CBSE Test Paper - 03

Class - 12 Chemistry (Amines)

1. The following compound is called

   a. None of the below
   b. 4 – aminocyclohexane
   c. pyrrole
   d. 4 – aminocyclohexanene
2. The molecular formula of ethyl acetate is
   a. C_4H_8O
   b. $C_4H_8O_2$
   c. $C_5H_{10}O_2$
   d. $C_5H_8O_2$
3. The nitrogen atom of trimethylamine is _____ hybridized which is reflected in the CNC bond angle of _____.
   a. sp^3,120°
   b. sp^2, 120°
   c. sp^3, 108°
   d. sp^2, 108°
4. Anisole reacts with a mixture of concentrated sulphuric and nitric acids to yield a mixture of ortho and para nitroanisole

   a. ortho and para in equal amounts
   b. major product is ortho nitroanisole

c. None of these
d. major product is para nitroanisole

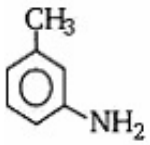
5. Which one of the following cannot be obtained by Gabriel phthalimide synthesis?
   a. CH_3NH_2
   b. None of these
   c. $CH_3CH_2NH_2$
   d. Aromatic primary amines

6. Write the chemical equation for the following chemical reaction: A primary amine is prepared from a primary alkyl halide.

7. Give IUPAC name of sulphanilic acid.

8. What is Heinsberg reagent?

9. Identify A and B in the following reactions:
   $CH_3COOC_2H_5 \xrightarrow{NH_3} A \xrightarrow{Br_2/KOH} B$

10. Write the common and IUPAC names of the following compound;
    

11. Before reacting aniline with for HNO_3 nitration, it is converted to acetanilide. Why is this done and how is nitroaniline obtained subsequently?

12. An aromatic compound A on treatment with aqueous ammonia and heating forms compound B which on heating with Br_2 and KOH forms a compound C of molecular formula C_6H_7N C_6H_7N.Write the structures and IUPAC names of compounds A, B and C.

13. Mention two important uses of sulphanilic acid.

14. Arrange the following in increasing order of their basic strength in aqueous solution:
    1. $C_2H_5NH_2, C_6H_5NH_2, NH_3, C_6H_5CH_2NH_2$ and $(C_2H_5)_2NH$
    2. $C_2H_5NH_2, (C_2H_5)_2NH, (C_2H_5)_3N, C_6H_5NH_2$

3. $CH_3NH_2, (CH_3)_2NH, (CH_3)_3N, C_6H_5NH_2, C_6H_5CH_2NH_2$

15. i. How will you convert:
    a. Nitrobenzene to phenol,
    b. Aniline to chlorobenzene

    ii. Identify the compounds A, B and C in the following reactions:

    a. $A \xrightarrow[NaOH]{Br_2} B \xrightarrow{HNO_2} C \xrightarrow[I_2]{\text{Red } P} CH_3$

    b. $A \xrightarrow{dil.\ HNO_3} B \xrightarrow{Sn/HCl} C \xrightarrow[Boil]{NaNO_2+HCl}$ 

    c. $A \xrightarrow{\Delta} B \xrightarrow[KOH]{Br_2} C \xrightarrow{HNO_2} C_2H_5OH$

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Solutions

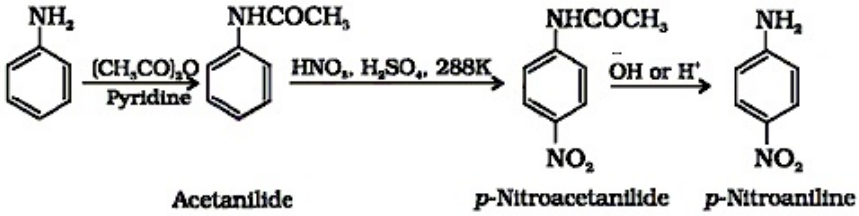
1. (c) pyrrole
   Explanation: This is pyrrole, a heterocyclic compound.
2. (b) $C_4H_8O_2$
   Explanation: Its molecular formula is $C_4H_8O_2$ and its chemical formula is $CH_3COOC_2H_5$.
3. (c) sp^3, 108°
   Explanation: The N atom uses its one 2s and three 2p orbitals for sp^3 hybridisation and the bond angle is 108° less than normal tetrahedral bond angle due to lone pair-bond-pair repulsion which is more than bondpair - bond pair repulsion.
4. (d) major product is para nitroanisole
   Explanation: In p-nitroanisole, the lone pair on oxygen is in conjugation with the pi bond of the benzene ring. Due to resonance, the nucleophilic centers are created at ortho and para positions. -OCH_3 hence is an activating group and hence o/p activating. The NO_2^+ ion can attack at ortho and para positions, but since steric hindrance is least at para position, the major product is p-nitroanisole.
5. (d) Aromatic primary amines
   Explanation: In Gabriel phthalimide reaction, a potassium salt of phthalimide is formed. It reacts readily with the primary alkyl halide to form the corresponding alkyl derivative. But aryl halide (C_6H_5X) does not react with potassium salt of phthalimide. Because C-X bond in haloarene (alkyl halide) is difficult to be cleaved due to a partial double bond character and hence, do not undergo SN_2 reaction with potassium salt of phthalimide. So, aromatic primary amines cannot be prepared by Gabriel phthalimide synthesis.
6. $RX + NH_3 \rightarrow RNH_2 + HX$
7. 4-Aminobenzene sulphonic acid.

8. Hinsberg reagent is benzenesulphonyl chloride $(C_6H_5SO_2Cl)$

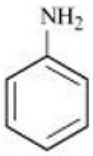
9. $\underset{Ethyl\ ethanoate}{CH_3COC_2H_5} \xrightarrow{NH_3} \underset{Ethanamide}{CH_3CONH_2} \xrightarrow{Br_2/KOH} \underset{Methanamine}{CH_3NH_2}$

10. The IUPAC name of the compound is 3-Methylaniline and the common name is m-Toluidine.

11. On direct nitration, aniline gets oxidized and protonated and besides ortho and para derivatives, 47% m-nitroaniline is also formed. Therefore, it is converted into acetanilide and then nitrated to give p-nitro derivative as major product.

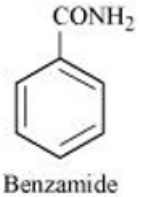


12. It is given that compound 'C' having the molecular formula, C_6H_7N and formed by the reaction of compound 'B' with Br_2 and KOH. This is a Hoffmann bromamide degradation reaction. Therefore, compound 'B' is an amide and compound 'C' is an amine. The only amine having the molecular formula C_6H_7N is aniline, $(C_6H_5NH_2)$



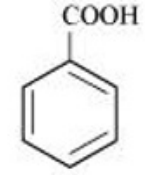
Aniline

Compound 'B' (from which 'C' is formed) must be benzamide, $(C_6H_5CONH_2)$



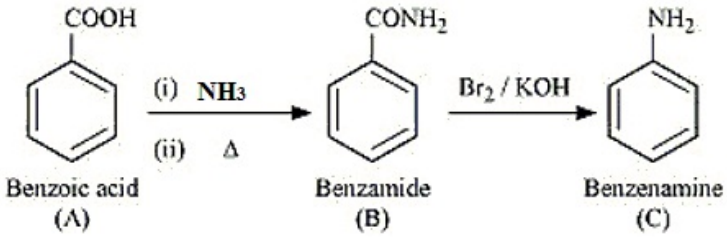
Benzamide

Further, benzamide is formed by heating compound 'A' with aqueous ammonia. Therefore, compound 'A' must be benzoic acid.

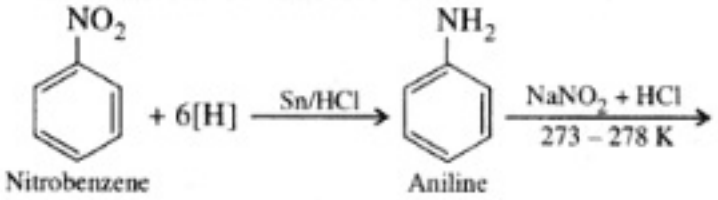


Benzoic acid

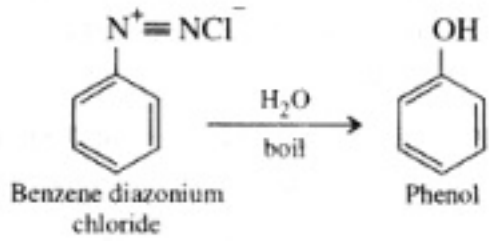
The given reactions can be explained with the help of the following equations:



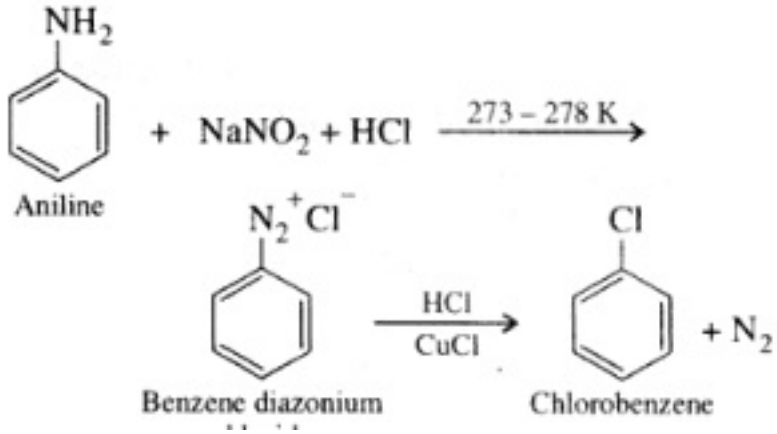
13. Salphanilic acid is used in the manufacture of:
    i. Dyes
    ii. Sulpha drugs.
14. i. $C_6H_5NH_2 < NH_3 < C_6H_5CH_2NH_2 < C_2H_5NH_2 < (C_2H_5)_2NH$
    ii. $C_6H_5NH_2 < C_2H_5NH_2 < (C_2H_5)_3N < (C_2H_5)_2NH$
    iii. $C_6H_5NH_2 < C_6H_5CH_2NH_2 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$
15. i. Steps involved in the conversions are given below:



a.



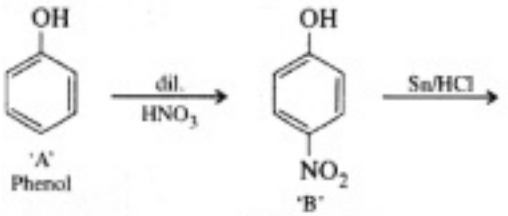
b.

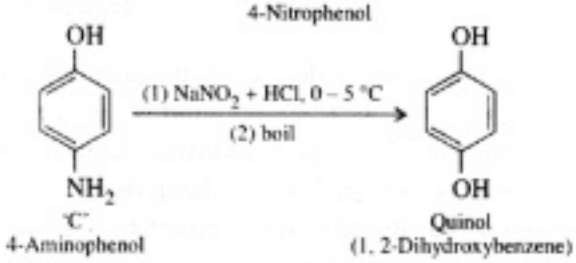


ii. A, B and C are identified as under:

a. $\underset{\substack{'A'\\Ethanamide}}{CH_3CONH_2} \xrightarrow[NaOH]{Br_2} \underset{\substack{'B'\\Methanamine}}{CH_3NH_2} \xrightarrow{HNO_2} \underset{\substack{'C'\\Methaonol}}{CH_3OH} \xrightarrow{P/I_2} \underset{Iodomethane}{CH_3I}$

b.





c. $\underset{'A'}{CH_3CH_2COONH_4} \xrightarrow{Heat} \underset{'B'}{CH_3CH_2CONH_2}$

A min *ophenol* — Pr *opana* mi *de*

$\xrightarrow[KOH]{Br_2} \underset{'C'}{CH_3CH_2NH_2} \xrightarrow{HNO_2} \underset{Ethanol}{CH_3CH_2OH}$

Pr *opana* min *e*