CBSE Class 12 Chemistry Chapter 13 Amines Worksheet with Answer– Set 3

Q1. How many isomeric amines can have the formula $C_4H_{11}N$?
(a) Five
(b) Six
(c) Seven
(d) None of the above

Answer:

(a) Five isomeric amines can have the formula $C_4H_{11}N$.

Q2. What is the hybridisation of the nitrogen atom in piperidine?
(a) sp
(b) sp^2
(c) sp^3
(d) None of the above

Answer:

(c) The hybridisation of the nitrogen atom in piperidine is sp^3.

Q3. Dimethyl amine reacts with nitrous acid to produce
(a) $(CH_3)_2NNO$
(b) CH_3OH
(c) $N_2^+ CH_3OH$
(d) None of the above

Answer:

(a) Dimethyl amine reacts with nitrous acid to produce $(CH_3)_2NNO$.

Q4. Benzene diazonium chloride reacts with hypophosphorous acid to produce
(a) Phenol
(b) Benzene
(c) Cyano benzene
(d) None of the above

Answer:

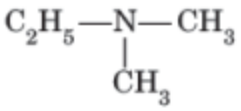
(b) Benzene diazonium chloride reacts with hypophosphorous acid to produce benzene.

Q5. Aniline produces a Schiff base on reaction with
(a) Ammonia
(b) Acetyl chloride
(c) Benzaldehyde
(d) None of the above

Answer:

(c) Aniline produces a Schiff base on reaction with benzaldehyde.

Q6. Write the IUPAC and common name of the following compound.



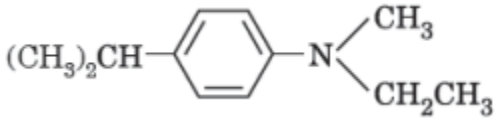
Answer:

The IUPAC name of the compound mentioned above is N, N Dimethyl ethanamine, while its common name is Ethyl dimethyl amine or N, N Dimethyl Aminoethane.

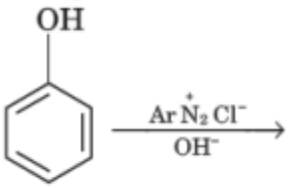
Q7. Draw the structure of N-Ethyl-4- isopropyl- N- methyl aniline.

Answer:

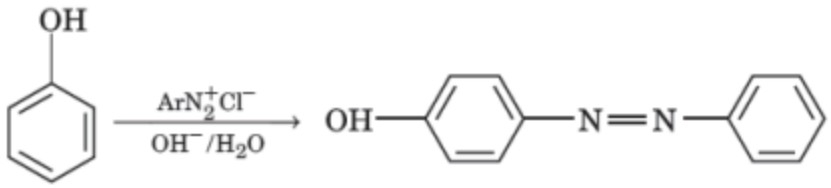
The structure of N-Ethyl-4- isopropyl- N- methyl aniline is given below.



Q8. Complete the following reaction.



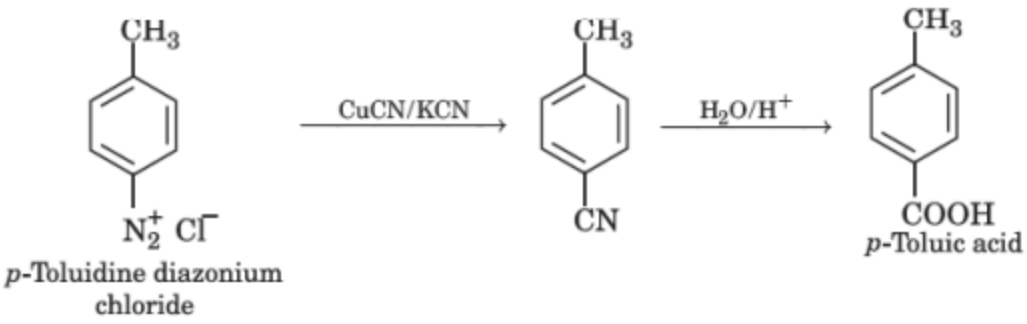
Answer:



Q9. Convert p- toluidine diazonium chloride to p- toluic acid.

Answer:

We can convert p- toluidine diazonium chloride to p- toluic acid by reacting it with copper cyanide or potassium cyanide followed by hydrolysis.



Q10. Why tertiary butyl amine can not be prepared by the action of ammonia on tertiary butyl bromide?

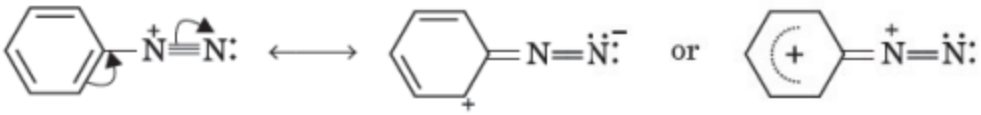
Answer:

We can not prepare tertiary butyl amine by the action of ammonia on tertiary butyl bromide because tertiary Butylamine is a 3° alkyl halide. On treatment with a base like NH_3, it prefers to undergo an elimination reaction rather than the substitution reaction. Therefore, the product isobutylene is formed instead of tertiary butylamine.

Q11. Why is aryldiazonium ion more stable than alkyl diazonium ion?

Answer:

Aryldiazonium ion is more stable than the alkyl diazonium ion because of resonance.



However, no such stabilisation exists in the alkyl diazonium ion. Thus, the aryldiazonium ion is more stable than the alkyl diazonium ion.

Q12. Why is p-methoxy aniline a stronger base than aniline but p-nitroaniline is a weaker base than aniline?

Answer:

Methoxy group (-OCH_3) is an electron-releasing group and it increases the electron density on the nitrogen atom. Therefore, it has a greater electron-donating tendency than aniline and thus is a stronger base than aniline.
On the other hand, the nitro group is an electron-withdrawing group and therefore, it decreases the electron density on the nitrogen atom. As a result, p-nitroaniline is a weaker base than aniline.

Q13. Why can't we prepare aniline by the Gabriel Phthalimide reaction?

Answer:

We can not prepare aniline by the Gabriel Phthalimide reaction because it requires the treatment of potassium phthalimide with C_6H_5Cl or C_6H_5Br. Since aryl halides do not undergo nucleophilic substitution reactions under ordinary conditions, therefore, the reaction does not occur. Hence, aniline cannot be prepared by the Gabriel Phthalimide method.

Q14. Why sulphanilic salts are insoluble in water and organic solvents?

Answer:

Sulphanilic salts are insoluble in water and organic solvents because they are ionic in nature, and exist in the form of a dipolar salt. Thus, are insoluble in water and organic solvents.

Q15. Why is an amide more acidic than an amine?

Answer:

An amide is more acidic than an amine because of the delocalisation of the lone pairs of electrons on nitrogen atoms over the carbonyl group, the amino group acquire a positive charge which makes the N-H bond weak. Moreover, the anion formed after the removal of a proton is resonance stabilised. However, no such stabilisation exists in amine. Thus, an amide is more acidic than an amine.

Q16. Which is a more basic $PhNH_2$ or Ph_2NH?

Answer:

Aromatic amines are less basic than alkylamines because the electron density of the lone pair of electrons is delocalized into the ring, mainly at ortho and para positions. An increase in the number of phenyl groups bonded to N increases delocalization and hence decreases basicity. Therefore, the $PhNH_2$ isomer is more basic than Ph_2NH.

Q17. An optically inactive compound (A) having the molecular formula ($C_4H_{11}N$) on treatment with HNO_2 gave alcohol (B). (B) on heating at 410 K gave an alkene (C). (C) on treatment with HBr gave an optically active compound (D) having the molecular formula C_4H_9Br. Identify A, B, C and D and write down their structural formulae. Also, write the equations involved.

Answer:

Since compound (A) is optically inactive and contains nitrogen which gives alcohol with HNO_2 it is the primary amine. Here,
A = 1- Amino butane ($CH_3CH_2CH_2CH_2NH_2$)
B = Butanol ($CH_3CH_2CH_2CH_2OH$)
C = Butene ($CH_3CH_2CH=CH_2$)
D = 2-Bromo butane ($CH_3CH_2CH(Br)\ CH_3$) (Optically Active)

The reactions may be given as
$CH_3CH_2CH_2CH_2NH_2 + HNO_2 \rightarrow CH_3CH_2CH_2CH_2OH + N_2 + H_2O$
$CH_3CH_2CH_2CH_2OH + H_2SO_4 \rightarrow CH_3CH_2CH=CH_2$
$CH_3CH_2CH=CH_2 + HBr \rightarrow CH_3CH_2CH(Br)\ CH_3$ (Optically Active)

Q18. An organic compound A (C_3H_5N) on boiling with alkali gives ammonia and sodium salt of an acid B ($C_3H_6O_2$). A on reduction gives C (C_3H_9N) which with nitrous acid gives D (C_3H_8O). Give the structural formulae of A, B, C and D and the reactions involved.

Answer:

Here,
A = Ethyl cyanide ($CH_3CH_2C\equiv N$)
B = Propanoic acid (CH_3CH_2COOH)
C = Propyl amine ($CH_3CH_2CH_2NH_2$)
D = Propyl alcohol ($CH_3CH_2CH_2OH$)

$CH_3CH_2C{\equiv}N$ + Alkali → $CH_3CH_2COOH + NH_3$
$CH_3CH_2C{\equiv}N$ + Reduction → $CH_3CH_2CH_2NH_2$
$CH_3CH_2CH_2NH_2 + HONO \rightarrow CH_3CH_2CH_2OH$

Q19. Identify A, B and C in the following reaction.

$$(i)\ CH_3Br \xrightarrow{KCN} A \xrightarrow{LiAlH_4} B \xrightarrow[273\ K]{HNO_2} C$$

$$(ii)\ CH_3COOH \xrightarrow[\Delta]{NH_3} A \xrightarrow{Br_2+KOH} B \xrightarrow{CHCl_3+NaOH} C$$

$$(iii)\ CH_3CN \xrightarrow{H_2O/OH^-} A \xrightarrow[\Delta]{NH_3} B \xrightarrow{Br_2+KOH} C$$

Answer:

(i) Here,
A = Methyl cyanide,
B = Ethyl amine
C = Ethyl alcohol.

(ii) Here,
A = Acetamide,
B = Methyl amine
C = Methyl isocyanide.

(iii) Here,
A = Acetic acid,
B = Acetamide,
C = Methyl amine

Q20. How will you convert?
(a) Benzene to Aniline
(b) Benzoic acid to Aniline

Answer:

We can convert the following as mentioned below.
(a) Benzene to Aniline: We can convert benzene to aniline in two steps.
Step 1: Benzene to Nitro Benzene: Foremost, we will react benzene with nitric acid in the presence of the concentrated sulphuric acid leading to the formation of nitro benzene.
Step 2: Nitro Benzene to Aniline: We will reduce nitro benzene to aniline by the reducing agent Sn metal in the presence of hydrochloric acid leading to the formation of resulting aniline.

(b) Benzoic acid to Aniline: We can convert benzoic acid to aniline in two steps.

Step 1: Benzoic acid to Benzamide: Foremost, we will react the benzoic acid with ammonia leading to the formation of benzamide.

Step 2: Benzamide to Aniline: We will react benzamide with the bromine in the presence of alcoholic potassium hydroxide leading to the formation of the required product.