of basicity in gaseous state (non aqueous solution).
- (A) $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH}$ (B) $(\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2$
- (C) $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N}$ (D) $(\text{CH}_3)_3\text{N} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH}$
49. Arrange the given amines in increasing order of basicity (I) n - pentyl amine, (II) sec - pentyl amine, (III) isopentyl amine, (IV) tert pentyl amine.
- (A) $\text{I} < \text{II} < \text{III} < \text{IV}$ (B) $\text{II} < \text{III} < \text{I} < \text{IV}$ (C) $\text{IV} < \text{III} < \text{II} < \text{I}$ (D) $\text{III} < \text{IV} < \text{I} < \text{II}$
50. Match the details of section - I with section - II and select correct option.
- | Section - I | Section - II |
|---------------------------|--------------|
| (P) Benzenamine | (T) 11.0 |
| (Q) N - Methyl Aniline | (V) 5.08 |
| (R) N, N Dimethyl Aniline | (V) 4.30 |
| (S) N - ethyl ethanamine | (W) 4.62 |
- (A) (P)-(V), (Q)-(T), (R)-(W), (S)-(U) (B) (P)-(T), (Q)-(W), (R)-(V), (S)-(U)
- (C) (P)-(U), (Q)-(V), (R)-(T), (S)-(W) (D) (P)-(W), (Q)-(V), (R)-(U), (S)-(T)
51. Which of the following sentence is incorrect ?
- (a) p - nitro aniline is more basic than aniline.
- (b) Aniline is weaker base than o - Methoxy aniline.
- (c) p - Methoxy aniline is weaker base than aniline.
- (d) Aniline is weaker base than ethyl amine.

52. Mention the decreasing order for basicity of NH_3 , CH_3NH_2 and $(\text{CH}_3)_2\text{NH}$.
- (A) $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > \text{NH}_3$ (B) $\text{NH}_3 > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH}$
 (C) $\text{CH}_3\text{NH}_2 > \text{NH}_3 > (\text{CH}_3)_2\text{NH}$ (D) $(\text{CH}_3)_2\text{NH} > \text{NH}_3 > \text{CH}_3\text{NH}_2$
53. For which of the following value of dissociation constant is maximum ?
- (A) $\text{C}_6\text{H}_5\text{OH}$ (B) $\text{CH}_3^+\text{NH}_3 \text{Cl}^-$ (C) $\text{CH}_3 - \text{C} \equiv \text{CH}$ (D) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$
54. Which of the following is strongest base in aqueous solution ?
- (A) Methyl amine (B) Aniline (C) Trimethyl amine (D) Dimethyl amine
55. Which of the following is most basic ?
- (A) Amine (B) o - nitro aniline (C) p - nitroaniline (D) m - nitro aniline
56. Which of the following is most basic ?



57. Which of the following compound is not basic ?
- (A) CH_3NH_2 (B) $(\text{CH}_3)_2\text{NH}$ (C) $(\text{CH}_3)_3\text{N}$ (D) $\text{C}_6\text{H}_5\text{NH}_2$
58. Which of the following compound is not basic ?
- (A) Aniline (B) p - nitro aniline (C) m - nitro aniline (D) benzylamine
59. Which of the following is strongest base ?



60. Which of the following is least basic ?



61. Which of the following has highest value of K_b ? $\text{R} = \text{CH}_3$
- (A) R_2NH (B) R_3N (C) $\text{R}-\text{NH}_2$ (D) NH_3
62. For NH_3 value of pK_b is
- (A) 4.0 (B) 4.75 (C) 4.22 (D) 3.75
63. Which of the following order of basicity is correct for ethyl substituted amine ?
- (A) $(\text{C}_2\text{H}_5)_2\text{NH} > (\text{C}_2\text{H}_5)_3\text{N} > \text{C}_2\text{H}_5\text{NH}_2$ (B) $(\text{C}_2\text{H}_5)_3\text{N} > (\text{C}_2\text{H}_5)_2\text{NH} > \text{C}_2\text{H}_5\text{NH}_2$
 (C) $(\text{C}_2\text{H}_5)_3\text{N} > \text{C}_2\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_2\text{NH}$ (D) $\text{C}_2\text{H}_5\text{NH}_2 > (\text{C}_2\text{H}_5)_3\text{N} > (\text{C}_2\text{H}_5)_2\text{NH}$

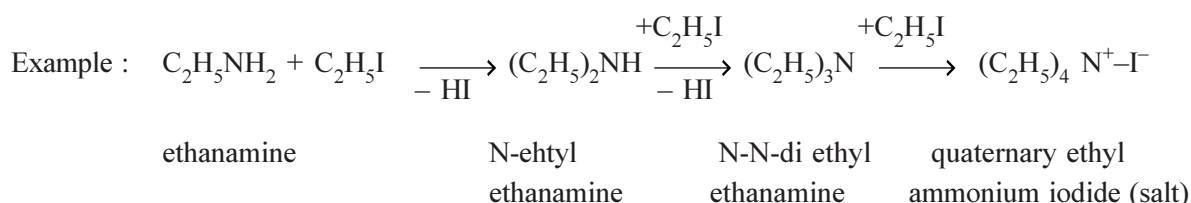
64. Which of the following is most basic ?
 (A) p - Toludine (B) m - toludine (C) Aniline (D) o - toludine
65. For which of the following pK_b value is highest ?
 (A) p - aniline (B) Aniline (C) o - aniline (D) m - aniline
66. Which is decreasing order of basicity for o, m, p amino phenol ?
 (A) p > o < m (B) o > p > m (C) m > o > P (D) m > p > o
67. Which is decreasing order of basicity for o, m, p phenylene diamine ?
 (A) p < m < o (B) o < m < p (C) o < p < m (D) m < p < o
68. Which is decreasing order of basicity for o, m, p phenyl diamine ?
 (A) m > p > o (B) p > m > o (C) o > p > m (D) m > p > o
69. Which is decreasing order of basicity for o, m, p chloro aniline ?
 (A) p > m > o (B) m > p > o (C) m > o > p (D) o > m > p
70. In which of the following reactions amine act as acid ?
 (A) $(C_2H_5)_3N + BF_3 \rightarrow$ (B) $CH_3NH_2 + H_2O \rightarrow$
 (C) $(C_2H_5)_2NH + H_2PtCl_6 \rightarrow$ (D) $[(CH_3)_2CH]_2NH + n-C_4H_9Li \rightarrow$

Answers : 46. (C), 47. (C), 48. (B), 49. (C), 50. (D), 51. (D), 52. (B), 53. (B), 54. (D), 55. (A), 56. (A), 57. (B), 58. (D), 59. (C), 60. (C), 61. (A), 62. (B), 63. (A), 64. (D), 65. (D), 66. (A), 67. (B), 68. (A), 69. (A), 70. (D),

• Chemical Reactions of Amines

• Alkylation :

On reaction of aliphatic and aromatic primary amine with alkyl halide, it successively gives 2° amine, 3° amine and quaternary ammonium salt.



• Acylation :

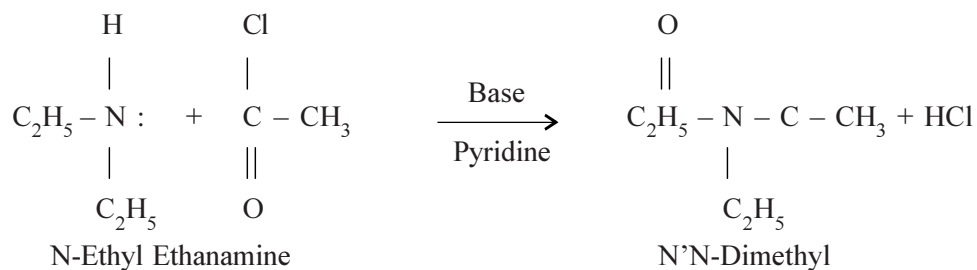
On reaction of aliphatic and aromatic primary and secondary amine with acid chloride or acid anhydride, it gives amide product.

This reaction is carried out in presence of base pyridine.

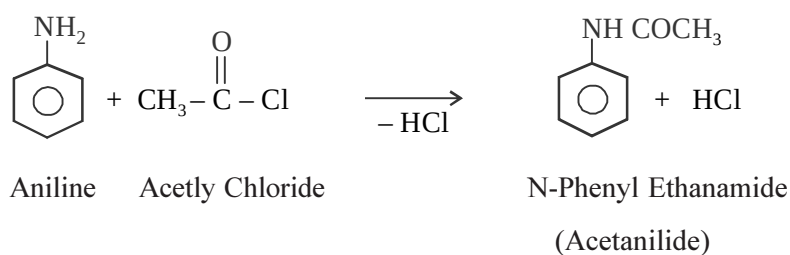
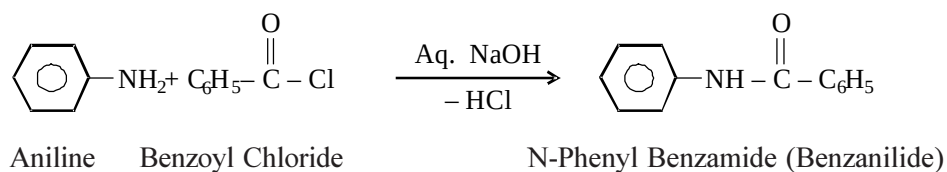
• Reagents

- Acetyl chloride / Pyridine or conc. H_2SO_4 or CH_3COOH CH_3COCl
- Acetic anhydride / conc. H_2SO_4 or CH_3COOH $(CH_3CO)_2O$
- Benzoyl Chloride / aq. NaOH

$C_6H_5COCl \rightarrow$ is known as '**Schotten Baumann**' reaction.

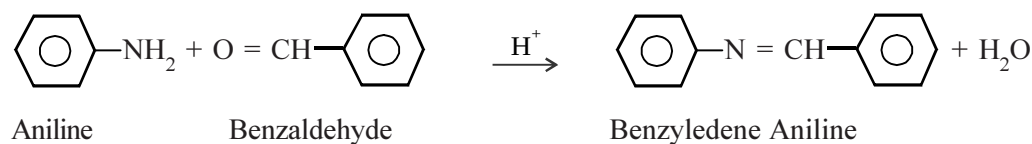
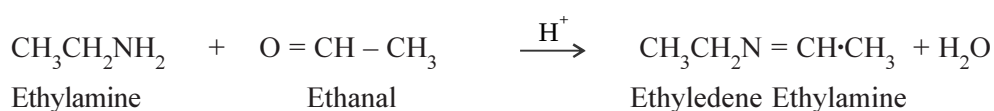
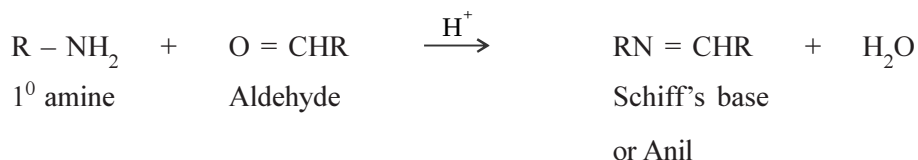


• **'Schotten-Baumann' Reaction**



• **Reactions with Aldehyde and Ketone**

Primary aliphatic and aromatic amine on reaction with aldehyde and ketone in presence of acid catalyst forms 'azomethene'. It is known as 'Schiff base' or 'anil'.



• **Carbyl amine reaction (isocyanide detection)**

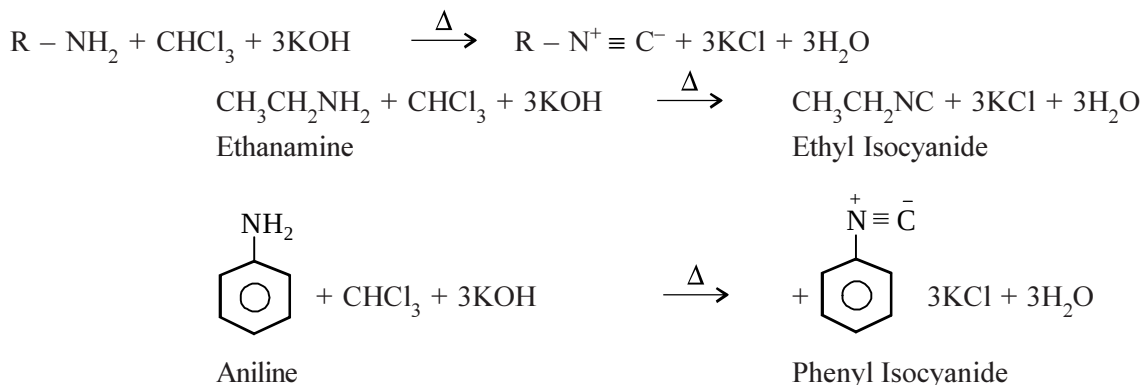
Only primary aliphatic and aromatic amines gives this test.

Useful to detect primary amine in the laboratory.

1° amine on heating with chloroform (CHCl_3) and alcoholic KOH gives foul smelling isocyanide gas.

Secondary and tertiary amine do not give this test.

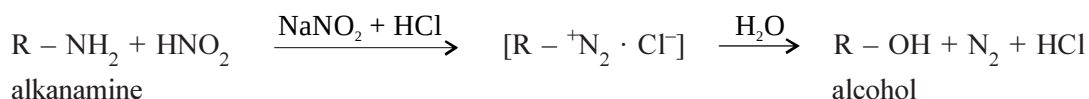
• **Common reaction**



• **Reactions with nitrous acid (HNO₂)**

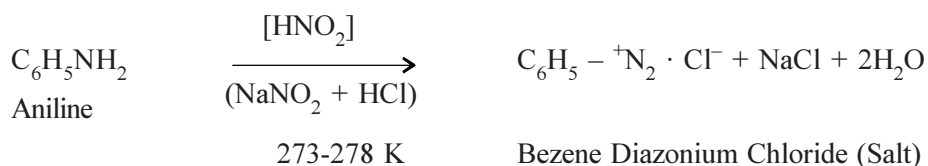
(A) **Reaction of primary aliphatic amine with nitrous acid (HNO₂)**

1^o amine on reaction with HNO₂ forms alkyl diazonium salt. As it is unstable it releases N₂ gas and converted into alcohol.



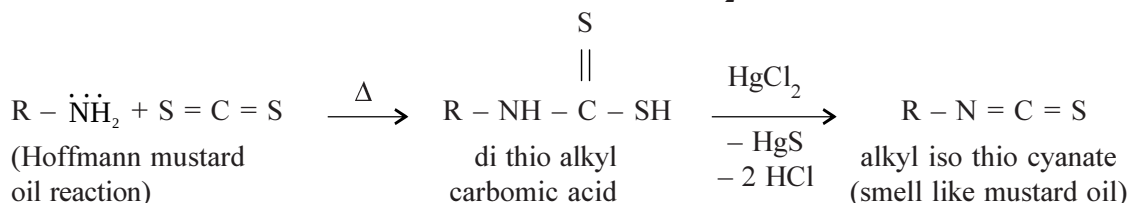
(B) **Reaction of primary aromatic amine with nitrous acid (HNO₂) :**

By reaction at low temperature (273-278 K) it forms benzene Diazonium Chloride (Salt).

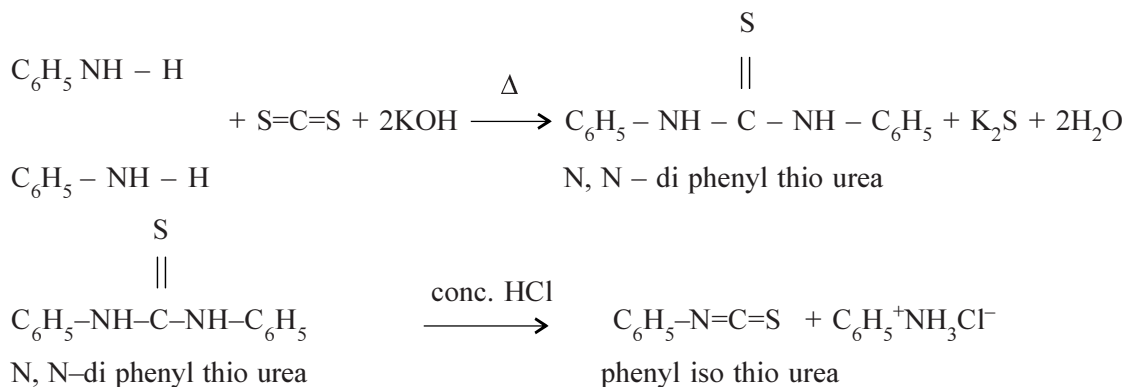


• **Reaction with Carbon Disulphide (CS₂)**

(A) **Reaction of aliphatic amine with Carbon Disulphide (CS₂) (Hoffman-mustard reaction) :**



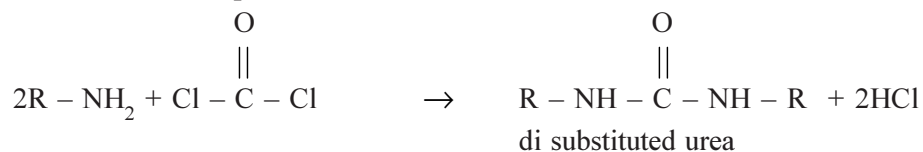
(B) **Reaction of aromatic amine :**



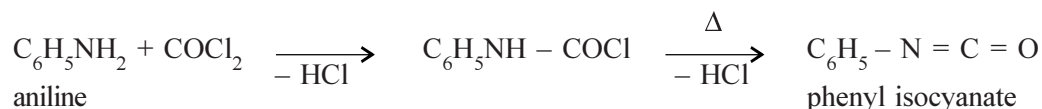
N, N diphenyl thio urea (thio carbonyl) is used as reaction stimulator during vulcanization of rubber.

• **Reaction with phosgene (carbonyl chloride) (COCl_2)**

(A) **Reaction with aliphatic amine :**



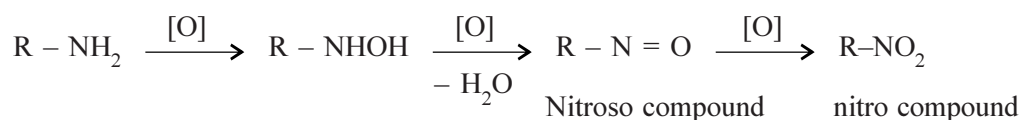
(B) **Reaction with aromatic amine :**



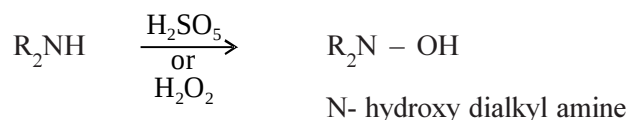
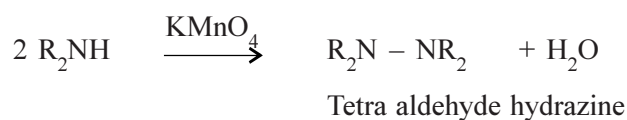
• **Oxidation**

Product obtained by the oxidation of amine depends on type of amine and oxidising agent.

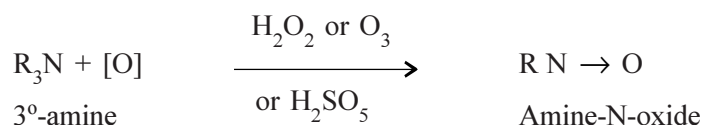
(A) **Primary amine :**



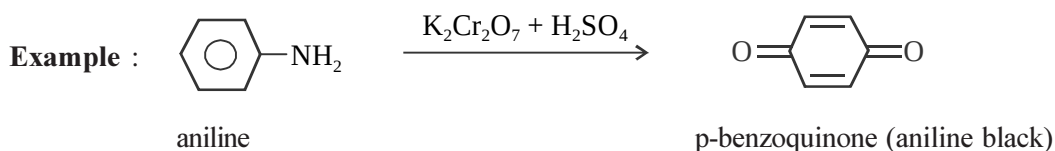
(B) **Secondary amine :**



(C) Tertiary amine cannot be oxidised by KMnO_4 but on oxidation by ozone, H_2O_2 , or Caros acid (H_2SO_5) it forms amine N-oxide.



(D) Aromatic amine can be oxidised by $\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4$.

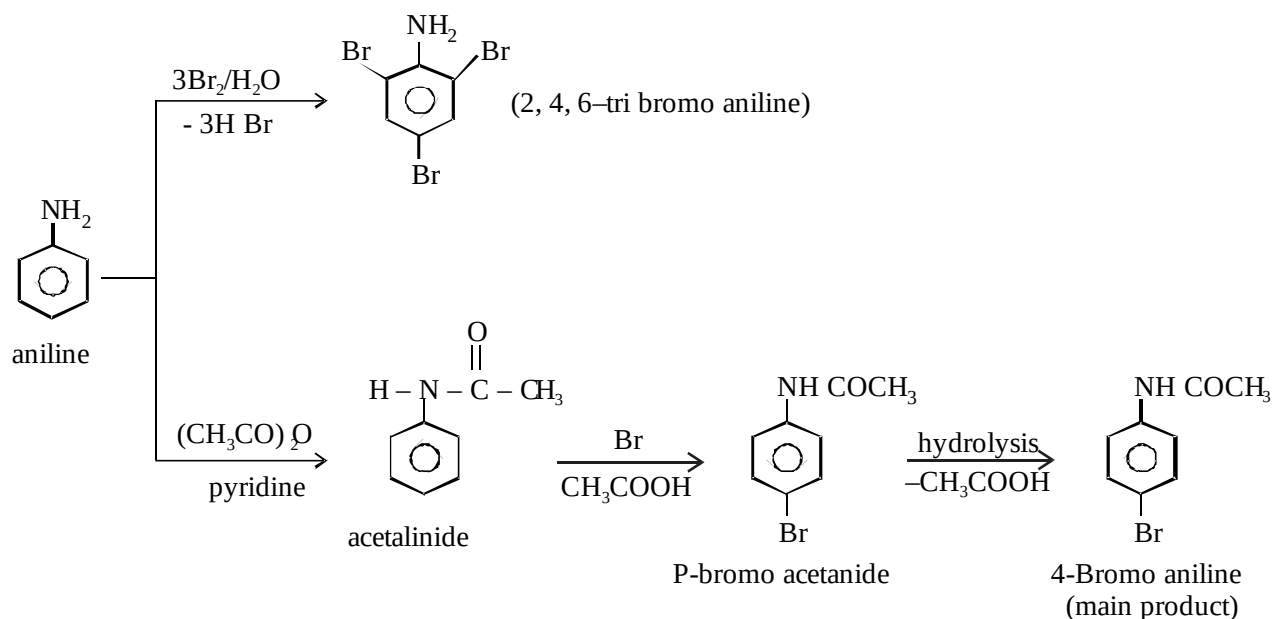


• **Reaction with Hinsberg reagent**

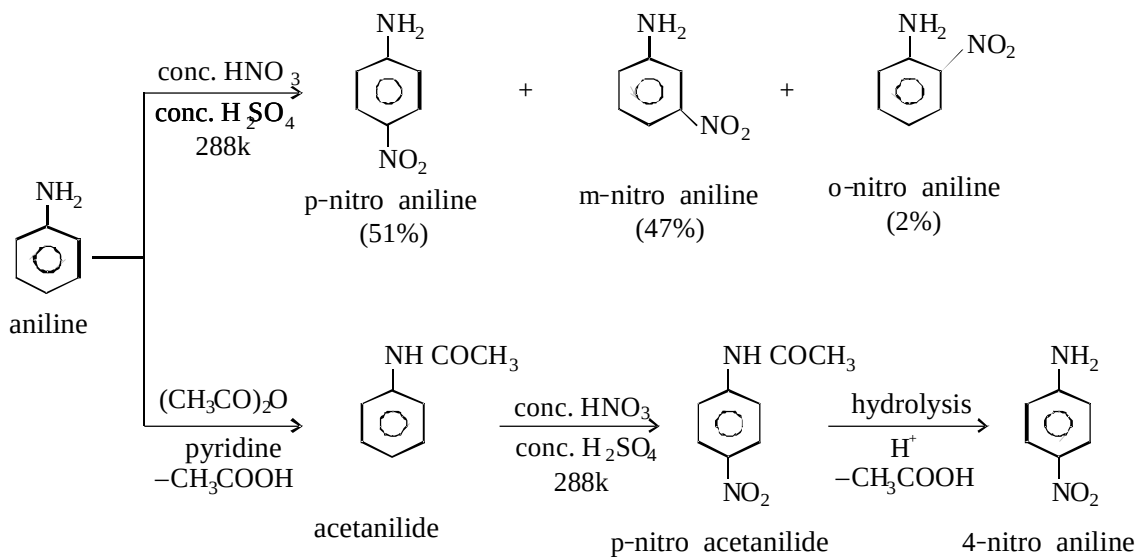
- Primary and secondary amine on reaction with benzene sulphonyl chloride (Hinsberg reagent) gives sulphonamide product. While tertiary amine do not react because no hydrogen atom is bonded with N in tertiary amine.

• Electrophilic substitution reaction :

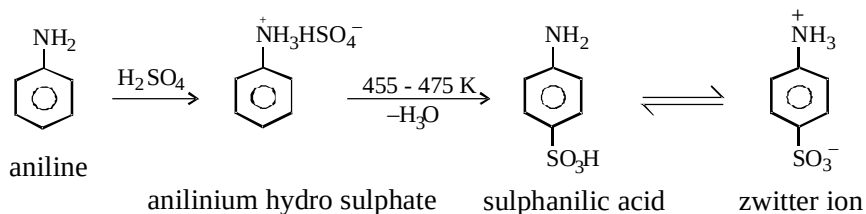
(A) Bromination :



(B) Nitration :



(C) Sulphonation :



71. By which reaction phenyl isocyanide is formed ?

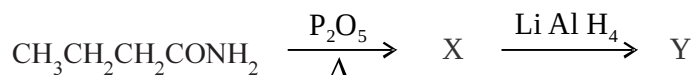
(A) Hoffman reaction

(B) Carbyl amine test

(C) Reimer Tieman reaction

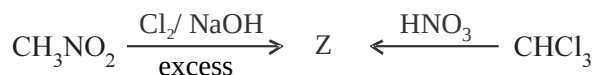
(D) Wurtz reaction

72. What is the final product Y in the following reaction ?



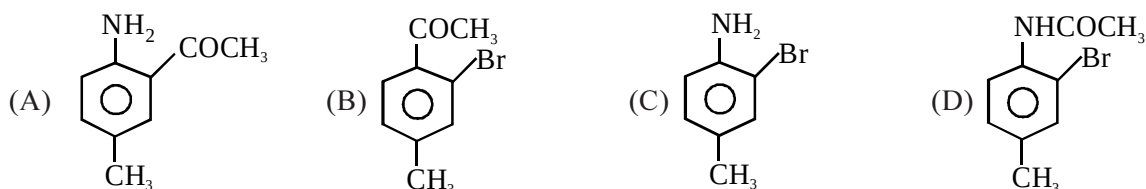
- (A) n - Butylamine (B) Propyl isocyanide
(C) n - Buty cyanide (D) n - Propylamine

73. Identify Z in following reaction :



- (A) ClCH_2NO_2 (B) Cl_2CHNO_2 (C) CHCl_3 (D) Cl_3CNO_2

74. P-toluidine $\xrightarrow{\text{AC}_2\text{O}}$ X $\xrightarrow[\text{CH}_3\text{COOH}]{\text{Br}_2}$ Y $\xrightarrow[\text{H}^+]{\text{H}_2\text{O}}$ Z then which of the following is Z.



75. When primary amine reacts with ethanoic KOH and Chloroform is obtained.

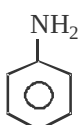
- (A) isocyanide (B) aldehyde (C) cyanide (D) alcohol

76. On reduction of organic compound X, compound Y is formed which on reaction with CHCl_3 in presence of alcoholic KOH gives compound Z whose catalytic reduction produces N - methyl aniline. Then compound X is

- (A) methyl amine (B) aniline (C) nitro benzene (D) nitro methane

77. Which product is obtained on heating $(\text{CH}_3)_4\text{N}^+\text{OH}^-$?

- (A) CH_3NH_2 (B) $\text{C}_2\text{H}_5\text{NH}_2$ (C) $(\text{CH}_3)_3\text{N}$ (D) $(\text{CH}_3)_2\text{NH}$

78.  $\xrightarrow{\text{CH}_3\text{COCl}}$ X $\xrightarrow[\text{conc. } [\text{H}_2\text{SO}_4]]{\text{conc. } \text{HNO}_3}$ Y $\xrightarrow{\text{hydrolysis}}$ Z Identify the Z in the given reaction.

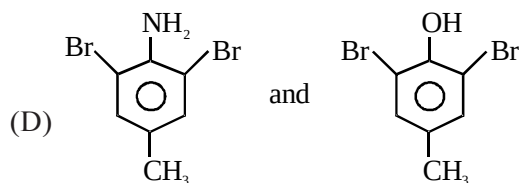
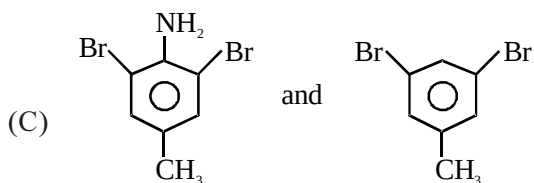
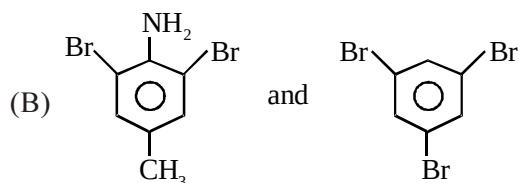
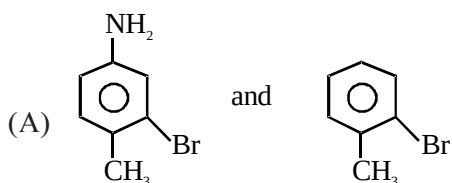
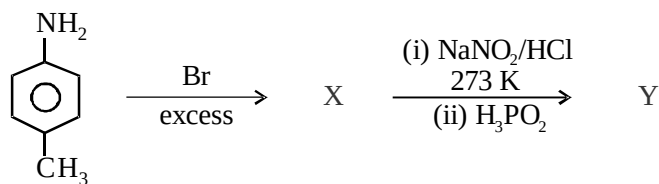
- (A) acetanilide (B) p - Nitro acetanilide (C) p - Nitro aniline (D) Sulphanilic acid

79. Identify correctness of given sentences ?

- (i) by sulphonation reaction aniline with conc. H_2SO_4 at 455 K - 475 K temperature gives sulphanilic acid
(ii) Sulphanilic acid act as Zwitter acid and it is amphoteric
(iii) Sulphanilic acid has high melting point and it is insoluble in water

- (A) T F T (B) T F F (C) F T F (D) T T T

80. Predict about x and y in the given reaction :



81. Which gas is obtained during reaction between ethyl amine and Na - metal ?

- (A) N_2 (B) H_2 (C) C_2H_2 (D) CO_2

82. 1° amine in presence of excess HgCl_2 on heating with CS_2 it gives isocyanate. By which name these reaction is known

- (A) Hoffman Bromamide reaction (B) Perkin reaction
(C) Hoffman - Mustard oil reaction (D) Carbyl amine test

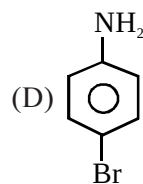
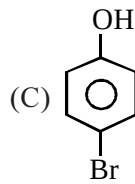
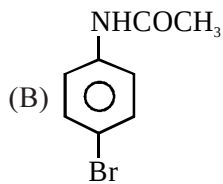
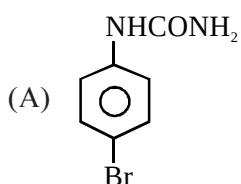
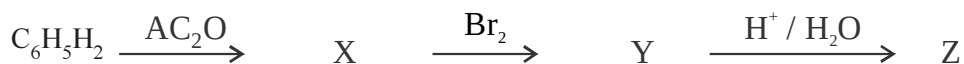
83. Which of the following reaction is not useful either in preparation or separation of amine ?

- (A) Hinsberg reaction (B) Carbyl amine test
(C) Hoffman reaction (D) Wurtz reaction

84. Which of the following statement is not correct ?

- (A) ethylamine and aniline both have $-\text{NH}_2$ group
(B) ethylamine and aniline both are soluble in HCl
(C) ethylamine and aniline both on reaction with HNO_2 forms hydroxy compounds
(D) ethylamine and aniline both on reaction with CHCl_3 and KOH gives foul smelling compound

85. Identify the Z in the given reaction.



86. Which product is obtained on oxidation of aniline with $\text{Na}_2\text{Cr}_2\text{O}_7$ and Conc. H_2SO_4 ?

- (A) benzoic acid (B) m - amino benzoic acid
(C) p - benzoaminone (D) Schiff base

87. For conversion of benzenamide $\rightarrow$ acetanilide which reagents are useful ?

- (A) NaOH/Br_2 , LiAlH_4 (B) NaOH/Br_2 , CH_3COCl
(C) HONO , Cu_2Cl_2 , $(\text{CH}_3\text{CO})_2\text{O}$ (D) NaOH/Br_2 , $\text{Ni}[\text{H}_2]$, CH_3COCl

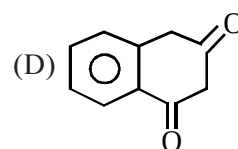
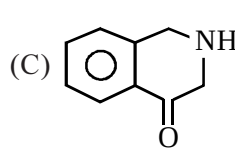
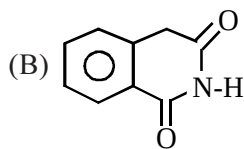
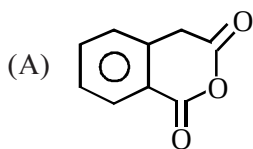
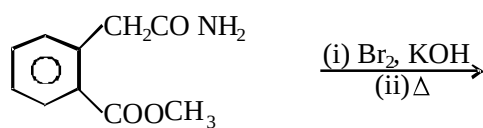
88. Which of the following amine do not react with acetyl chloride ?

- (A) CH_3NH_2 (B) $(\text{CH}_3)_2\text{NH}$
(C) $(\text{CH}_3)_3\text{N}$ (D) None of these

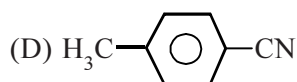
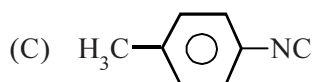
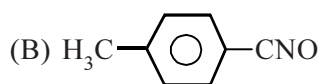
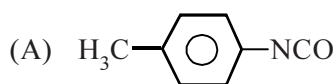
89. $\text{CH}_3\text{CH}_2\text{Cl} \xrightarrow{\text{NaCN}} \text{X} \xrightarrow{\text{Ni}/\text{H}_2} \text{Y} \xrightarrow{(\text{CH}_3\text{CO})_2\text{O}} \text{Z}$ Identify Z in the above reaction.

- (A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NHCOCH}_3$ (B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
(C) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CONHCH}_3$ (D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CONHCOCH}_3$

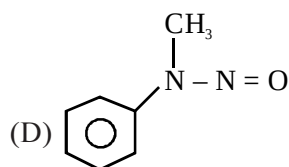
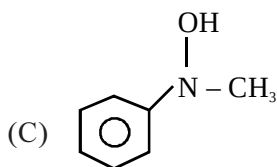
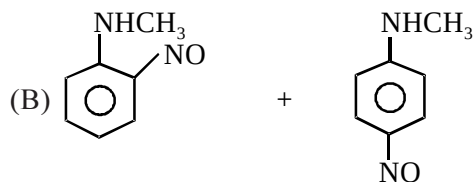
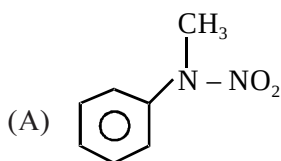
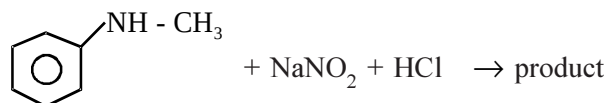
90. Identify the product of the reaction :

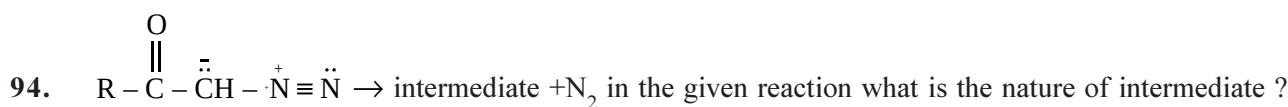
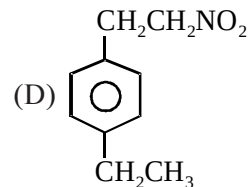
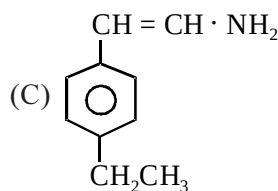
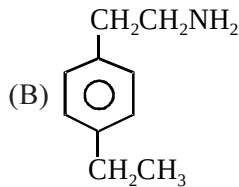
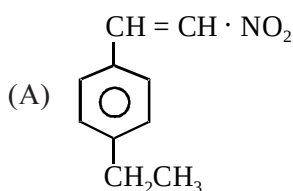
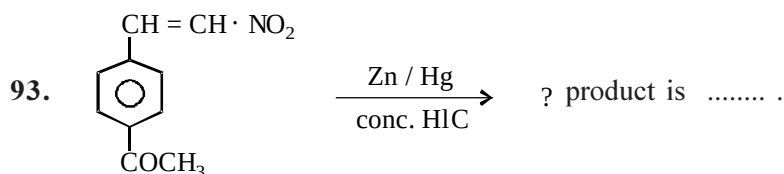


91. Mention the product in given reaction ? p-toluidine $\xrightarrow[\Delta]{\text{Alcoholic KOH, CHCl}_3}$



92. Predict product in the following reaction.





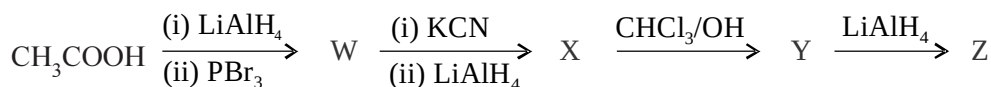
(A) carboniumion

(B) carbanion

(C) carbene

(D) free radical

95. Identify Z in the following reaction ?



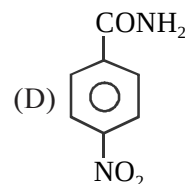
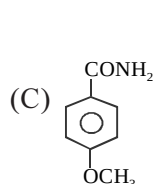
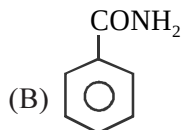
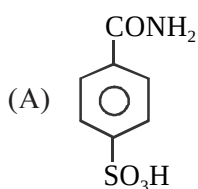
(A) $\text{CH}_3\text{CH}_2\text{OH}$

(B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NHCH}_3$

(C) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$

(D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$

96. Which of the following gives Hoffman reaction with most ease ?



97. Acylation reaction taking place in which of the following reagent is called Schotten Baumen reaction.

(A) CH_3COCl /reaction

(B) $(\text{CH}_3\text{CO})_2\text{O}$ /Mkktý H_2SO_4

(C) $\text{C}_6\text{H}_5\text{COCl}$ aqueous NaOH

(D) CH_3COCl / CH_3COOH

98. Reaction of 1° aliphatic amine with aldehyde or ketone in presence of acid catalyst gives

(A) azo methane

(B) Schiff base

(C) aniline

(D) all of the given

99. Which of the following is used as reaction stimulant during vulcanization of rubber ?

(A) N, N diphenyl thio urea

(B) N - Methyl aniline

(C) N, N di methyl aniline

(D) tetra alkyl Hydrazine

100. Product obtain by reaction of amine with which reagent on heating gives phenyl isocyanide ?

(A) Phosphine

(B) Phosgene

(C) Hydroxyl amine

(D) Potassium cyanide

101. By which of the following 3° amine can't be oxidize ?

- (A) O_3 (B) H_2O_2 (C) H_2SO_5 (D) $KMnO_4$

102. What is the proportion of p, m, o isomers respectively in the product of the reaction of aniline with Conc. HNO_3 / Conc. H_2SO_4 at 288K temperature ?

- (A) 51 %, 47 %, 2 % (B) 47 %, 51 %, 2 % (C) 2 %, 51 %, 47 % (D) 2 %, 47 %, 51 %

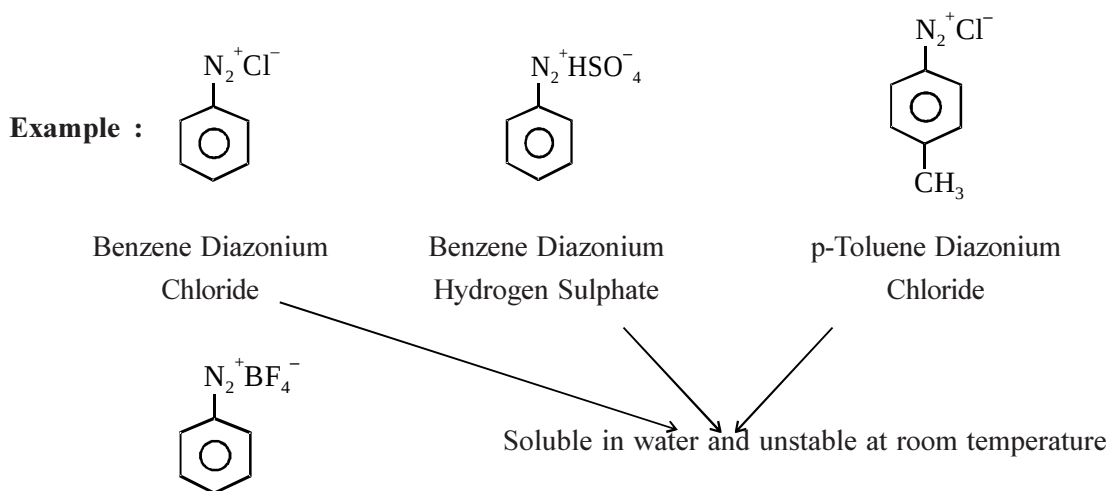
103. m - DNB on reaction with which of the following gives m - nitro aniline.

- (A) $(NH_4)_2S$ (B) Na_2S (C) Ni/H_2 (D) Both (A) and (B)

Answers : 71. (C), 72. (A), 73. (D), 74. (C), 75. (A), 76. (C), 77. (C), 78. (C), 79. (D), 80. (B), 81. (B), 82. (C), 83. (D), 84. (C), 85. (D), 86. (C), 87. (B), 88. (C), 89. (A), 90. (C), 91. (C), 92. (D), 93. (C), 94. (C), 95. (B), 96. (C), 97. (C), 98. (D), 99. (A), 100. (B), 101. (D), 102. (A), 103. (D),

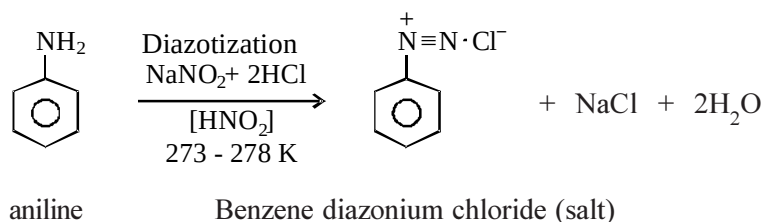
• Diazonium Salt

General formula : $Ar \cdot N_2^+ X^-$ (where $X^- = Cl^-, Br^-, HSO_4^-, BF_4^-$)



- Benzene diazonium fluoroborate (insoluble in water) but
- Stable at room temperature

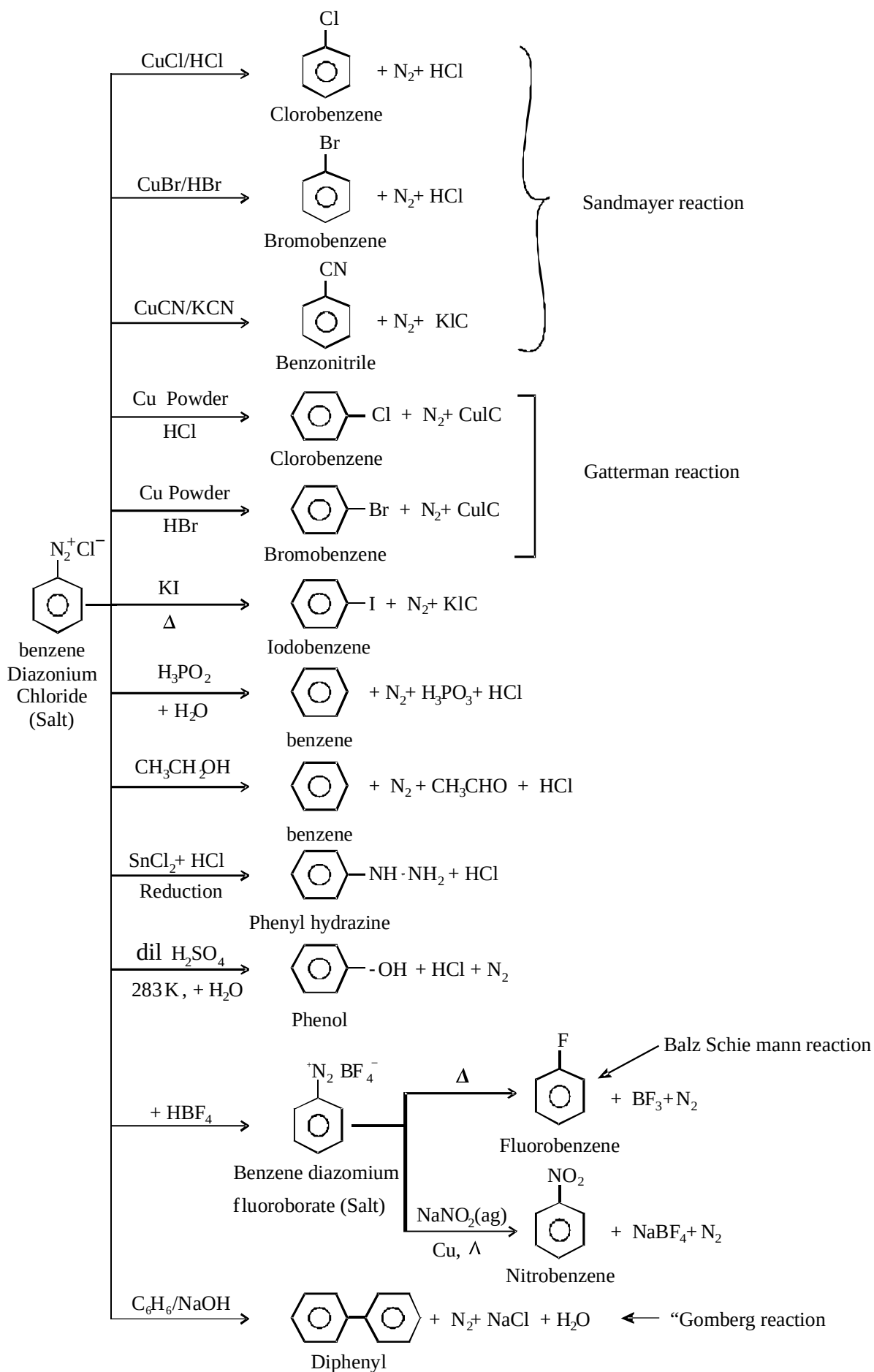
• Preparation of benzene diazonium chloride and its properties



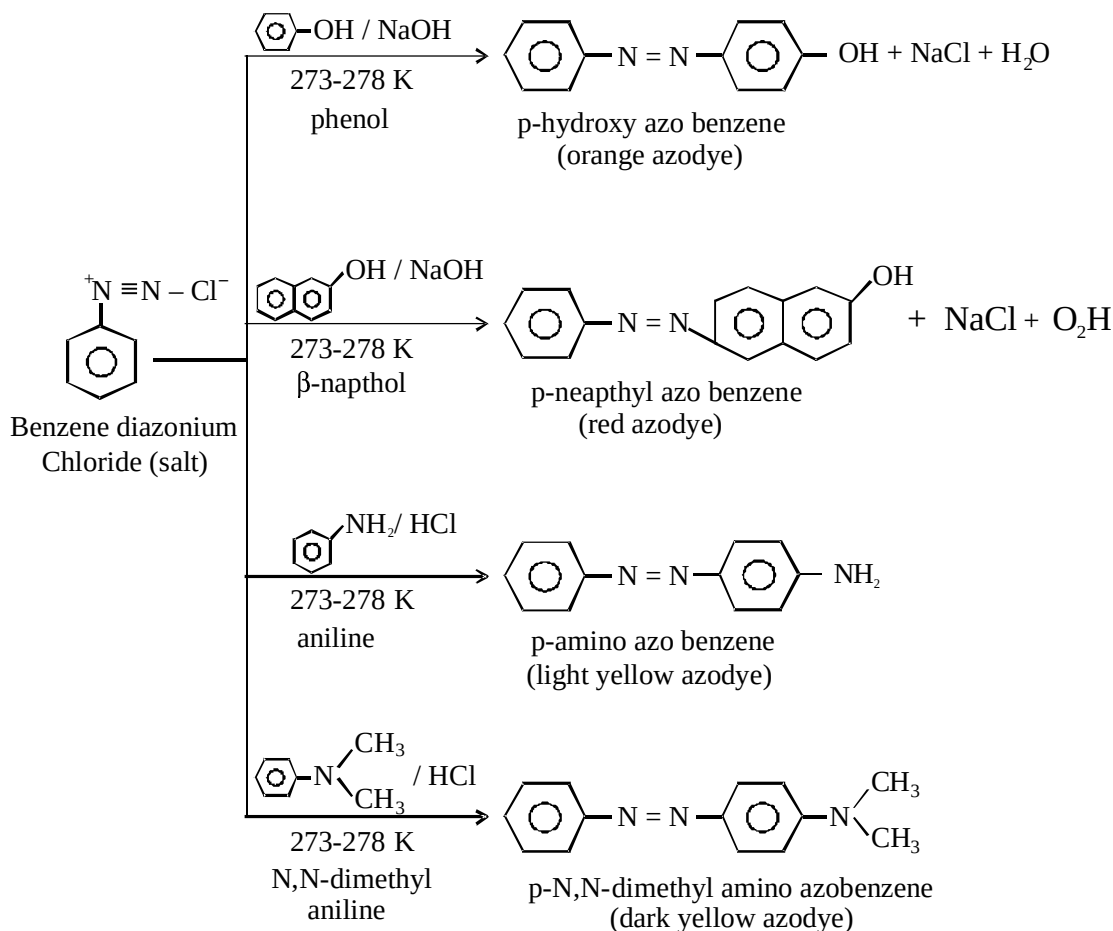
• Physical properties :

- Colourless crystalline solid substance
- Soluble in water
- Stable at low temperature.
- Cannot be obtained in dry state as it is explosive in nature.
- Its reactions are done immediately.

• Substitution reactions of benzene diazonium salt :



• **Azo coupling reaction of benzene di azonium chloride salt:**



• **Tests of amine**

(i) **Carbyl amine test**

Primary aliphatic and aromatic both type of amines gives this test.

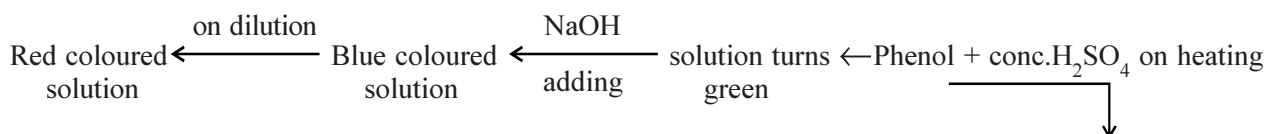
(ii) **Azodye test :**

Primary aromatic amine gives this test.

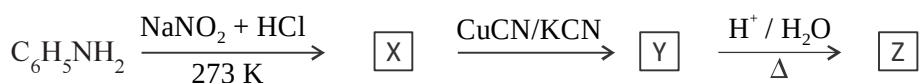
(iii) **Liberman test:**

Secondary (aliphatic and aromatic both gives)

2° amine on reaction with HNO_2 forms N-nitroso amine
(Yellow oily liquid)



104. In the given reaction identify Z. :



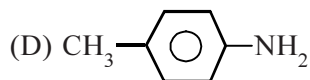
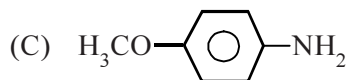
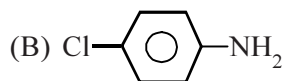
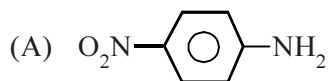
(A) $\text{C}_6\text{H}_5\text{CN}$

(B) $\text{C}_6\text{H}_5\text{CONH}_2$

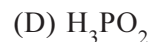
(C) $\text{C}_6\text{H}_5\text{COOH}$

(D) $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$

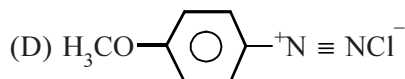
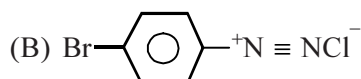
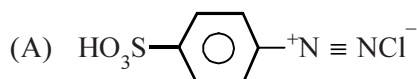
105. For which of the following arylamine diazotization reaction is difficult ?



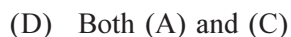
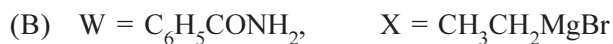
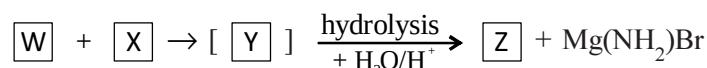
106. Which of the following is useful for Deamination reaction of benzene diazonium chloride ?



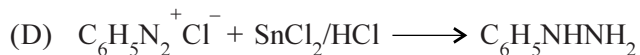
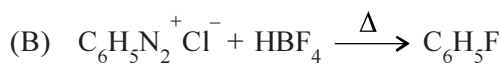
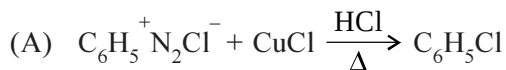
107. Which of the following diazonium salt on heating with dil. H_2SO_4 gives corresponding phenol with difficulty ?



108. For the given reaction if $\boxed{\text{Z}}$ = 1-Phenyl propan-1-amine then for $\boxed{\text{W}}$ and $\boxed{\text{X}}$ which of the following option is appropriate.



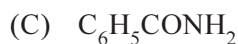
109. For aryl diazonium salt which of the following reaction is not correct ?



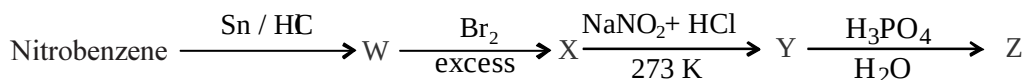
110. Which Product is obtained by reaction of aliphatic primary amine with nitrous acid ?



111. Which of the following compound is easily synthesized aromatic compounds ?

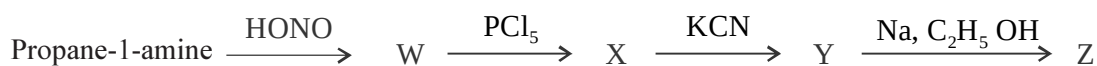


112. Identify X, Y, Z in the given reaction.



- | | |
|--|--|
| (A) W = aniline | (B) W = benzene |
| X = 2, 4, 6-tribromo aniline | X = 2, 4, 6-tribromo benzene |
| Y = 2, 4, 6-tribromo benzene diazonim chloride | Y = 2, 4, 6-trichloro benzene |
| Z = 1, 3, 5-tribromo benzene | Z = 2, 4, 6-trichloro phenol |
| (C) W = aniline | (D) W = aniline |
| X = bromo aniline | X = p-bromo aniline |
| Y = p-bromo benzene diazonium chloride | Y = p-bromo benzene diazonium chloride |
| Z = p-bromo phenol | Z = bromo benzene |

113. Identify [W], [X] and [Z] in following reaction :

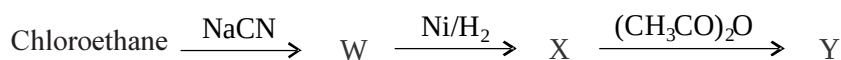


- | | | |
|---|---|---|
| (A) W = CH ₃ CHO, | X = CH ₃ Cl, | Z = CH ₃ CH ₂ NH ₂ |
| (B) W = CH ₃ CH ₂ OH, | X = CH ₃ CH ₂ Cl, | Z = CH ₃ CH ₂ CH ₂ NH ₂ |
| (C) W = CH ₃ CH ₂ CH ₂ OH, | X = CH ₃ CH ₂ Cl, | Z = CH ₃ CH ₂ CH ₂ CH ₂ NH ₂ |
| (D) W = CH ₃ CHO, | X = CH ₃ CH ₂ Cl, | Z = CH ₃ CH ₂ CH ₂ NH ₂ |

114. C₅H₁₁N is optically active compound on its reaction with HNO₂, C₅H₁₁OH is formed. Then which is that compound ?

- | | |
|-------------------------|------------------------------|
| (A) N-Methyl butanamine | (B) 1-amino pentane |
| (C) 2-amino pentane | (D) N,N-dimethyl propanamine |

115. What is Y in the following reaction ?



- | | |
|---|---|
| (A) CH ₃ CH ₂ CH ₂ NHCOCH ₃ | (B) CH ₃ CH ₂ CH ₂ NH ₂ |
| (C) CH ₃ CH ₂ CH ₂ CONHCH ₃ | (D) CH ₃ CH ₂ CH ₂ CH ₂ CONHCOCH ₃ |

116. What is the structure of the coloured compound obtain by reaction of aniline with the product obtained by diazotization reaction of aniline at tow temperature

- | | |
|-----|-----|
| (A) | (B) |
| (C) | (D) |

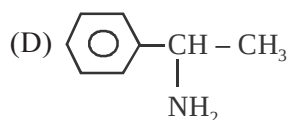
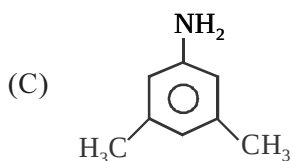
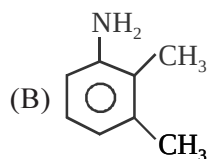
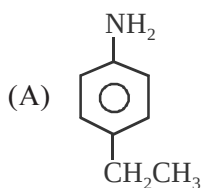
117. 3, 4, 5, tribromo aniline $\xrightarrow[\text{(ii) H}_3\text{PO}_2]{\text{(i) diazotization}}$? (Products)

- (A) 3, 4, 5-tribromobenzene (B) 3, 4, 5-tribromophenol
(C) 1, 2, 3-tribromobenzene (D) 1, 2, 6-tribromophenol

118. Aromatic nitrile (ArCN) cannot be formed by which of the following reaction ?

- (A) $\text{ArX} + \text{KCN}$ (B) $\text{ArCONH}_2 + \text{P}_2\text{O}_5$
(C) $\text{Ar N}^+\text{Cl}^- + \text{CuCN}$ (D) $\text{ArCONH}_2 + \text{SOCl}_2$

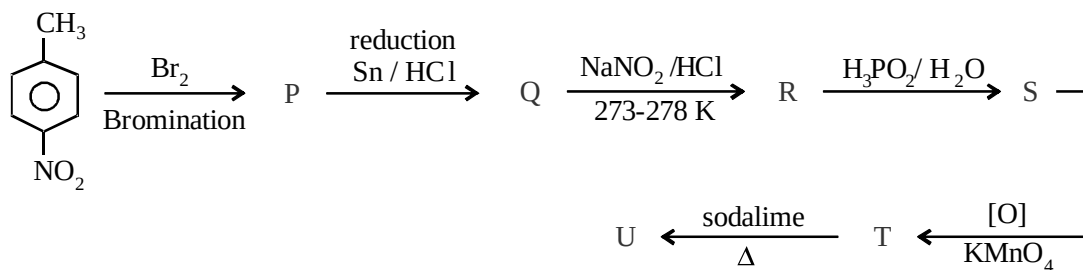
119. Identify structural formula of optically active compound [X] having molecular formula $\text{C}_8\text{H}_{11}\text{N}$ which is soluble in aqueous HCl and produces N_2 on reaction with HNO_2 ?



120. Which oxidized product is obtained by reaction between benzene diazonim chloride with hypo phosphorous acid ?

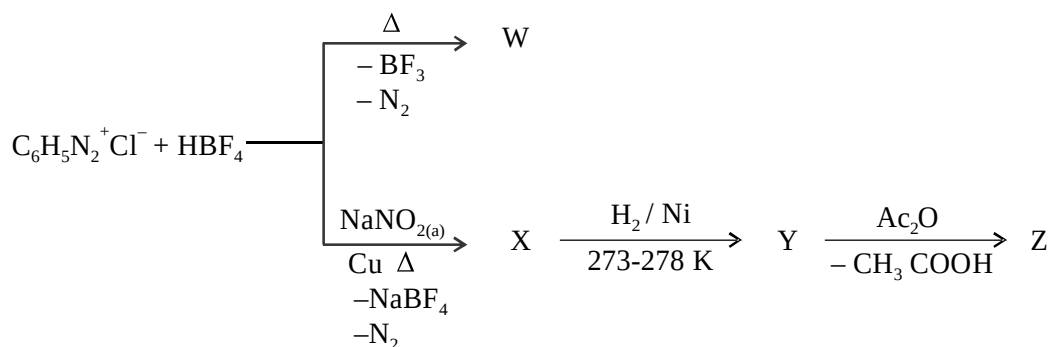
- (A) H_3PO_4 (B) $\text{H}_4\text{P}_2\text{O}_7$
(C) H_3PO_3 (D) None

121. Identify [U] in the given reaction :



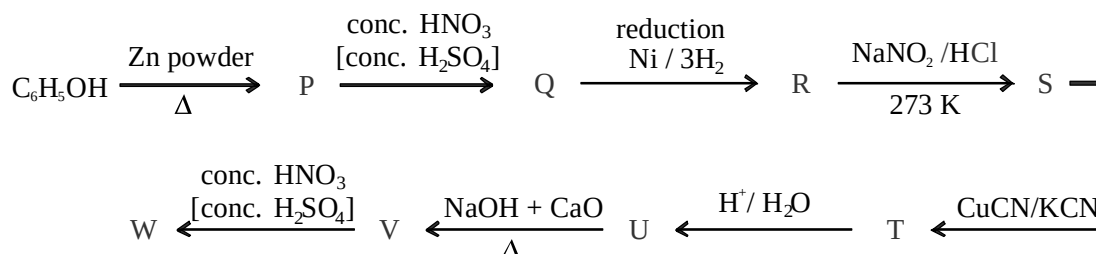
- (A) benzene (B) 1, 2-di bromo benzene
(C) bromo benzene (D) 1, 2-di bromo benzene acid

122. In the given reaction give the IUPAC names of products W and Z respectively.



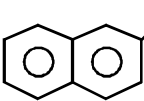
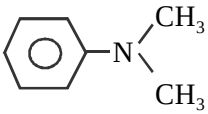
- (A) Benzene, acetanilide (B) Fluoro benzene, acetanilide
 (C) Toluene, N-acetanilide benzanamide (D) Fluoro benzene, N- phenyl ethanamide

123. In the given reaction which two products will be same ?



- (A) P and V (B) Q and W (C) R and V (D) Both (A) and (B)

124. By reaction of benzene diazonium chloride with reactant in the column I to give coloured products. Their names are given in column II. Then select the correct option.

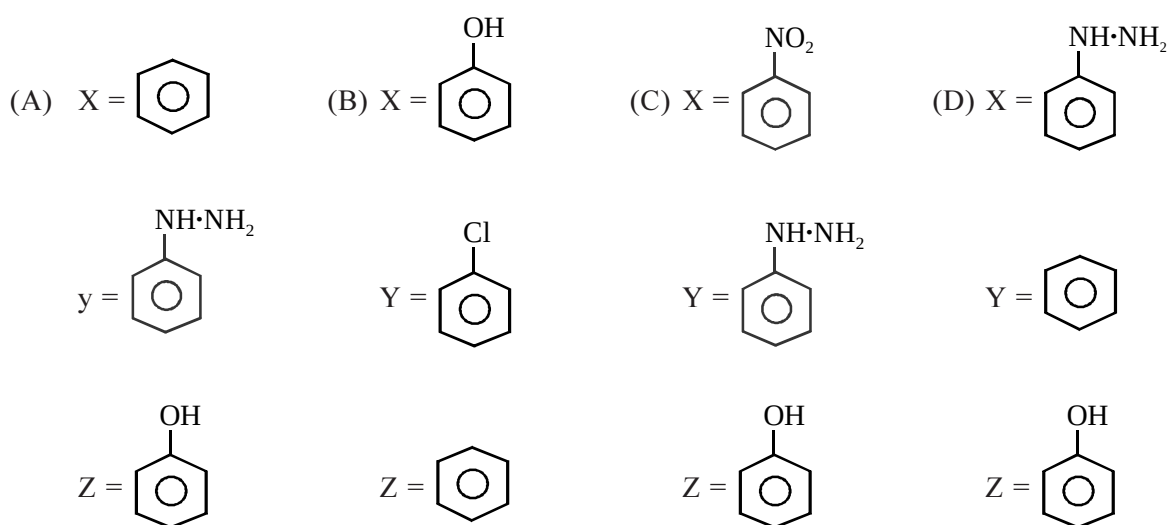
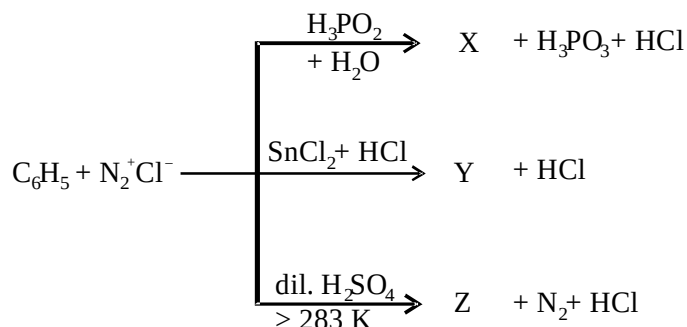
Column-I	Column-II
(P)  OH/NOOH	(T) p-amino azo benzene
(Q)  / NaOH	(U) p-N, N-di methyl amino azo benzene
(R)  / HCl	(V) p-hydroxy azo benzene
(S)  / HCl	(W) β-naphthyl azo benzene

- (A) (P)–(U), (Q)–(V), (R)–(W), (S)–(T) (B) (P)–(V), (Q)–(W), (R)–(T), (S)–(U)
 (C) (P)–(T), (Q)–(U), (R)–(V), (S)–(W) (D) (P)–(W), (Q)–(T), (R)–(U), (S)–(V)

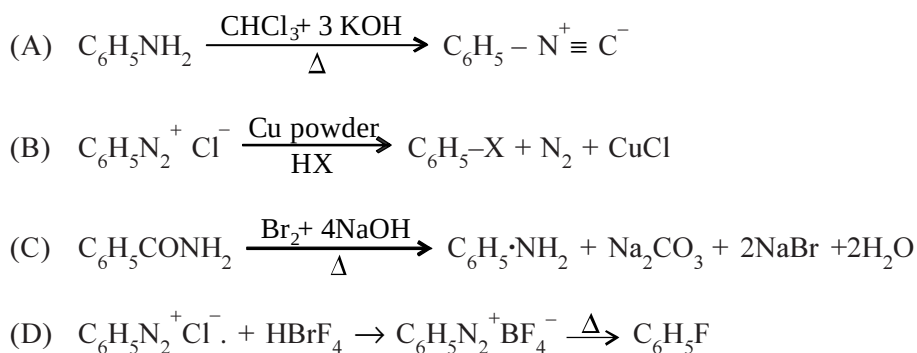
125. Which of the following compound is not formed by Sandmeyer reaction ?

- (A) chloro benzene (B) bromo benzene (C) benzene nitrile (D) iodo benzene

126. Identify X, Y and Z in the given reaction. :



127. Which of the following reaction is known as Balz Schiemann reaction ?



128. Which of the following diazonium salt is stable at room temperature ?

- (A) $\text{C}_6\text{H}_5\text{N}_2^+ \text{Cl}^-$ (B) $\text{C}_6\text{H}_5\text{N}_2^+ \text{HSO}_4^-$ (C) $\text{C}_6\text{H}_5\text{N}_2^+ \text{BF}_4^-$ (D) B and C

129. Which product is obtained by reaction of benzene diazonium chloride's (salt) Gomberg reaction ?



130. Which of the following gives Liberman's test ?
 (A) 1° amine (B) 2° amine (C) 3° amine (D) all the given
131. By reaction of 2° amine with HNO_2 formed coloured oily liquid which on heating with phenol and concentrated H_2SO_4 forms colour solution, on adding NaOH to it becomes coloured solution. This solution on dilution turns coloured solution.
 (A) yellow, green, blue, red (B) green, yellow, blue, red
 (C) blue, red, yellow, green (D) red, yellow, blue green
132. Which product is obtained by reaction of benzene diazonium chloride with bromo benzene in presence of NaOH?
 (A) diphenyl (B) p-bromo diphenyl
 (C) P, P'-dibromo, diphenyl (D) p-bromo azo benzene

Answers : 104. (C), 105. (A), 106. (D), 107. (A), 108. (D), 109. (C), 110. (C), 111. (A), 112. (A), 113. (C), 114. (B), 115. (A), 116. (B), 117. (C), 118. (A), 119. (D), 120. (B), 121. (C), 122. (D), 123. (D), 124. (B), 125. (D), 126. (A), 127. (D), 128. (C), 129. (A), 130. (B), 131. (A), 132. (B)

• **Cyanide or nitrile compounds**

• **Electronic structure :**

– $\text{C} \equiv \text{N}$ group 1 σ and two π bond.

Hybridization of C and N is sp

R – C – N bond angle 180°

• **Physical properties :**

Their boiling points are lower than the corresponding carboxylic acid. Fragrant smell and non toxic.

Very weak basic compounds.

• **IUP(A)(C) nomenclature:**

After deciding the longest chain of carbon of hydrocarbon root including the carbon of nitrile group word nitrile is added.

If -CN group is attached to cyclic system then suffix 'carbonitrile' is added.

• **Common Nomenclature :**

At the end of the hydrocarbon group word cyanide is placed

Example : (1) $\text{CH}_3 - \text{C} \equiv \text{N}$

IUPAC • ethane nitrile

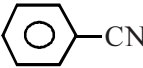
common • methylcyanide

• acetonitrile

Example : (2)  -CN

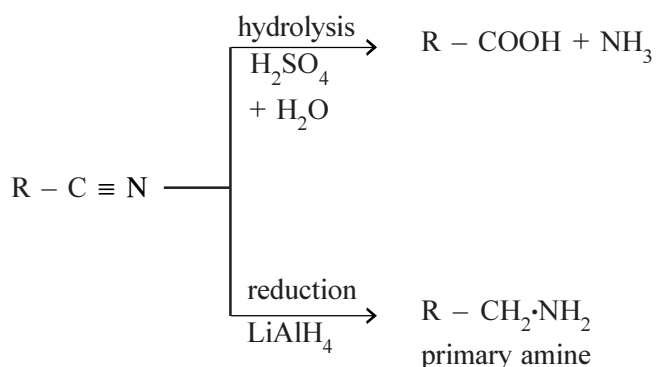
I → benzene carbonitrile

common → phenyl cyanide

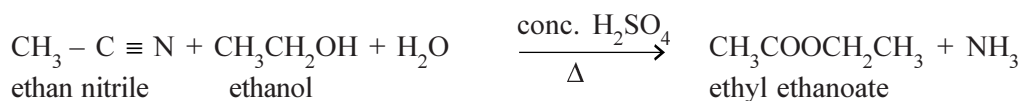
No.	Structural formula	Common name	IUPAC name	Boiling point
1.	$\text{CH}_3 - \text{CN}$	Methyl cyanide	ethane nitrile	355 K
2.	$\text{CH}_3 - \text{CH}_2 - \text{CN}$	Ethyl cyanide	Propane nitrile	370 K
3.	$\text{CH}_2 = \text{CH} - \text{CN}$	Vinyl cyanide (acrylonitrile)	Prop-2-ene nitrile	351 K
4.	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CN}$	Propyl cyanide	Butane nitrile	391 K
5.	$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CN} \\ \\ \text{CH}_3 \end{array}$	Iso propyl cyanide	2-methyl propane nitrile	377 K
6.		Phenyl cyanide (benzonitrile)	Benzene carbonitrile or benzonitrile	464 K

• **Chemical properties :**

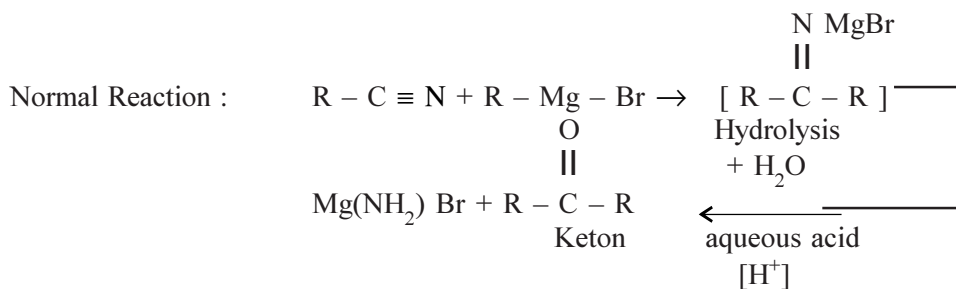
- (i) On hydrolysis reaction of cyanide compounds in presence of H_2SO_4 carboxylic acid forms and ammonia gas liberated.



- (ii) On heating ethane nitrile and ethanol in presence of conc. H_2SO_4 ethyl ethanoate forms.



- (iii) On hydrolysis of intermediate product by aqueous acid formed by addition reaction between cyanide compound and Grignard reagent gives ketone.



- **Isocyanide compounds:**

General formula : $R - N^+ \equiv C^+$ $R = \text{alkyl or aryl}$

- **Physical properties :**

Very high foul smelling, highly toxic and less soluble in water. Their boiling points are lower than alkyl cyanide.

- **IUPAC nomenclature :**

Prefix "iso" is placed before the name of cyanide compounds.

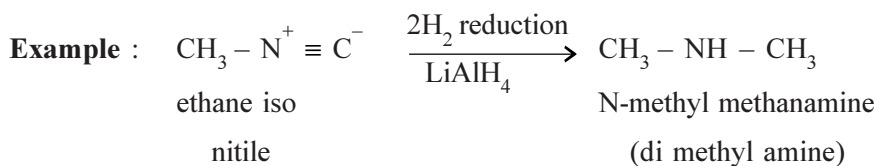
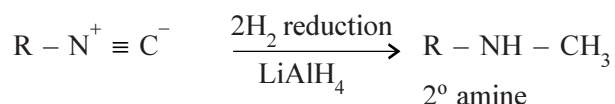
At the end word carbyl amine is placed.

Example : CH_3NC

Methyl isocyanide or methyl carbyl amine or ethane iso nitrile.

- **Reduction of isocyanide compounds**

- Isocyanide compounds on reduction with LiAlH_4 gives secondary amine as product.



- **Nitro compounds**

General formula : R-NO_2 , where R = alkyl or aryl

IUPAC nomenclature : after deciding the longest carbon chain of alkane root prefix ‘Nitro’ is placed before the alkane name.

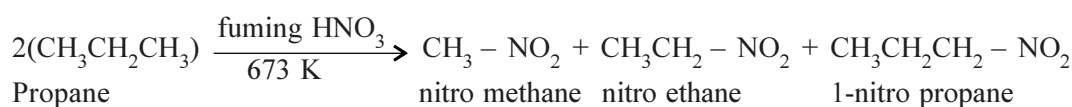
- **Physical properties :**

Colourless, neutral, less soluble in water

Due to resonance in nitro group alkyl nitro compounds are most polar than compounds of other functional group.

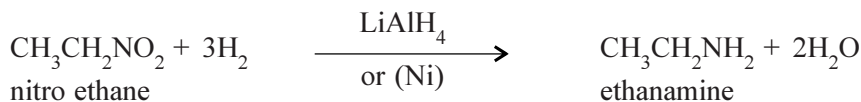
- **Preparation :**

On heating alkane hydro carbon with fuming nitric acid in gaseous state at 673 K gives mixture of alkyl nitro compounds.



• **Reduction of nitro compounds:**

On reducing nitro alkane by LiAlH_4 or dihydrogen in presence of nickel catalyst gives primary alkyl amine.



133. Which of the following gas is responsible for Bhopal accident ?

- (A) $\text{CH}_3 - \text{N} = \text{C} = \text{O}$ (B) $\text{CH}_3 - \text{CH} = \text{N} = \text{S}$
 (C) $\text{CH}_3 - \text{N} = \text{C} = \text{S}$ (D) $\text{CH}_3 - \text{O} - \text{N} = \text{S}$

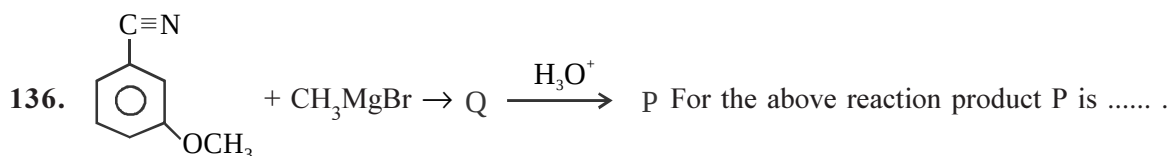
134. Select proper option for given sentences on the basis of physical properties :

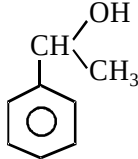
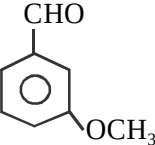
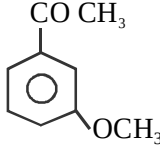
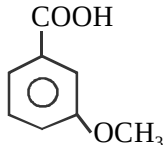
- (i) Alkyl iso cyanide possess foul smell, while alkyl cyanide possess fragrant smell.
 (ii) Alkyl cyanide compounds are toxic compounds.
 (iii) Boiling point of alkyl cyanides are less than the isomeric alkyl iso cyanide.
 (iv) Aceto nitrile is soluble in water while methyl carbyl amine is not soluble in water.

- (A) T T T F (B) T F T F (C) T F F F (D) T F F T

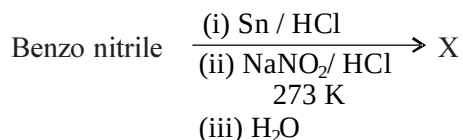
135. Which product is obtained by the hydrolysis of the product obtained by the reaction between butane nitrile and ethyl magnesium bromide?

- (A) ethyl-n-propyl ether (B) ethoxy propane
 (C) ethyl propanoate (D) hexan-3-one



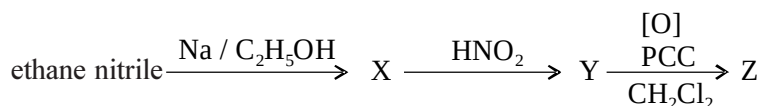
- (A)  (B)  (C)  (D) 

137. Identify X in the following reaction :

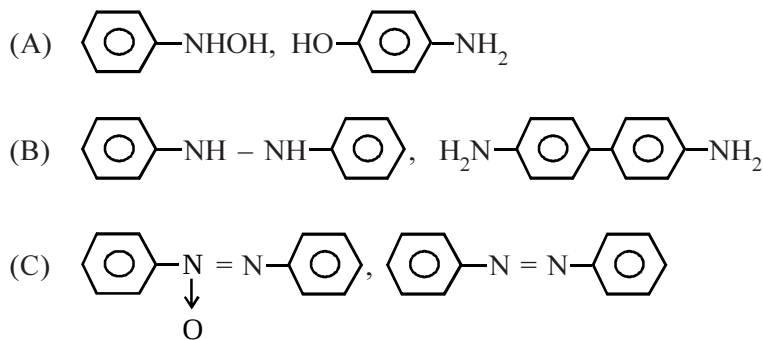


- (A) toluene (B) benzoyl alcohol
 (C) benzaldehyde (D) benzene diazonium chloride

138. In allyl isocyanide number of σ and π bonds are and
- (A) 9 σ and 3 π (B) 3 σ and 4 π (C) 9 σ and 9 π (D) 5 σ and 7 π
139. Which of the following is correct name for $\text{CH}_2 = \text{CH}-\text{CN}$?
- (A) acrylo nitrile (B) vinyl cyanide
(C) prop-2-ene-nitrile (D) all the above are correct
140. What is the correct IUPAC name of CH_3NC ?
- (A) methyl isonitrile (B) ethan isonitrile
(C) methylcarbonyl amine (D) Both (B) and (C)
141. For the given reaction identify X, Y and Z.



- (A) X = ethanol, Y = ethanal, Z = ethanoic acid
(B) X = ethyl amine, Y = ethanol, Z = ethanal
(C) X = ethanamide, Y = ethanol, Z = ethanal
(D) X = ethanoic acid, Y = ethanol, Z = ethanal
142. In the given reaction $\text{C}_6\text{H}_5-\text{NO}_2 \xrightarrow[\text{NH}_4\text{Cl}]{\text{Zn Powder}} \text{X} \xrightarrow[\text{conc. HCl}]{\text{cold}} \text{Y}$. X and Y are respectively and



(D) None of the given

- In the following reactions two sentences are given. In which one sentence is assertion (A) and other is reason (R). carefully study the sentences and choose the proper option as per following give instructions.

- (A) Assertion (A) is correct, reason (R) is correct and Reason (R) is correct explanation of assertion (A)
(B) Assertion (A) is correct, reason (R) is correct and Reason (R) is not correct explanation of assertion (A)
(C) Assertion (A) is correct, reason (R) is incorrect
(D) Assertion (A) is incorrect, reason (R) is correct

- 143. Sentence (A) :** Aniline is less basic than p-toluidine.
Reason (R) : p-toluidine is more basic than aniline because $-\text{CH}_3$ group present in it is e^- donor group.
- 144. Sentence (A) :** Primary aliphatic form most stable alkyl diazonium chloride salt.
Reason (R) : Benzene diazonium chloride is easily soluble in water while benzene diazonium fluoro borate is insoluble in water.
- 145. Sentence (A) :** Aniline is weaker base than ammonia.
Reason (R) : Aniline is more stable than resonance.
- 146. Sentence (A) :** p-nitro aniline is weaker base than p-toluidine.
Reason (R) : As $-\text{NO}_2$ group in p-nitro aniline is e^- attracting group hence p-nitro aniline become strong base.
- 147. Sentence (A) :** Benzo nitrile cannot be prepared by nucleophilic substitution reaction of benzene.
Reason (R) : Benzo nitrile can be easily prepared from benzene diazonium chloride salt.

• **Questions containing one or more than one correct answers :**

- 148.** By which of the following m-nitro benzene can be converted into m-nitro aniline?
 (A) $(\text{NH}_4)_2\text{S}$ (B) Zn/NaOH (C) $\text{Sn} + \text{HCl}$ (D) $\text{Zn} + \text{NH}_4\text{Cl}$
- 149.** Benzonitrile is formed when....
 (A) on heating bromo benzene with alcoholic KCN.
 (B) on heating benzene diazonium chloride with KCN in presence of Cu powder.
 (C) on fusion of sodium benzenesulphonate with NaCN.
 (D) on heating benzaldoxime with acetic anhydride.
- 150.** A compound X with molecular formula $\text{C}_4\text{H}_{11}\text{N}$ on reaction with HNO_2 forms tertiary alcohol with molecular formula $\text{C}_4\text{H}_{10}\text{O}$, then compound X gives which of the following reaction ?
 (A) Carbyl amine test.
 (B) Hoffman mustard reaction.
 (C) On reaction with HNO_2 diazonium salt.
 (D) On oxidation with KMnO_4 gives 2-methyl-2-nitro propane.
- 151.** p-chloro aniline and anilinium hydrochloride can be separated by which reaction ?
 (A) Sandmeyer (B) NaHCO_3
 (C) AgNO_3 (D) Carbyl amine test

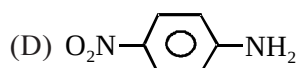
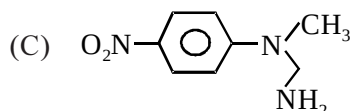
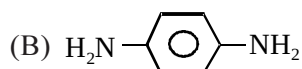
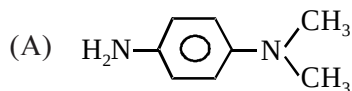
• **Mixed type questions :**

- 152.** Compound X whose molecular formula is $\text{C}_2\text{H}_3\text{N}$. on its reduction compound Y is formed. Its reaction with HNO_2 gives ethanol. On heating with chloroform and alcoholic KOH gives compound [Z] with specific smell, then compound Z is.....
 (A) $\text{CH}_3\text{CH}_2\text{NH}_2$ (B) $\text{CH}_3\text{CH}_2\text{N} \equiv \text{C}$ (C) $\text{CH}_3 - \text{C} \equiv \text{N}$ (D) $\text{CH}_3\text{CH}_2\text{OH}$

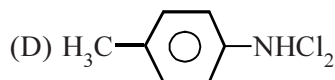
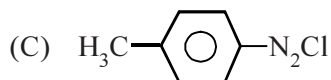
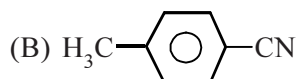
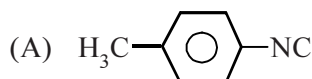
153. Which indicator is formed by reaction of diazonium salt of sulphanilic acid with N, N dimethyl aniline ?

- (A) methyl red (B) methyl orange (C) indigo (D) phenolphthalein

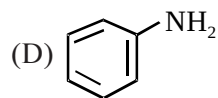
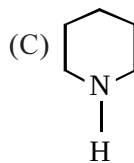
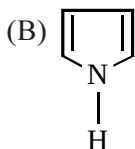
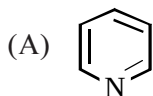
154. $\text{F}-\text{C}_6\text{H}_4-\text{NO}_2 \xrightarrow[\text{DMF}, \Delta]{(\text{CH}_3)_2\text{NH}}$ X $\xrightarrow{\text{H}_2 / \text{Ni}}$ Y here Y is



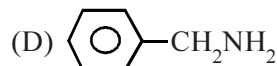
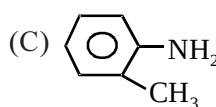
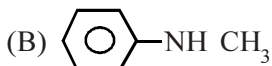
155. What is obtained by reaction of p-toluidine, chloroform and alcoholic KOH ?



156. Which of the following is strongest base ?



157. Which of the following is strongest base ?



158. Reaction of benzamide with POCl_3 gives

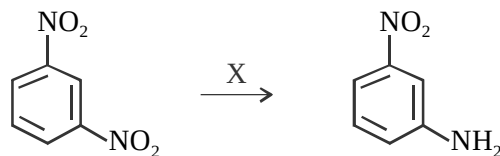
- (A) aniline (B) benzonitrile (C) chloro benzene (D) benzyl amine

159. Which of the following reaction is not useful for the synthesis of separation of amines ?

- (A) Hinsberg method (B) Hoffmann method (C) Wurtz reaction (D) Curtius reaction

160. Which of the following amine do not produces N_2 gas on heating with HNO_2 ?

- (A) tri methyl amine (B) ethyl amine
(C) secondary butyl amine (D) iso propyl amine

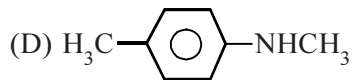
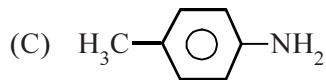
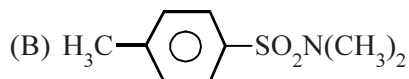
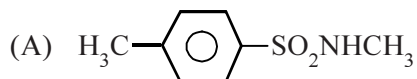
161.  here X is =

- (A) Na_2S (B) Sn/HCl (C) LiAlH_4 (D) all the given

162. Which of the following gives yellow oily liquid with nitrous acid ?

- (A) methyl amine (B) aniline (C) dimethyl aniline (D) trimethyl amine

163. Which of the following is soluble in NaOH ?



164. What is obtained on reaction of acetaldoxime with P_2O_5 ?

- (A) methyl cyanide (B) methyl cyanate
(C) ethyl cyanide (D) none

Answers : 133. (A), 134. (D), 135. (D), 136. (C), 137. (B), 138. (A), 139. (D), 140. (D),
141. (B), 142. (A), 143. (A), 144. (D), 145. (B), 146. (C), 147. (B), 148. (A),
149. (B), (C), (D), 150. (A), (B), (C), (D), 151. (A), (B), (C), 152. (C), 153. (B),
154. (A), 155. (A), 156. (C), 157. (D), 158. (B), 159. (C), 160. (A), 161. (A),
162. (C), 163. (A), 164. (A)

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