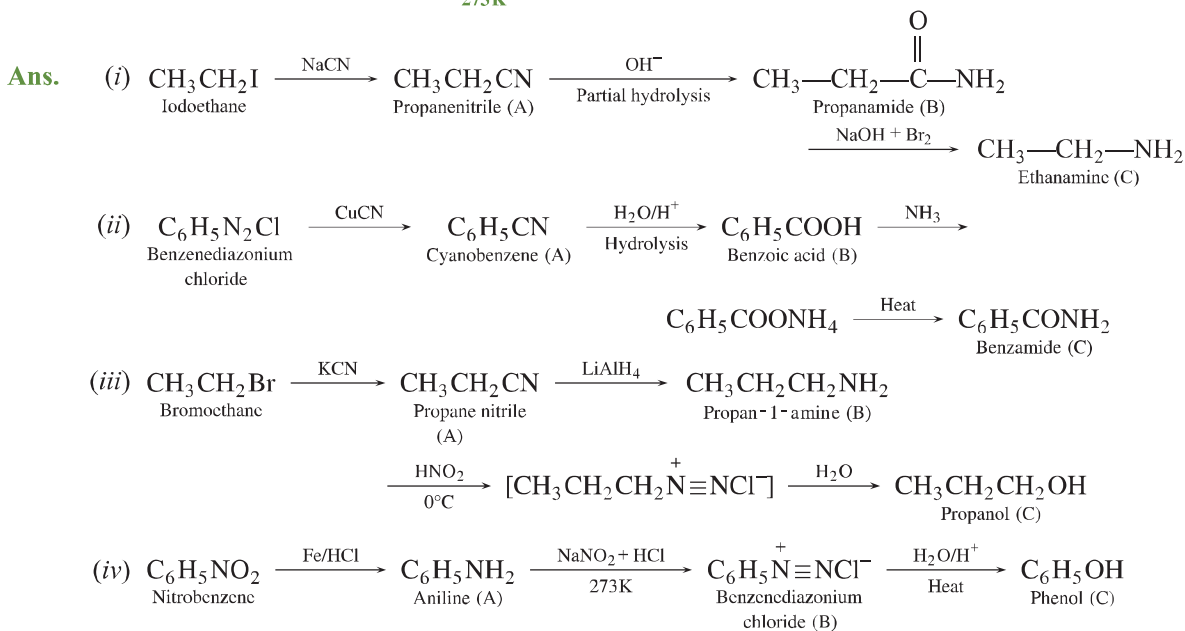
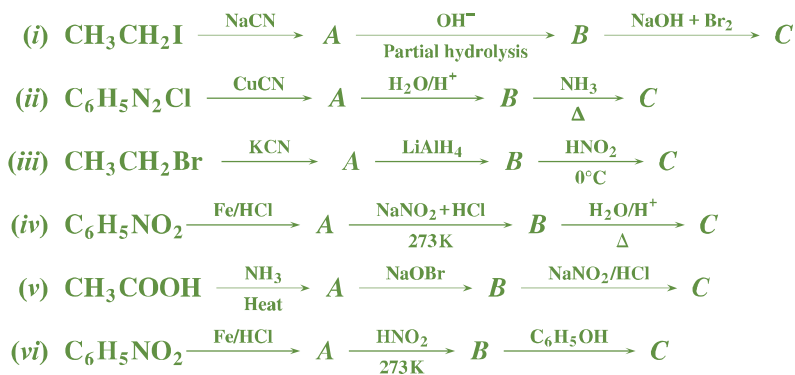
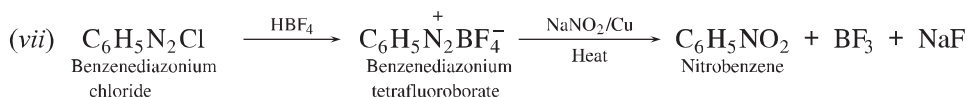


Q. 9. Give the structures of A, B and C in the following reactions:

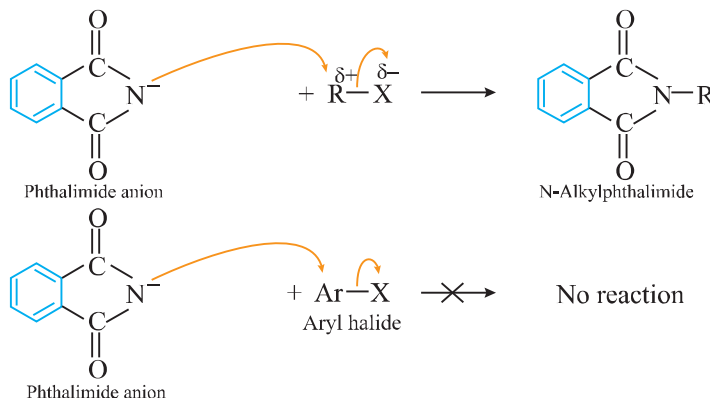




Q. 12. Why cannot aromatic primary amines be prepared by Gabriel phthalimide synthesis?

[CBSE 2020 (56/5/1)]

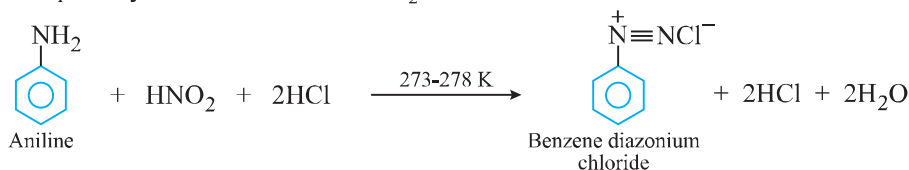
Ans. The success of Gabriel phthalimide reaction depends upon the nucleophilic attack by the phthalimide anion on the organic halogen compound.



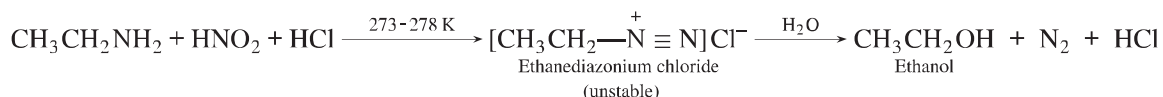
Aryl halides do not undergo nucleophilic substitution reactions easily because the carbon-halogen bond acquires partial double bond character due to resonance, therefore aromatic primary amines cannot be prepared by Gabriel phthalimide reaction.

Q. 13. Write the reactions of (i) aromatic and (ii) aliphatic primary amines with nitrous acid.

Ans. Aromatic primary amines react with HNO_2 at 273–278 K to form aromatic diazonium salts.



Aliphatic primary amines also react with HNO_2 at 273–278 K to form aliphatic diazonium salts. But these are unstable even at this low temperature and thus decompose readily to form a mixture of compounds consisting of alkyl chlorides, alkenes and alcohols, out of which alcohols generally predominate.



Q. 14. Give plausible explanation for each of the following:

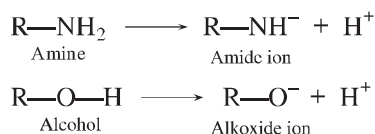
(i) Why are amines less acidic than alcohols of comparable molecular masses?

(ii) Why do primary amines have higher boiling point than tertiary amines?

(iii) Why are aliphatic amines stronger bases than aromatic amines?

[CBSE 2020 (56/5/1)]

Ans. (i) Loss of a proton from an amine gives amide ion while loss of a proton from alcohol gives an alkoxide ion as shown below:



As O is more electronegative than N, RO^- can accommodate the negative charge more easily than the RNH^- can accommodate the negative charge.

RO^- is more stable than RNH^- . Therefore, amines are less acidic than alcohols.

(ii) In primary amines, two hydrogen atoms are present on N-atom and they undergo extensive intermolecular hydrogen bonding which results in association of molecules while in tertiary amines,

no hydrogen atom is present on N-atom. Hence there is no hydrogen bonding in tertiary amines. As a result of this primary amines have higher boiling point than tertiary amines.

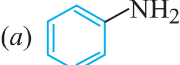

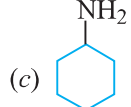
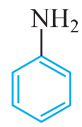
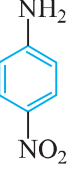
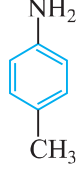
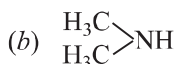
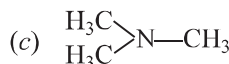
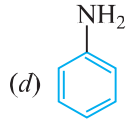
- (iii) Aliphatic amines are stronger bases than aromatic amines because:
- due to resonance in aromatic amines, the lone pair of electrons on the nitrogen atom gets delocalised over the benzene ring and thus is less easily available for protonation.
 - the aryl amine ions have lower stability than the corresponding alkyl amines, *i.e.*, protonation of aromatic amines is not favoured.

Multiple Choice Questions

[1 mark]

Choose and write the correct option(s) in the following questions.

- The correct IUPAC name for $\text{CH}_2 = \text{CHCH}_2\text{NHCH}_3$ is [NCERT Exemplar]
 - Allylmethylamine
 - 2-amino-4-pentene
 - 4-aminopent-1-ene
 - N-methylprop-2-en-1-amine
- In order to prepare a 1° amine from an alkyl halide with simultaneous addition of one CH_2 group in the carbon chain, the reagent used as source of nitrogen is [NCERT Exemplar]
 - Sodium amide, NaNH_2
 - Sodium azide, NaN_3
 - Potassium cyanide, KCN
 - Potassium phthalimide, $\text{C}_6\text{H}_4(\text{CO})_2\text{N}^-\text{K}^+$
- The best reagent for converting 2-phenylpropanamide into 2-phenylpropanamine is [NCERT Exemplar]
 - excess H_2
 - Br_2 in aqueous NaOH
 - iodine in the presence of red phosphorus
 - LiAlH_4 in ether
- Which of the following reagents would not be a good choice for reducing an aryl nitro compound to an amine? [NCERT Exemplar]
 - H_2 (excess)/Pt
 - LiAlH_4 in ether
 - Fe and HCl
 - Sn and HCl
- Amongst the given set of reactants, the most appropriate for preparing 2° amine is [NCERT Exemplar]
 - $2^\circ \text{R}-\text{Br} + \text{NH}_3$
 - $2^\circ \text{R}-\text{Br} + \text{NaCN}$ followed by H_2/Pt
 - $1^\circ \text{R}-\text{NH}_2 + \text{RCHO}$ followed by H_2/Pt
 - $1^\circ \text{R}-\text{Br}$ (2 mol) + potassium phthalimide followed by $\text{H}_3\text{O}^+/\text{heat}$
- The best reagent for converting, 2-phenylpropanamide into 1-phenylethanamine is [NCERT Exemplar]
 - excess H_2/Pt
 - NaOH/Br_2
 - $\text{NaBH}_4/\text{methanol}$
 - $\text{LiAlH}_4/\text{ether}$
- An organic compound 'A' on treatment with NH_3 gives 'B' which on heating gives 'C'. 'C' when treated with Br_2 in the presence of KOH produces ethylamine. Compound 'A' is
 - $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{COOH}$
 - CH_3COOH
 - $\text{CH}_3-\underset{\text{CH}_3}{\text{CH}}-\text{COOH}$
 - $\text{CH}_3-\text{CH}_2-\text{COOH}$
- The source of nitrogen in Gabriel synthesis of amines is [NCERT Exemplar]
 - Sodium azide, NaN_3
 - Sodium nitrite, NaNO_2
 - Potassium cyanide, KCN
 - Potassium phthalimide, $\text{C}_6\text{H}_4(\text{CO})_2\text{N}^-\text{K}^+$
- Which of the following statements about primary amines is 'false'?
 - Alkylamines are stronger bases than arylamines.
 - Alkylamines are stronger bases than ammonia.
 - Alkylamines react with nitrous acid to produce alcohols.
 - Arylamines react with nitrous acid to produce phenols.

10. Amongst the following, the strongest base in aqueous medium is _____. [NCERT Exemplar]
 (a) CH_3NH_2 (b) NCCH_2NH_2 (c) $(\text{CH}_3)_2\text{NH}$ (d) $\text{C}_6\text{H}_5\text{NHCH}_3$
11. Which of the following is the weakest Brönsted base? [NCERT Exemplar]
- (a)  (b)  (c)  (d) CH_3NH_2
12. The correct increasing order of basic strength for the following compounds is _____. [NCERT Exemplar]
- (I)  (II)  (III) 
- (a) $\text{II} < \text{III} < \text{I}$ (b) $\text{III} < \text{I} < \text{II}$ (c) $\text{III} < \text{II} < \text{I}$ (d) $\text{II} < \text{I} < \text{III}$
13. Which of the following has highest pK_b value?
 (a) $\text{CH}_3\text{CH}_2\text{NH}_2$ (b) NH_3
 (c) CH_3NH_2 (d) $\text{C}_6\text{H}_5\text{NH}_2$
14. The most reactive amine towards dilute hydrochloric acid is _____. [NCERT Exemplar]
- (a) $\text{CH}_3\text{—NH}_2$ (b)  (c)  (d) 
15. The order of reactivity of halides with amines is
 (a) $\text{RBr} > \text{RI} > \text{RCl}$ (b) $\text{RI} > \text{RBr} > \text{RCl}$
 (c) $\text{RCl} > \text{RBr} > \text{RI}$ (d) $\text{RI} > \text{RCl} > \text{RBr}$
16. Benzylamine may be alkylated as shown in the following equation:

$$\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2 + \text{R—X} \longrightarrow \text{C}_6\text{H}_5\text{CH}_2\text{NHR}$$

 Which of the following alkylhalides is best suited for this reaction through $\text{S}_{\text{N}}1$ mechanism? [NCERT Exemplar]
- (a) CH_3Br (b) $\text{C}_6\text{H}_5\text{Br}$ (c) $\text{C}_6\text{H}_5\text{CH}_2\text{Br}$ (d) $\text{C}_2\text{H}_5\text{Br}$
17. Carbylamine reaction is used as a test for
 (a) primary amines (b) aromatic amines
 (c) primary and secondary amines (d) secondary and tertiary amines
18. Which of the following compounds will dissolve in an alkali solution after it undergoes reaction with Hinsberg's reagent?
 (a) $(\text{CH}_3)_3\text{N}$ (b) CH_3NH_2 (c) $(\text{C}_2\text{H}_5)_2\text{NH}$ (d) $\text{C}_6\text{H}_5\text{NHC}_6\text{H}_5$
19. Methylamine reacts with HNO_2 to form _____. [NCERT Exemplar]
 (a) $\text{CH}_3\text{—O—N=O}$ (b) $\text{CH}_3\text{—O—CH}_3$ (c) CH_3OH (d) CH_3CHO
20. In the nitration of benzene using a mixture of conc. H_2SO_4 and conc. HNO_3 , the species which initiates the reaction is _____. [NCERT Exemplar]
 (a) NO_2 (b) NO^+ (c) NO_2^+ (d) NO_2^-
21. Which of the following will be most stable diazonium salt RN_2^+X^- ?
 (a) $\text{CH}_3\text{CH}_2\text{N}_2^+\text{X}^-$ (b) $\text{C}_6\text{H}_5\text{N}_2^+\text{X}^-$ (c) $\text{CH}_3\text{N}_2^+\text{X}^-$ (d) $\text{C}_6\text{H}_5\text{CH}_2\text{N}_2^+\text{X}^-$

22. Reduction of nitrobenzene by which of the following reagent gives aniline? [NCERT Exemplar]
 (a) Sn/HCl (b) Fe/HCl (c) H₂-Pd (d) Sn/NH₄OH
23. Which of the following cannot be prepared by Sandmeyer's reaction? [NCERT Exemplar]
 (a) Chlorobenzene (b) Bromobenzene (c) Iodobenzene (d) Fluorobenzene

Answers

1. (d) 2. (c) 3. (d) 4. (b) 5. (c) 6. (b) 7. (d) 8. (d) 9. (d) 10. (c)
 11. (a) 12. (d) 13. (d) 14. (b) 15. (b) 16. (c) 17. (a) 18. (b) 19. (c) 20. (c)
 21. (b) 22. (a,b,c) 23. (c, d)

Assertion-Reason Questions

In the following questions, two statements are given—one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

- (a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
 (b) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
 (c) Assertion (A) is correct, but Reason (R) is incorrect statement.
 (d) Assertion (A) is incorrect, but Reason (R) is correct statement.
- Assertion (A) : Hoffmann's bromamide reaction is given by primary amines.
Reason (R) : Primary amines are more basic than secondary amines.
 - Assertion (A) : In order to convert R-Cl to pure R-NH₂, Gabriel-phthalimide synthesis can be used.
Reason (R) : With proper choice of alkyl halides, phthalimide synthesis can be used to prepare 1°, 2° or 3° amines.
 - Assertion (A) : Aromatic primary amines cannot be prepared by Gabriel phthalimide synthesis.
Reason (R) : Aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide.
 - Assertion (A) : Butan-1-ol is more soluble in water than butan-1-amine.
Reason (R) : Alcohols are less polar than amines.
 - Assertion (A) : Only a small amount of HCl is required in the reduction of nitro compounds with iron scrap and HCl in the presence of steam.
Reason (R) : FeCl₂ formed gets hydrolysed to release HCl during the reaction.
 - Assertion (A) : Acetanilide is less basic than aniline.
Reason (R) : Acetylation of aniline results in decrease of electron density on nitrogen.
 - Assertion (A) : Acylation of amines gives a monosubstituted product whereas alkylation of amines gives polysubstituted product.
Reason (R) : Acyl group sterically hinders the approach of further acyl groups.
 - Assertion (A) : In strongly acidic solutions, aniline becomes more reactive towards electrophilic reagents
Reason (R) : The amino group being completely protonated in strongly acidic solution, the lone pair of electrons on the nitrogen is no longer available for resonance.
 - Assertion (A) : Reduction of *m*-dinitrobenzene with ammonium sulphide gives *m*-nitroaniline.
Reason (R) : *m*-nitroaniline formed gets precipitated and hence further reduction is prevented.
 - Assertion (A) : N-Ethylbenzene sulphonamide is soluble in alkali.
Reason (R) : Hydrogen attached to nitrogen in sulphonamide is strongly acidic.

11. **Assertion (A)** : N, N-Diethylbenzene sulphonamide is insoluble in alkali.

Reason (R) : Sulphonyl group attached to nitrogen atom is strong electron withdrawing group.

Answers

1. (a) 2. (c) 3. (a) 4. (c) 5. (d) 6. (d) 7. (c) 8. (d) 9. (c) 10. (d)
11. (b)

Passage-based/Case-based Questions

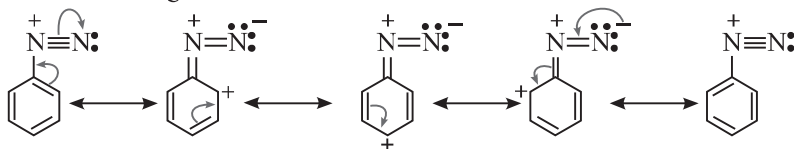
Read the given passages and answer the questions that follow.

PASSAGE-1

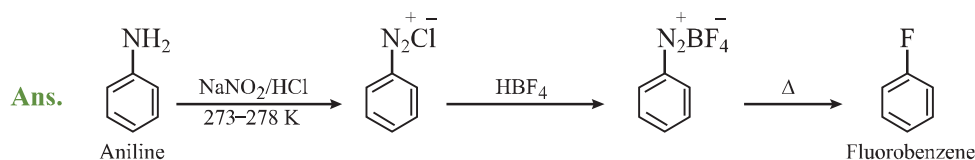
The conversion of primary amines into diazonium salts is known as diazotization. Arene diazonium salts are generally colourless crystalline solids highly soluble in water. These salts are more stable than aliphatic diazonium salts and undergo a number of substitution reactions due to excellent leaving ability of diazo group as N_2 . Arene diazonium salts also couple with phenols and amines to form coloured azo dyes. Such type of reactions are known as coupling reactions.

1. Why are arene diazonium salts more stable than aliphatic diazonium salts?

Ans. Arene diazonium salts are more stable than aliphatic diazonium salts due to dispersal of positive charge on the benzene ring as shown below.



2. How will you convert: Aniline to fluorobenzene?



3. Why are benzenediazonium salts soluble in water?

Ans. Being ionic, they are soluble in water.

4. What is diazotisation?

Ans. The reaction of converting aromatic primary amines into diazonium salts by treatment with a solution of nitrous acid at $273\text{ K}-278\text{ K}$ is called diazotisation.

5. What product is formed when aniline is first diazotised and then reacted with phenol in the alkaline medium?

Ans. *p*-hydroxyazobenzene.

PASSAGE-2

Amines have a lone pair of electrons on nitrogen atom due to which they behave as Lewis base. Larger the value of K_b or smaller the value of pK_b , stronger is the base. Amines are more basic than alcohols, ethers, esters, etc. The basic character of aliphatic amines should increase with the increase of alkyl substitution. But it does not occur in a regular manner as a secondary aliphatic amine is unexpectedly more basic than a tertiary amine in solutions. Aromatic amines are weaker bases than ammonia and aliphatic amines. Electron-donating groups such as $-CH_3$, $-OCH_3$, $-NH_2$, etc., increase the basicity while electron-withdrawing substituents such as $-NO_2$, $-CN$, halogens, etc. decrease the basicity of amines. The effect of these substituents is more at *p*- than at *m*-positions.

1. Arrange the following in increasing order of their basic strength:



Ans. $C_6H_5NH_2 < NH_3 < C_6H_5CH_2NH_2 < C_2H_5NH_2 < (C_2H_5)_2NH$

2. Arrange the following compounds in increasing order of their acidic strength:



Ans. dimethylamine < methylamine < N-methylaniline < aniline.

3. Rearrange the following in increasing order of their basic strength:



Ans. p-nitroaniline < aniline < p-toluidine < N, N-dimethyl-p-toluidine.

4. Which is more acidic, aniline or ammonia?

Ans. Due to delocalization of the lone pair of electrons of the N-atom of aniline over the benzene ring, aniline is more acidic than ammonia.

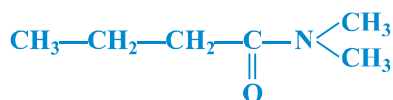
5. $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution. Give reason.

Ans. The basicity of amine in aqueous solution depends upon the stability of the substituted ammonium cation. Here the combination of three factors, +ve I effect of CH_3 groups, hydrogen bonding and steric hindrance favour greater stability for ammonium cation of dimethyl amine than ammonium cation of trimethyl amine. Hence dimethylamine is stronger base than trimethyl amine.

Very Short Answer Questions

[1 mark]

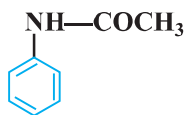
Q. 1. Write the IUPAC name of the given compound:



[CBSE (F) 2016]

Ans. N, N – Dimethylbutanamide

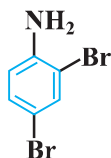
Q. 2. Write the IUPAC name of the given compound:



[CBSE East 2016]

Ans. N- Phenylethanamide

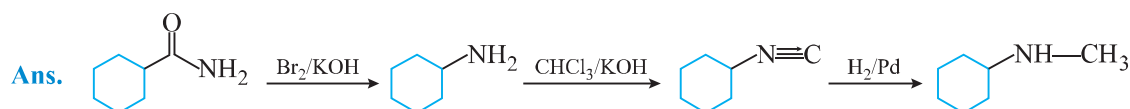
Q. 3. Write the IUPAC name of the given compound:



[CBSE South 2016]

Ans. 2,4-Dibromobenzaniline or 2,4-Dibromoaniline

Q. 4. Suggest a route by which the following conversion can be accomplished. [NCERT Exemplar] [HOTS]



Q. 5. Why do amines behave as nucleophiles?

Ans. Due to the presence of a lone pair of electrons on nitrogen atom, amines behave as nucleophiles.

Q. 6. What is the role of pyridine in the acylation reaction of amines? [NCERT Exemplar]

Ans. Pyridine and other bases are used to remove the side product, *i.e.*, HCl from the reaction mixture.

Q. 7. What is the role of HNO₃ in the nitrating mixture used for nitration of benzene? [NCERT Exemplar]

Ans. HNO₃ acts as a base in the nitrating mixture and provides the electrophile NO₂⁺.

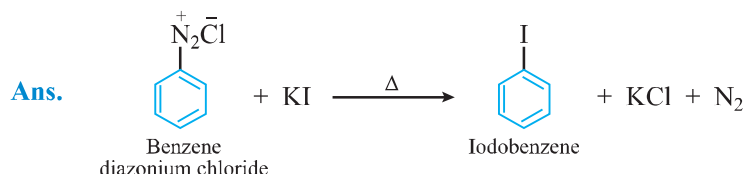
Q. 8. The conversion of primary aromatic amines into diazonium salts is known as _____.

[CBSE (AI) 2014]

Ans. Diazotisation.

Q. 9. Write a chemical reaction in which the iodide ion replaces the diazonium group in a diazonium salt.

[CBSE Delhi 2008]

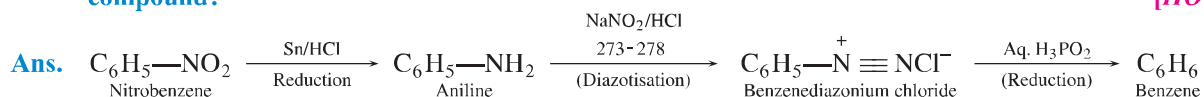


Q. 10. Why is benzene diazonium chloride not stored and is used immediately after its preparation?

[NCERT Exemplar]

Ans. Benzene diazonium chloride is very unstable.

Q. 11. What are the reactions involved in the reductive removal of nitro group from an aromatic compound? [HOTS]

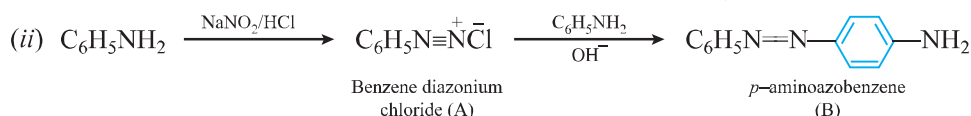
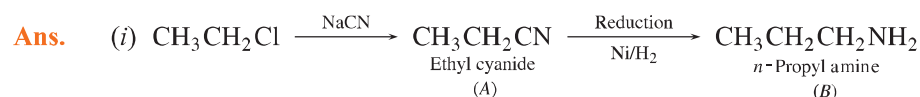


Short Answer Questions–I

[2 marks]

Q. 1. Identify A and B in each of the following processes:

[CBSE (AI) 2010]



Q. 2. Arrange the following:

[CBSE Guwahati 2015]

(i) In increasing order of their basic strength



(ii) In increasing order of solubility in water



Ans. (i) $\text{C}_6\text{H}_5\text{NH}_2 < \text{CH}_3\text{CH}_2\text{NH}_2 < \text{CH}_3\text{NHCH}_3$

(ii) $(\text{CH}_3)_3\text{N} < (\text{CH}_3)_2\text{NH} < \text{CH}_3\text{NH}_2$

Q. 3. Account for the following:

(i) Aniline gets coloured on standing in air for a long time.

(ii) MeNH₂ is stronger base than MeOH.

[NCERT Exemplar]

Ans. (i) Due to electron-donating effect (+R-effect) of —NH₂ group, the electron density on the benzene ring increases. As a result, aniline is easily oxidised on standing in air for a long time to form coloured products.

(ii) Nitrogen is less electronegative than oxygen therefore lone pair of electrons on nitrogen is readily available for donation. Hence, MeNH₂ is more basic than MeOH.

Q. 4. Account for the following:

[CBSE (AI) 2014] [HOTS]

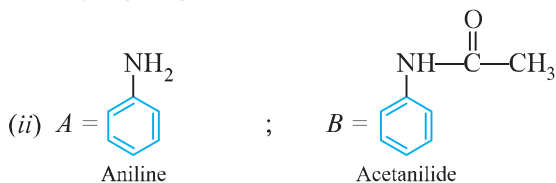
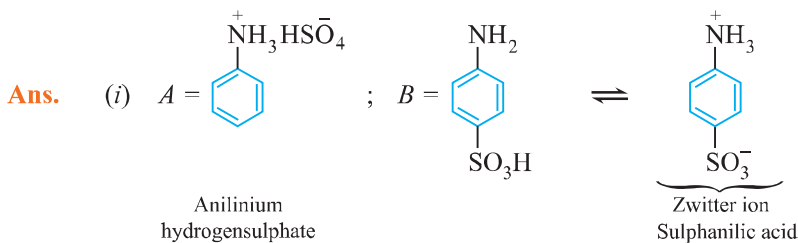
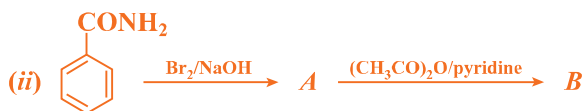
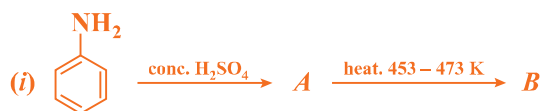
(i) pK_b of aniline is more than that of methylamine.

(ii) Although trimethylamine and *n*-propylamine have the same molecular weight, but the former boils at a lower temperature (276 K) than the latter (322 K). Explain.

Ans. (i) Refer to Ans. 3(i) NCERT Textbook Exercises.

(ii) *n*-Propylamine has two H-atoms on the N-atom and hence undergoes intermolecular H-bonding, thereby raising its boiling point. Trimethylamine, $(\text{CH}_3)_3\text{N}$, being a tertiary amine does not have any H-atom on the N-atom. As a result, it does not undergo H-bonding and hence its boiling point is low.

Q. 5. Write structures of compounds A and B in each of the following reactions: [CBSE 2019 (56/3/2)]

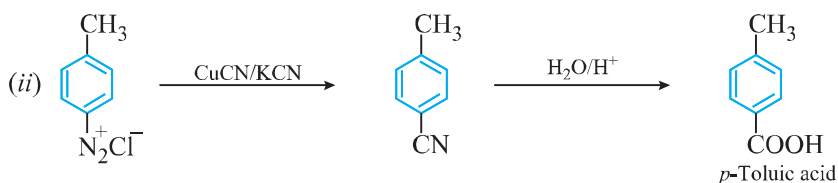
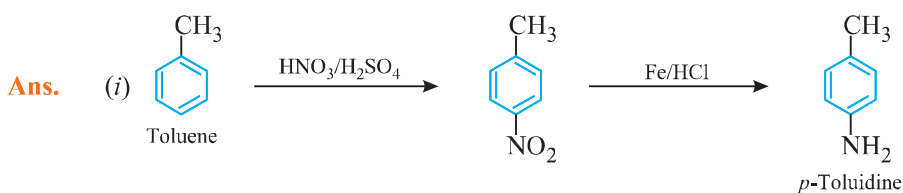


Q. 6. How will you carry out the following conversions?

(i) toluene \longrightarrow *p*-toluidine

(ii) *p*-toluidine diazonium chloride \longrightarrow *p*-toluic acid

[NCERT Exemplar]

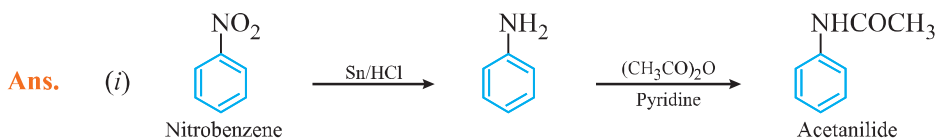


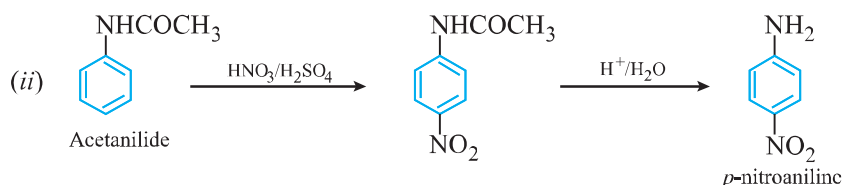
Q. 7. Write the following conversions:

(i) nitrobenzene \longrightarrow acetanilide

(ii) acetanilide \longrightarrow *p*-nitroaniline

[NCERT Exemplar]





Short Answer Questions–II

[3 marks]

Q. 1. (i) Arrange the following compounds in increasing order of dipole moment.



[NCERT Exemplar]

(ii) Give possible explanation for each of the following:

(a) The presence of a base is needed in the ammonolysis of alkyl halides.

(b) Amides are more acidic than amines.

Ans. (i) $\text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{CH}_2\text{NH}_2 < \text{CH}_3\text{CH}_2\text{OH}$

(ii) (a) To remove HX formed so that the reaction shifts in the forward direction.

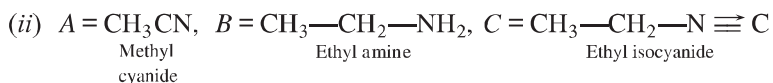
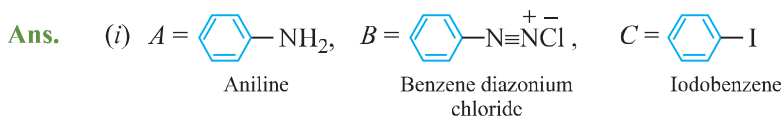


Due to +R effect, availability of lone pair of electron on N of $-\text{NH}_2$ group decreases. As a result, acid amide is much weaker base than amines. Because of the positive charge on N, as a result of resonance, N can easily lose a proton and behaves, as a weak acid.

Q. 2. Write the structures of A, B and C in the following:



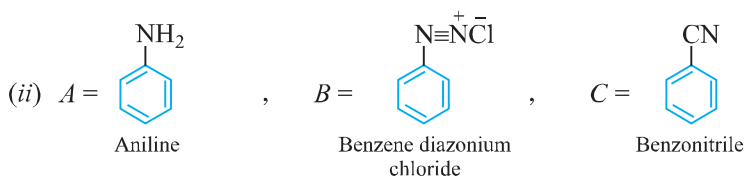
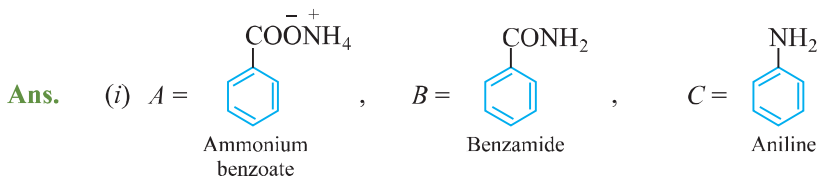
[CBSE Delhi 2016]



Q. 3. Complete the following reactions:



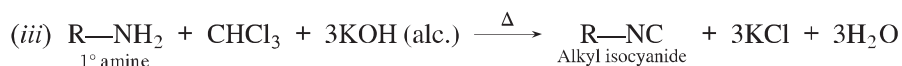
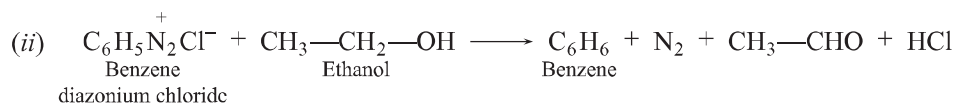
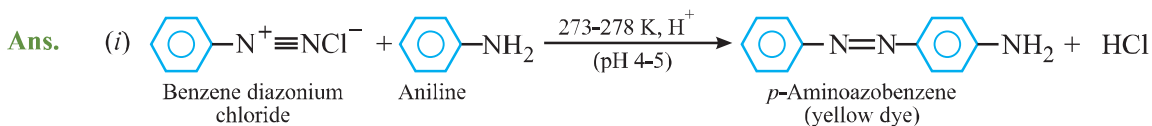
[CBSE East 2016]



Q. 4. Complete the following chemical equations:

[CBSE Delhi 2010]

- (i) $C_6H_5N_2Cl + C_6H_5NH_2 \xrightarrow{OH^-}$
 (ii) $C_6H_5N_2Cl + CH_3CH_2OH \longrightarrow$
 (iii) $RNH_2 + CHCl_3 + KOH \longrightarrow$

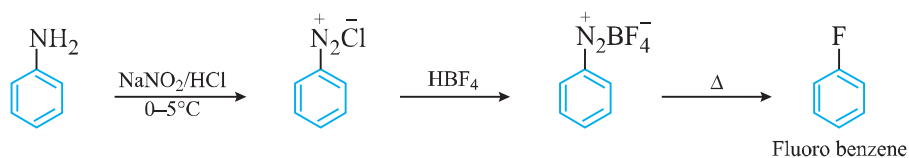


Q. 5. How are the following conversions carried out:

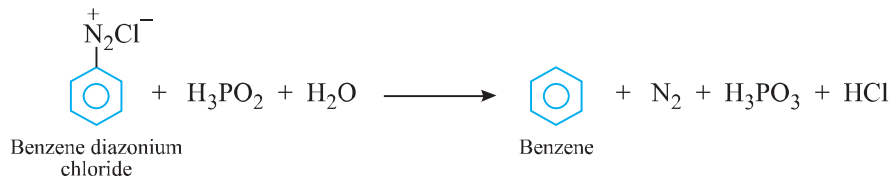
- (i) Aniline to fluorobenzene
 (ii) Benzene diazonium chloride to benzene
 (iii) Methyl chloride to ethylamine

[CBSE (F) 2013]

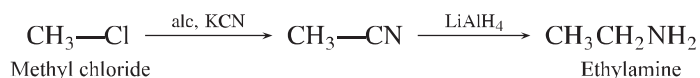
Ans. (i) Aniline to fluorobenzene



(ii) Benzene diazonium chloride to benzene



(iii) Methyl chloride to ethylamine

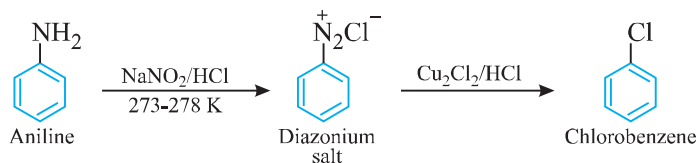


Q. 6. How will you convert the following:

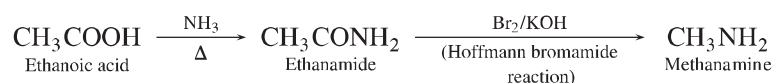
- (i) Aniline to chlorobenzene
 (ii) Ethanoic acid to methanamine
 (iii) Benzene diazonium chloride to phenol

[CBSE (F) 2013]

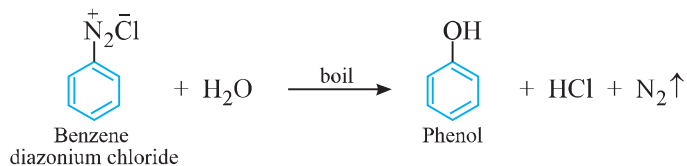
Ans. (i) Aniline to chlorobenzene



(ii) Ethanoic acid to methanamine

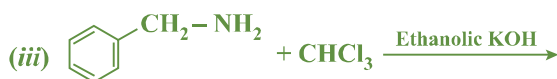
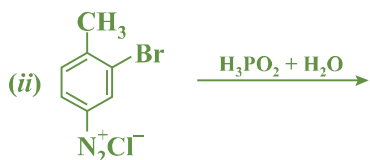


(iii) Benzene diazonium chloride to phenol

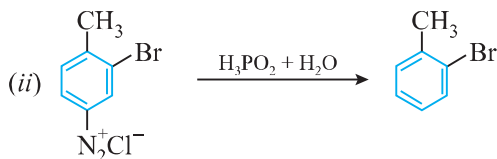
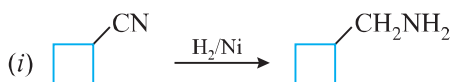


Q. 7. Complete the following reactions:

[CBSE 2019 (56/2/1)]



Ans.



Q. 8. How do you convert the following:

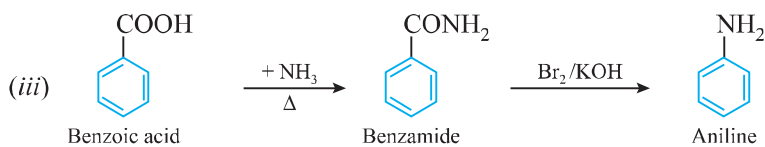
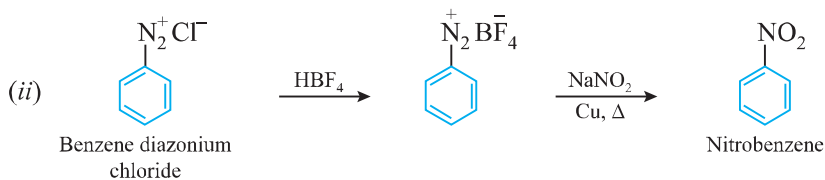
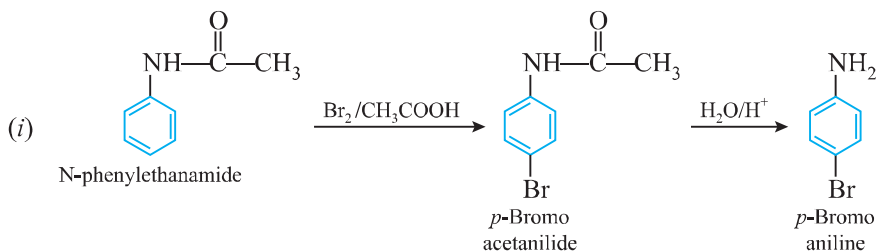
(i) N-phenylethanamide to p-bromoaniline

(ii) Benzene diazonium chloride to nitrobenzene

(iii) Benzoic acid to aniline

[CBSE 2019 (56/2/1)]

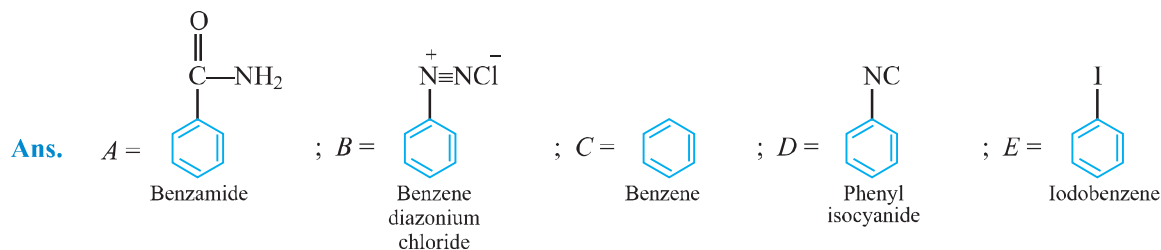
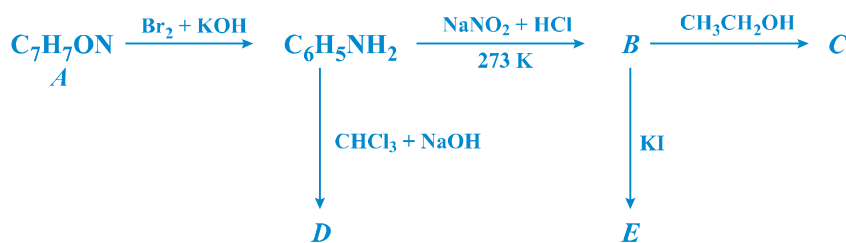
Ans.



Long Answer Questions

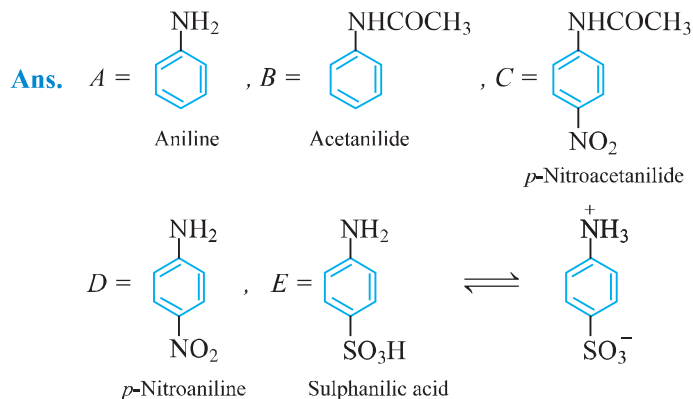
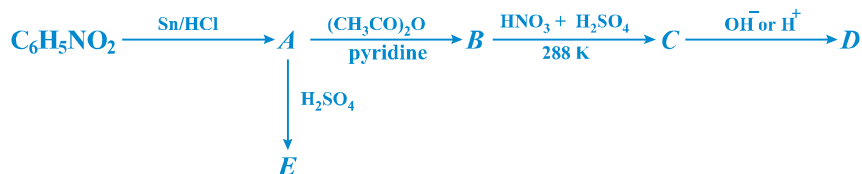
[5 marks]

Q. 1. An aromatic compound 'A' of molecular formula C_7H_7ON undergoes a series of reactions as shown below. Write the structures of A, B, C, D and E in the following reactions: [CBSE Delhi 2015] [HOTS]



Q. 2. Write the structures of A, B, C, D and E in the following reactions:

[CBSE (F) 2017]



Q. 3. (i) Write the structures of main products when aniline reacts with the following reagents:

(a) Br_2 water

(b) HCl

(c) $(CH_3CO)_2O$ /pyridine

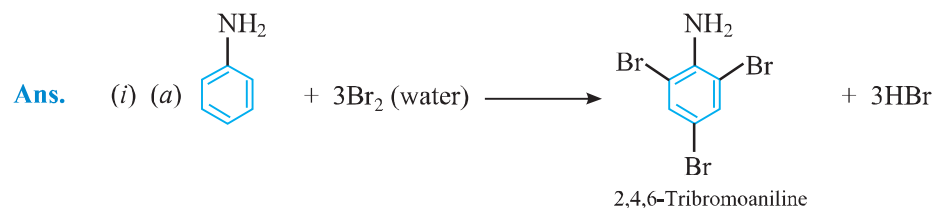
(ii) Arrange the following in the increasing order of their boiling point:

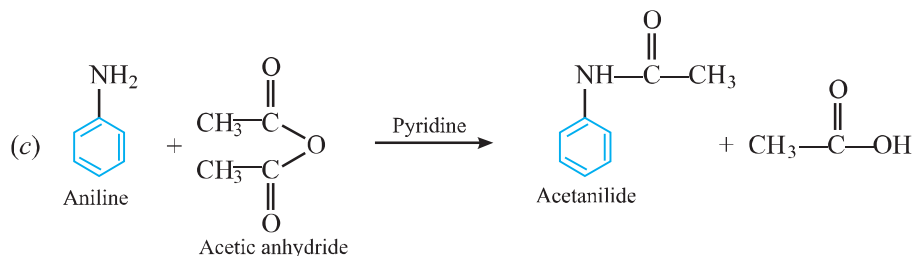
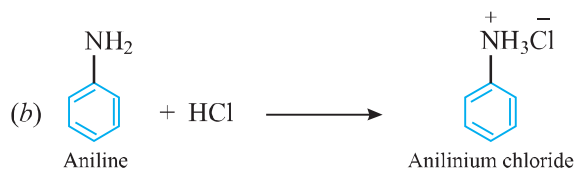


(iii) Give a simple chemical test to distinguish between the following pair of compounds:



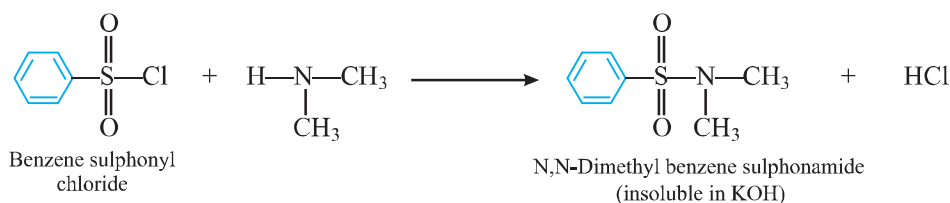
[CBSE Delhi 2015]



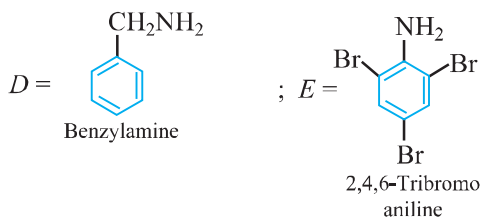
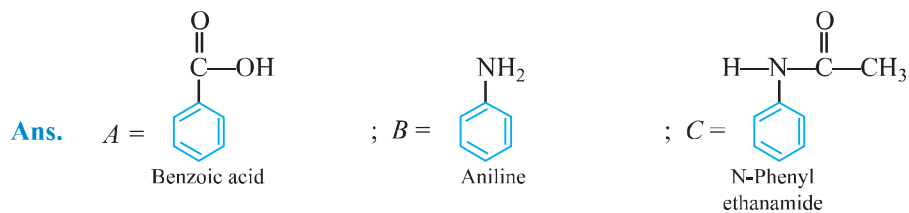
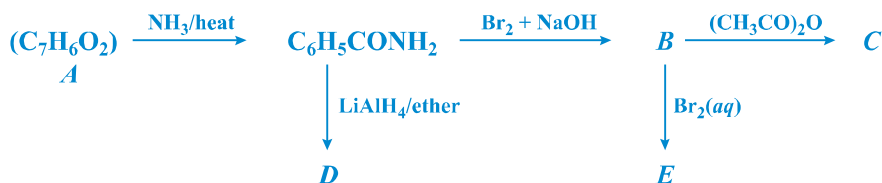


(ii) $(\text{CH}_3)_3\text{N} < \text{C}_2\text{H}_5\text{NH}_2 < \text{C}_2\text{H}_5\text{OH}$

(iii) Dimethyl amine and trimethyl amine can be distinguished by using Hinsberg's reagent, *i.e.*, $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$. When treated with Hinsberg's reagent dimethylamine being a 2° amine gives *N,N*-dimethyl benzene sulphonamide which is insoluble in aqueous KOH solution while trimethyl amine being a 3° amine does not react with Hinsberg's reagent.



Q. 4. An aromatic compound 'A' of molecular formula $\text{C}_7\text{H}_6\text{O}_2$ undergoes a series of reactions as shown below. Write the structures of A, B, C, D and E in the following reactions: [CBSE Allahabad 2015]



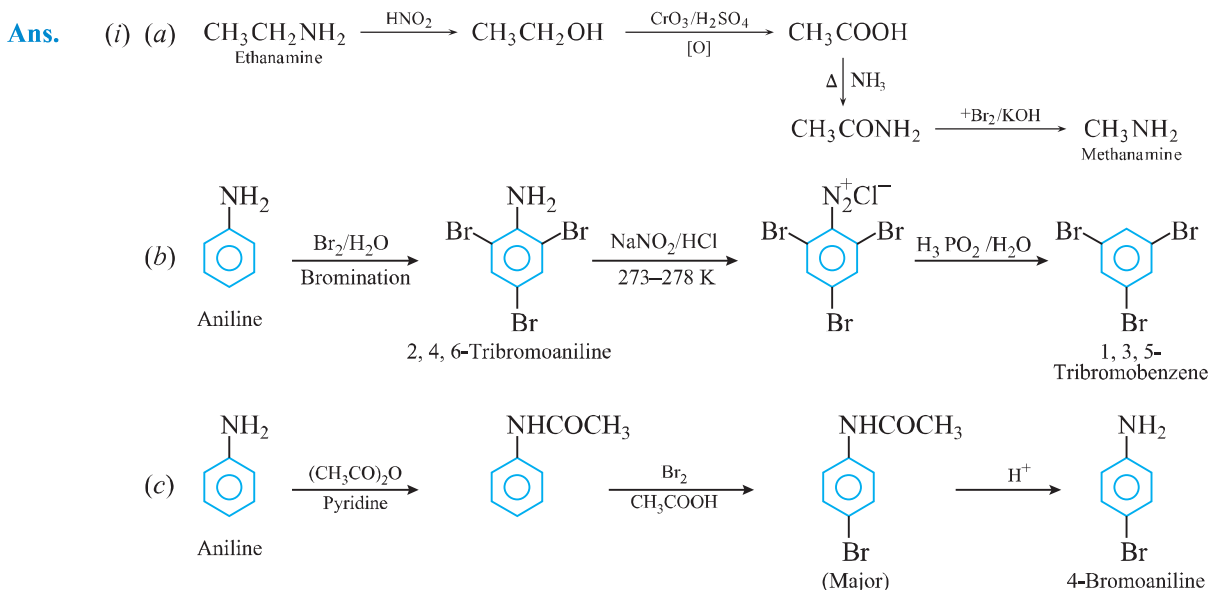
Q. 5. (i) How will you bring about the following conversions?

- (a) Ethanamine into methanamine
 (b) Aniline into 1,3,5-tribromobenzene
 (c) Aniline into 4-bromoaniline

(ii) Account for the following:

[CBSE 2019 (56/5/2)]

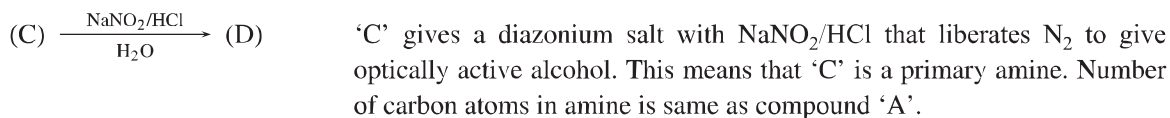
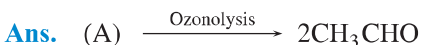
- (a) Methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide.
 (b) Diazonium salts of aromatic amines are more stable than those of aliphatic amines.



(ii) (a) Refer to Ans. 3(iii) of NCERT Textbook Exercises.

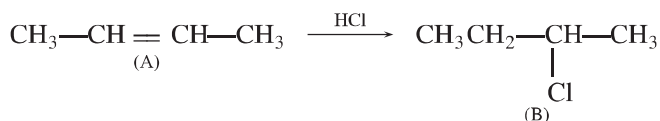
(b) Refer to Ans. 3(vi) of NCERT Textbook Exercises.

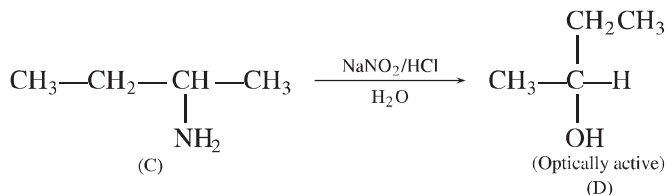
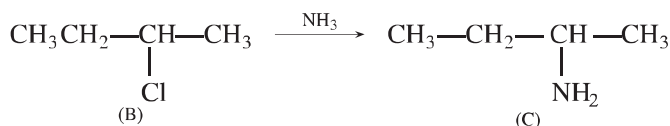
Q. 6. A hydrocarbon 'A', (C_4H_8) on reaction with HCl gives a compound 'B', ($\text{C}_4\text{H}_9\text{Cl}$), which on reaction with 1 mol of NH_3 gives compound 'C', ($\text{C}_4\text{H}_{11}\text{N}$). On reacting with NaNO_2 and HCl followed by treatment with water, compound 'C' yields an optically active alcohol, 'D'. Ozonolysis of 'A' gives 2 moles of acetaldehyde. Identify the compounds 'A' to 'D'. Explain the reactions involved. [HOTS]



Since products of ozonolysis of compound 'A' are $\text{CH}_3\text{—CH=O}$ and O=CH—CH_3 . Therefore, the compound 'A' is $\text{CH}_3\text{—CH=CH—CH}_3$.

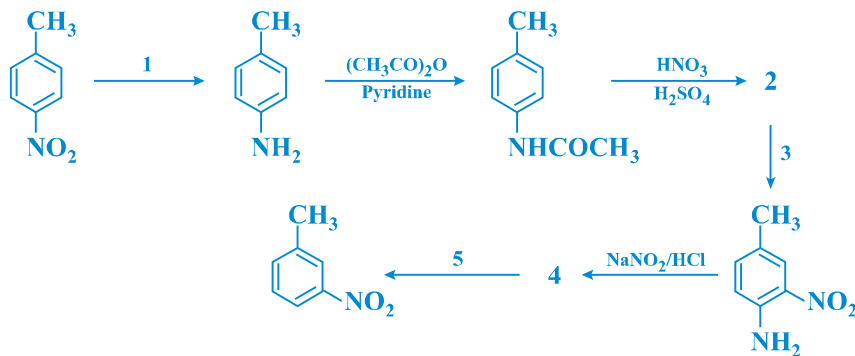
On the basis of structure of 'A', the reactions can be explained as follows:



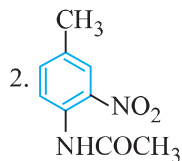


Q. 7. Predict the reagents or the products in the following reaction sequence:

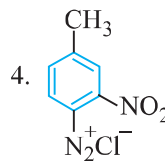
[HOTS]



Ans. 1. Sn-HCl (conc.)



3. H₂O/H⁺



5. H₃PO₂/H₂O

Self-Assessment Test

Time allowed: 1 hour

Max. marks: 30

Choose and write the correct answer for each of the following.

(3 × 1 = 3)

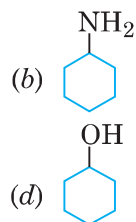
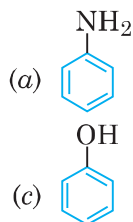
1. Best method for preparing primary amines from alkyl halides without changing the number of carbon atoms in the chain is

- (a) Hoffmann Bromamide reaction (b) Gabriel phthalimide synthesis
(c) Sandmeyer reaction (d) Reaction with NH₃

2. Which of the following compound will not undergo azo coupling reaction with benzene diazonium chloride?

- (a) Aniline (b) Phenol
(c) Anisole (d) Nitrobenzene

3. Which of the following compounds is the weakest Brönsted base?



In the following questions, two statements are given—one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

- (a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
 (b) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
 (c) Assertion (A) is correct, but Reason (R) is incorrect statement.
 (d) Assertion (A) is incorrect, but Reason (R) is correct statement. (3 × 1 = 3)

4. **Assertion (A)** : Nitromethane can give aldol condensation.

Reason (R) : α -Hydrogen of nitromethane is acidic.

5. **Assertion (A)** : All compounds containing an odd number of nitrogen atoms have odd masses and those containing even number of N atoms have even masses.

Reason (R) : Nitrogen rule can be applied to both aliphatic and aromatic compounds.

6. **Assertion (A)** : Tertiary amines have lower boiling points than those of primary and secondary amines of comparable molecular masses.

Reason (R) : Tertiary amines are unable to form intermolecular hydrogen bonds.

Answer the following questions:

7. Give an example of a zwitter ion. (1)

8. Convert Aniline into *p*-nitroaniline. (1)

9. How are the following conversions carried out?

(i) Ethanamine to N-ethylethanamide

(ii) Chloroethane to propan-1-amine

[CBSE (F) 2009] (2)

10. Predict, giving reasons, the order of basicity of the following compounds in

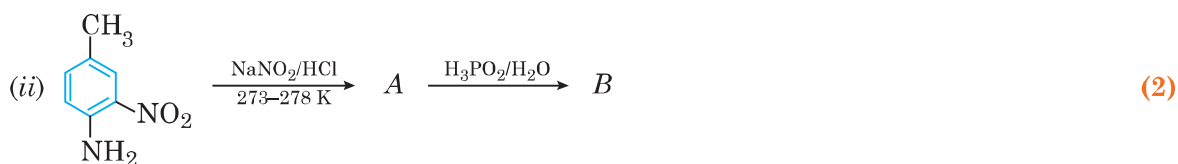
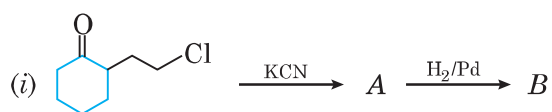
(i) gaseous phase and

(ii) in aqueous solutions $(\text{CH}_3)_3\text{N}$, $(\text{CH}_3)_2\text{NH}$, CH_3NH_2 , NH_3 . (2)

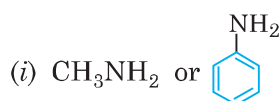
11. Explain the observed K_b order:

$\text{Et}_2\text{NH} > \text{Et}_3\text{N} > \text{EtNH}_2$ in aqueous solution (2)

12. Identify A and B in the following reaction.



13. In the following pairs which one is more basic and why?



(ii) CH_3NH_2 or NH_3



14. Give reasons:

- (i) Acetylation of aniline reduces its activation effect.
 (ii) CH_3NH_2 is more basic than $\text{C}_6\text{H}_5\text{NH}_2$.
 (iii) Although $-\text{NH}_2$ is o/p directing group, yet aniline on nitration gives a significant amount of *m*-nitroaniline. [CBSE Delhi 2017] (3)

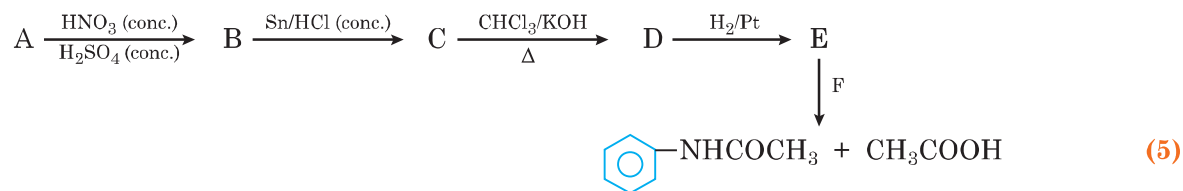
15. (i) Illustrate the following reactions:

- (a) Sandmeyer's reaction
 (b) Gattermann's reaction.

(ii) Write a chemical test to distinguish between aniline and methylamine.

[CBSE Sample Paper 2017] (3)

16. Write structures of reagents/organic compounds (A to F) in the following sequence of reactions:



Answers

1. (b) 2. (d) 3. (c) 4. (a) 5. (b) 6. (a)

