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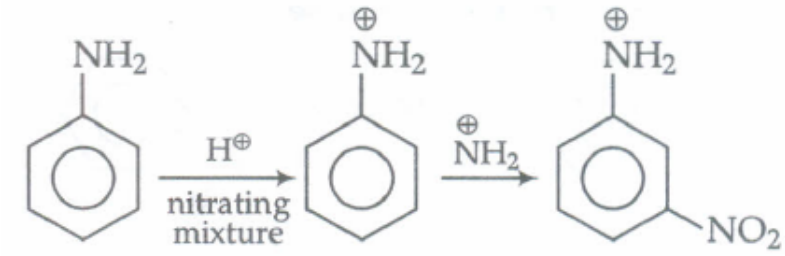
Time : 40 Mins | **Organic Compounds Containing Nitrogen - 1 Important Questions With Answers NEET Chemistry 2023 1** | **Marks : 160**

1. Nitration of aniline in strong acidic medium also gives m-nitroaniline because:
   a) In absence of substituents nitro group always goes to m-position.
   b) In electrophilic substitution reactions amino group is meta directive.
   c) Inspite of substituents nitro group always goes to only m-position.
   d) In acidic (strong) medium aniline is present as anilinium ion.

   Solution : -
   In acidic medium aniline is present as anilinium ion.



   In acidic medium, aniline is protonated to form anilinium ion which is m-directing. Hence besides para (51%) and ortho (2%), meta product (47%) is also formed in significant yield.

2. Which of the following reactions is appropriate for converting acetamide to methanamine?
   a) Carbylarnine reaction b) Hofmann bromarnide reaction c) Stephens reaction
   d) Gabriel phthalirnide synthesis

   Solution : -
   Acetamide ⇒ $CH_3 - \overset{O}{\overset{\|}{C}} - NH_2$
   Methanamine ⇒ CH_3NH_2
   Thus, it is the conversion of an amide into a primary amine with one carbon less in number. This conversion can be done by Hofmann bromamide reaction.

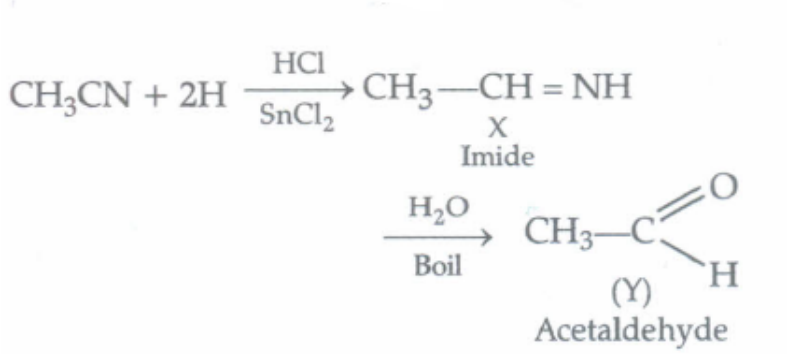
   $CH_3 - \overset{O}{\overset{\|}{C}} - NH_2 + Br_2 + 4KOH \xrightarrow{\Delta} CH_3NH_2 + 2KBr + 2K_2CO_3 + H_2O$

3. Phenyl isocyanides are prepared from which of the following reaction?
   a) Rosenmund's reaction **b) Carbylamine reaction** c) Reimer-Tiemann reaction d) Wurtz reaction

   Solution : -
   $C_6H_5NH_2 + CHCL_3 + 3\underset{(alc.)}{KOH} \rightarrow \underset{(alc.)}{C_6H_5NC} + 3KCl + 3H_2O$

4. In the reaction,
   $CH_3CN + 2H \xrightarrow[SnCl_2]{HCl} X \xrightarrow{Boiling} H_2OY$, the term Y is:
   a) acetone b) ethanamine c) acetaldehyde d) dimethyl amine

Solution : -



5. Consider the following sequence of reactions compound [A] $\xrightarrow{Reduction}$ [B] $\xrightarrow{HNO_2}$ CH_3CH_2OH The compound [A] is:
   a) CH_3CH_2CN b) CH_3NO_2 c) CH_3NC **d) CH_3CN**

   Solution : -

   $$\underset{(A)}{CH_3C} \equiv N \xrightarrow[LiAlH_4]{Reduction} CH_3 - \underset{(B)}{CH_2} - NH_2 \xrightarrow{HNO_2} CH_3CH_2OH$$

6. The product formed by the reaction of an aldehyde with a primary amine is:
   a) carboxylic acid b) aromatic acid **c) Schiff's base** d) ketone

   Solution : -

7. Which one of the following on reduction with $LiAlH_4$ yields a secondary amine?
   a) Methyl isocyanide b) Acetamide c) Methyl cyanide d) Nitroethane

   Solution : -

   $$CH_3 - \underset{(Methylisocyanide)}{N \equiv C} + 4[H] \xrightarrow{LiAlH_4} CH_3 \underset{Dimethylamine}{NHCH_3}$$

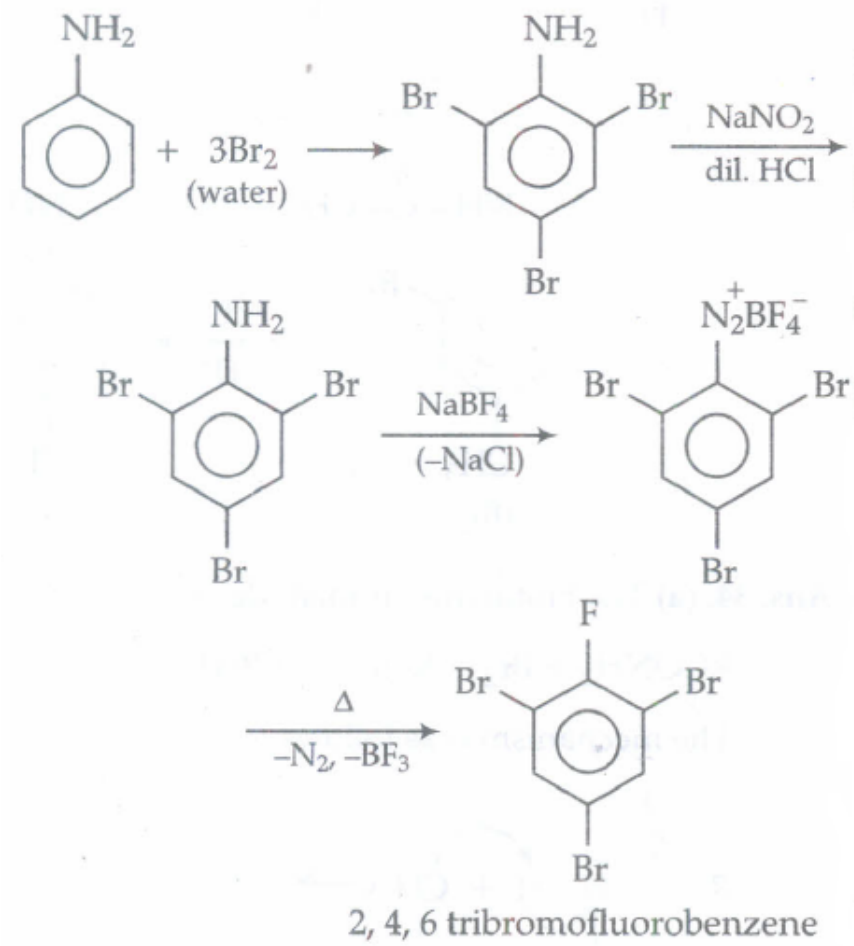
8. Which of the following is more basic than aniline?
   a) Diphenylamine b) Triphenylamine c) *p*-nitroaniline **d) Benzylamine**

   Solution : -

   benzyl amine $C_6H_5CH_2$ - $\ddot{N}H_2$ is more basic than aniline because benzyl group ($C_6H_5CH_2$-) shows +I effect. Thus it increases electron density at nitrogen and makes easy donation of lone pairs.

9. Anline is reacted with bromine water and the resulting product is treated with an aqueous solution of sodium nitrite in presence of dilute hydrochloric acid. The compound so formed is converted into a tetrafluoroborate which is subsequently heated. The final product is:
   a) 1, 3, 5 - trbromobenzene b) p - bromofluorobenzene c) p - bromoaniline
   d) 2, 4, 6 - tribromofluorobenzene

   Solution : -



2, 4, 6 tribromofluorobenzene

10. What is the decreasing order of basicity of 1^0, 2^0, and 3^0 ethyl amines and ammonia?
    a) $NH_3 > C_2H_5NH_2 > (C_2H_5)_2NH > (C_2H_5)_3N$ b) $(C_2H_5)_3N > (C_2H_5)_2NH > C_2H_5NH_2 > NH_3$
    c) $(C_2H_5)_3NH > C_2H_5NH_2 > (C_2H_5)_3N > NH_3$ **d) $(C_2H_5)_2NH > (C_2H_5)_3N > C_2H_5NH_2 > NH_3$**

    Solution : -

    We know that as the number of alkyl groups increases the electron density on nitrogen atom also increases so basic character increases but 3^0 amines are less basic than 2^0 amine due to steric hindrance. Thus correct order of basicity is

    $NH_3 > C_2H_5NH_2 > (C_2H_5)_3 < (C_2H_5)_2NH$

11. For carbylamine reaction, we need hot ale, KOH and:
    a) any primary amine and chloroform b) chloroform and silver powder
    c) a primary amine and an alkyl halide d) a mono alkyl amine and trichloromethane

    Solution : -

    $CH_3CH_2NH_2 + CHCl_3 + 3KOH\ (alc.) \longrightarrow \underset{\substack{Alkyl\\ isocyanide}}{RNC} + 2KCl + 3H_2O$

    When any (aliphatic or aromatic) primary amines warmed with chloroform and an alcoholic solution of KOH form isocyanide or carbylamine.

12. Mark the correct statement:
    a) Methyl amine is slightly acidic b) Methyl amine is less basic than ammonia
    c) Methyl amine is a stronger base than NH_3 d) Methyl amine forms salts with alkalies

    Solution : -

    Methyl amine is a stronger base than NH_3 due to +I effect of CH_3 which increase the electron density on the nitrogen atom therefore they can donate electron pair more easily than ammonia.

13. Calgon used as a water softner, is

a) $Na_2\,[Na_4(PO_3)_5]$ b) $Na_4[Na_3(P)_3)_6]$ c) $Na_4\,[Na_4(PO_4)_5]$ d) $Na_4\,[Na_2(PO_4)_6]$

Solution : -

Sodium polymetaphosphate is used to remove the permanent hardness of water. The commercial name of sodium polymetaphosphate is Calgon meaning calcium gone. The molecular formula of Calgon is $Na_2[Na_4(PO_3)_5]$.

14. The non-essential amino acid among the following is: _____.

a) Leucine **b) Alarrine** c) Lysine d) Vatine

Solution : -

Alanine.

15. The correct order of the basic strength of methyl-substituted amines in aqueous solution is: _____.

a) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$ b) $(CH_3)_3N > (CH_3)_2NH_2 > CH_3NH_2$ c) $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N^2$
d) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$

Solution : -

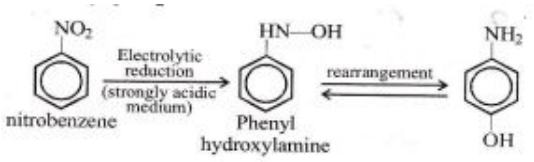
In aqueous solution, electron-donating inductive effect, solvation effect (H-bonding) and steric hindrance all together affect basic strength of substituted amines Basic character:
$(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$ $2^o1^o3^o$

16. The electrolytic reduction of nitrobenzene in strongly acidic medium produces _____.

a) Azoxybenzene b) Azobenzene c) Aniline **d) P-Aminophenol**

Solution : -

In strong acidic medium electrolytic reduction of $C_6H_5NO_2$



17. The number of structural isomers possible from the molecular formula C_3H_9N is _____.

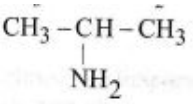
a) 4 b) 5 c) 2 d) 3

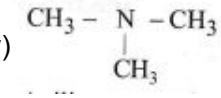
Solution : -

(a) C_3H_9N following isomers-

(i) $CH_3\text{-}CH_2\text{-}CH_2\text{-}NH_2$

(ii) $CH_3\text{-}NH\text{-}CH_2\text{-}CH_3$

(iii) 

(iv) 

18. Method by which Aniline cannot be prepared is: _____.

a) hydrolysis of phenyl isocyanide with acidic solution

b) degradation of benzamide with bromine in alkaline solution

c) reduction of nitrobenzene with H_2/pd in ethanol

d)

potassium salt of phthalimide treated with chlorobenzene followed by hydrolysis with aqueous NaOH solution.

Solution : -

Aniline cannot be prepared by this method as aryl halides do not sustain nucleophilic substitution reaction with potassium phthalimide under mild condition.

19. Which of the following will be most stable diazonium salt $RN_2^+X^-$?

a) $CH_3N_2^+X$ **b) $C_6H_5N_2^+X^-$** c) $CH_3CH_2N_2^+X^-$ d) $C_6H_5CH_2N_2^+X^-$

Solution : -

Arene diazonium salts are more stable compared to given options due to the dispersal of +ve charge on the benzene ring due to resonance.

20. Some reactions of amines are given. Which one is not correct?

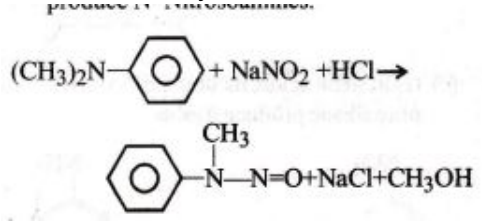
a) $(CH_3)_2NH + NaNO_2 + HCl \rightarrow (CH_3)_2\,N - N = O$ **b)** 

c) $CH_3CH_2NH_2 + HNO_2 \rightarrow CH_3CH_2OH + N_2$

d) $CH_3NH_2 + C_6H_5SO_2Cl \rightarrow CH_3NHSO_2C_6H_5$

Solution : -

When secondary amine mixed with nitrous acid to

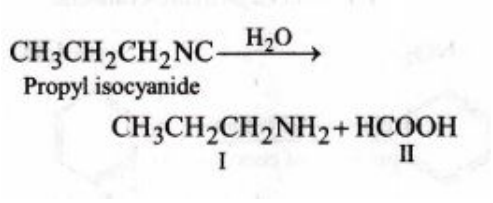


21. On hydrolysis of a "compound", two compounds are obtained. One of which on treatment with sodium nitrite and hydrochloric acid gives a product which does not respond to iodoform test. The second one reduces Tollen's reagent and Fehling's solution. The "compound" is _____.

a) $CH_3CH_2CH_2CON(CH_3)_2$ **b) $CH_3CH_2CH_2NC$** c) $CH_3CH_2CH_2CN$ d) $CH_3CH_2CH_2ON=O$

Solution : -

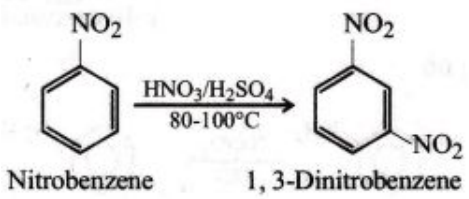
Hydrolysis of propyl isocyanide ($CH_3CH_2CH_2NH_2$) gives $CH_3CH_2CH_2NH_2$ + HCOOH. On treatment with $NaCO_2$ and HCl, I gives $CH_3CH_2CH_2OH$ which does not given iodoform test. II(HCOOH) reduces Tollen's reagent and Fehling's solution.



22. Nitrobenzene on reaction with conc. HNO_3/H_2SO_4 at 80-100^oC forms which one of the following produces?

a) 1, 3 - Dinitrobenzene b) 1, 4-Dinitrobenzene c) 1, 2, 4 - Trinitrobenzene d) 1, 2-Dinitrobenzene

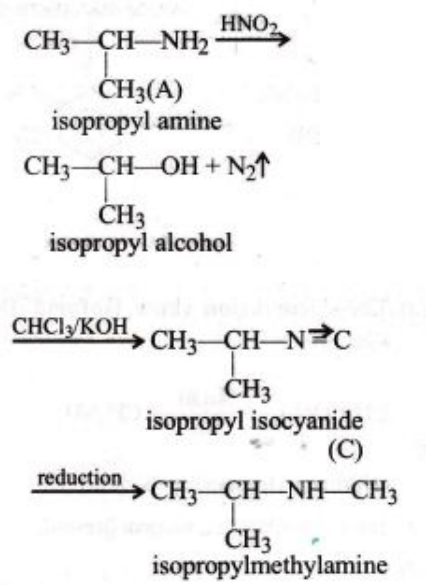
Solution : -



23. An organic compound (C_3H_9N) (A), when treated with nitrous acid, gave an alcohol and N_2 gas was evolved. (A) on warming with $CHCl_3$ and caustic potash gave (C) which on reduction gave isopropyl methylamine. Predict the structure of (A).

a)  b) CH_3CH_2-NH-CH_3 c)  d) $CH_3CH_2CH_2$-NH_2

Solution : -



24. Which of the following statements about primary amines is 'False'?
    a) Alkylamines are stronger bases than aryl amines
    b) Alkylamines react with nitrous acid to produce alcohols
    c) Aryl amines react with nitrous acid to produce phenols
    d) Alkylamines are stronger bases than ammonia

    Solution : -

    Aryl amines mixed with nitrous acid to produce diazonium salt and not phenol.

25. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4 in the mixture, nitric acid acts as a/an _____.
    a) acid **b) base** c) catalyst d) reducing agent

    Solution : -

    $$\underset{\text{Base}}{HONO_2} + H_2SO_4 \longrightarrow NO_2^+ + H_2O + HSO_4^-$$

    According to above reaction, nitric acid acts as a base having accepted a proton.

26. Which one of the following on reduction with lithium aluminiurn hydride yields a secondary amine?
    a) Methyl isocyanide b) Acetamide c) Methyl cyanide d) Nitroethane

    Solution : -

    In presence of $LiAlH_4$ reduction of alkyl isocyanides produces 2^o amines which is having methyl.

    $$R - N \equiv C + 4[H] \xrightarrow{LiAlH_4} \underset{2^\circ amine}{R - NH - CH_3}$$

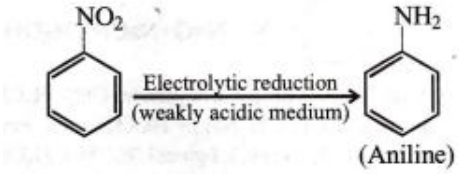
    e.g $CH_3 - N \equiv C + 4[H] \xrightarrow{LiAlH_4} \underset{dimethylamine}{CH_3 - NH - CH_3}$

    whereas, alkyl cyanides give 1^o amine on reduction.

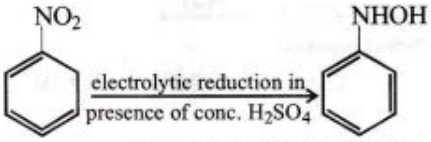
27. Electrolytic reduction of nitrobenzene in weakly acidic medium gives _____.
    a) N-Phenylhydroxylamine b) Nitrosobenzene **c) Aniline** d) P- Hydroxyamline

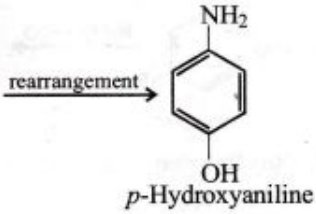
    Solution : -

(I) In weak acidic medium, Electroll'tic reduction of nitroalkane produce Aniline.



(II) When strong acidic medium t
it produces *p*–hydroxyaniline.





28. Amides can be converted into amines by a reaction named after _____.
a) Pertin b) Claisen **c) Hofmann** d) Kekule

Solution : -

Amides can be converted into amines by Hofmann's bromamide reaction. This reaction is named after Hofmann. The reaction is as follow,

$$-\mathrm{CONH_2} + \mathrm{Br_2}(l) + 4\mathrm{KOH} \rightarrow -\mathrm{NH_2} + 2\mathrm{KBr} + \mathrm{K_2CO_3} + 2\mathrm{H_2O}$$

29. The decomposition of organic compounds, sin the presence of oxygen and without the development of odoriferous substances is called _____.
a) decay b) N_2 - fixation c) nitrification d) dentrification

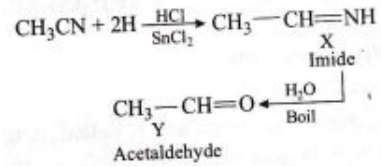
Solution : -

Decomposition of organic compounds in the presence of oxygen is generally called decay. The remaining three reaction takes place in the presence of bacteria.

30. In the reaction, $\mathrm{CH_3CN} + 2\mathrm{H}\ \overset{\mathrm{HCl}}{\mathrm{SnCl_2}} \longrightarrow \mathrm{X} \overset{\text{Boiling } \mathrm{H_2O}}{\longrightarrow} \mathrm{Y}$, then the Y is _____.

a) acetone b) ethanamine **c) acetaldehyde** d) dimethylamine

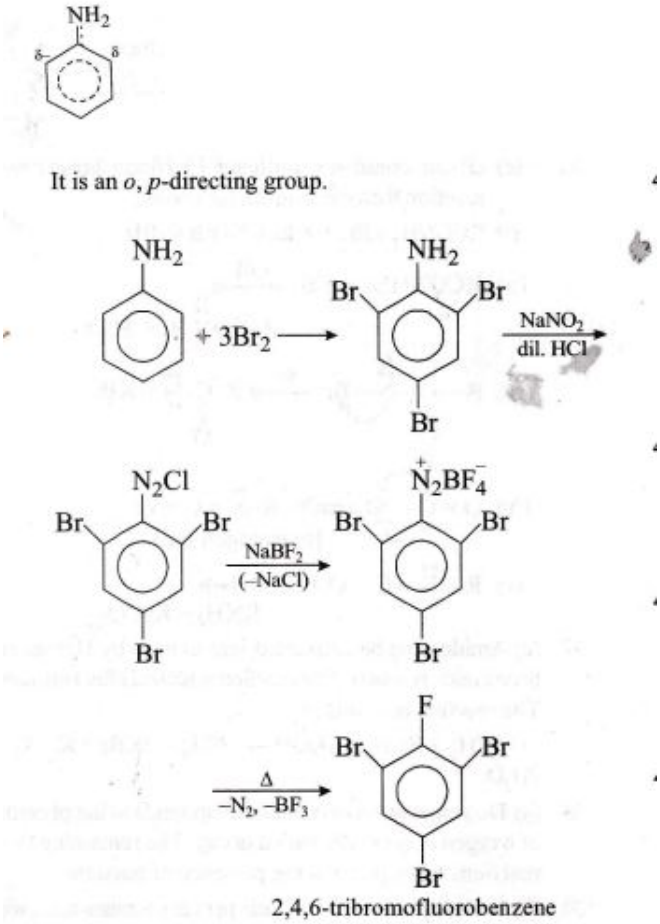
Solution : -



31. Aniline is reacted with bromine water and the resulting product is heated with an aqueous solution of sodium nitrite in presence of dilute hydrochloric acid. The compound so formed is converted into a tetrafluoroborate which is subsequently heated. The final product is _____.
a) 1, 3, 5-tribromo benzene b) p-bromofluoro benzenea c) p-bromoaniline
d) 2, 4, 6-tribromofluoro benzene

Solution : -

-NH_2 group is greatly activating group. Hence, reaction takes place rapidly.



32. Consider the following sequence of reactions $\text{Compound [A]} \xrightarrow{\text{Reduction}} \text{[B]} \xrightarrow{HNO_2} CH_3CH_2OH$.The compound [A] is _____.
a) CH_3CH_2CN b) CH_3NO_2 c) CH_3NC d) CH_3CN

Solution : -

$$CH_3C \equiv N \text{ A } \xrightarrow[LiAlH_4]{\text{Reduction}} CH_3 - CH_2 - NH_2 \xrightarrow{HNO_2} CH_3CH_2OH$$

I^o amme (Ethanamine)

$\therefore$ A is CH_3CN.

33. A reagent suitable for the determination of N-terminal residue of a peptide is _____.
a) p-toluene sulphonyl chloride b) 2,4-dinitrophenyl hydrazine c) carboxypeptidase
d) 2,4-dinitrofl uorobenzene

Solution : -

2,4-dinitrofluorobenzene is called ganger's reagent. When this reagent reacts with amino group of peptide chain, it form 2,4-dinitrophenyl derivatives which on hydrolysis tbrm DNP derivatives of amino acids.

34. The compound obtained by heating a mixture of primary amine and chloroform with ethanolic potassium hydroxide (KOH) is _____.
a) an alkyl isocyanide b) an alkyl halide c) an amide d) an amide and nitro compound

Solution : -

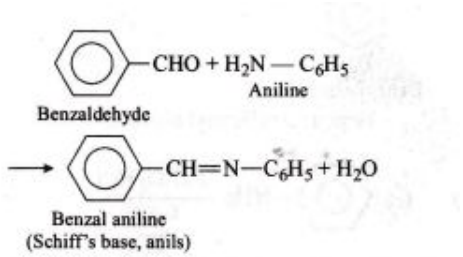
$$RNH_2 + CHCl_3 + 3KOH\ (alc.) \longrightarrow \underset{\text{alkyl isocyanide}}{RNC} + 3KCl + 3H_2O$$

This reaction is known as carbylamine test. (only 1^o amine gives this reaction).

35. When aniline reacts with oil of almonds (C_6H_5CHO) condensation takesplace and benzal derivative is formed. This is known as _____.

a) Millon's base b) Schitr's reagent **c) Schiff's base** d) Benedict's reagent

Solution : -



36. Which is formed when acetonitrile is hydrolysed partially with cold cone. HCl?

a) Acetic acid **b) Acetamide** c) Methyl cyanide d) Acetic anhydride

Solution : -

The partial hydrolysis of alkyl cyanides with cold conc. HCl or H_2SO_4 gives amides.

$$\underset{\text{Alkylcyanides}}{CH_3 - C} \equiv \xrightarrow[H_2O/OH^-]{\text{Nonc.HCl}} \underset{\text{Acetamide}}{CH_3CONH_2}$$

37. Acetamide and ethyl amine can be distinguished by reacting with _____.

a) aq.HCl and heat **b) aq. NaOH and heat** c) acidified $KMnO_4$ d) bromine water

Solution : -

When acetamide is heated with aq. NaOH it forms NH_3 gas but ethylamine cannot form NH_3.

$$CH_3CONH_2 + H_2O \xrightarrow{NaOH\Delta} CH_3COONa + NH_3$$

$$CH_3CH_2NH_2 + H_2O \xrightarrow{NaOH\Delta} \text{No reaction}$$

38. For carbylamine reaction, we need hot alc. KOH and _____.

a) any primary amine and chloroform b) chloroform and silver powder

c) a primary amine arrd an alkyl halide d) a mono alkyl amine and trichlorom ethane

Solution : -

Aliphatic and aromatic primary amines when warmed with chloroform and an alcoholic solution of KOH, form isocyamde or carbylamine which has very unpleasant smell.

$$CH_3CH_2NH_2 + CHCl_3 + 3KOH \xrightarrow{\text{Warm}} CH_3CH_2NC + 3KCl + 3H_2O$$

39. Indicate which nitrogen compound amongst the following would undergo Hofmann reaction?

a) $RCONHCH_3$ b) $RCOONH_4$ **c) $RCONH_2$** d) RCONHOH

Solution : -

When amides react with bromine in the presence of caustic alkali to form a primary amine carrying one carbon atom less than the parent amide, then the reaction is known as Hofmann bromamide reaction.

$$RCONH_2 + Br_2 + 4KOH \xrightarrow{\text{Heat}} RNH_2 + K_2CO_3 + 2KBr + 2H_2O$$

40. Mark the correct statement.

a) Methyl amine is slightly acidic b) Methyl amine is less basic than ammonia

c) Methyl amine is a stronger base than NH_3 d) Methyl amine forms salts with alkalies

Solution : -

Methyl amine is a stronger base than NH_3. This is due to the reason that alkyl groups are electron releasing groups (+I-effect). As a result of which, it increase the electron density on the nitrogen atom and therefore, they can donate electron pair more easily than ammonia.