CHAPTER

21

Compounds Containing Nitrogen

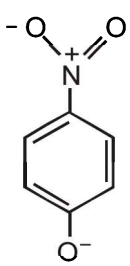
Section-A JEE Advanced/ IIT-JEE

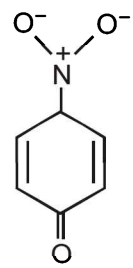
A Fill in the Blanks

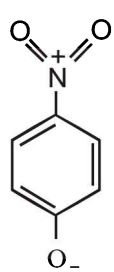
1. In an acidic medium, ... behaves as the strongest base. (nitrobenzene, aniline, phenol) *(1981 - 1 Mark)*
2. Amongst the three isomers of nitrophenol, the one that is least soluble in water is ..... . *(1992 - 1 Mark)*
3. The high melting point and insolubility in organic solvents of sulphanilic acid are due to its.....structure. *(1994 - 1 Mark)*

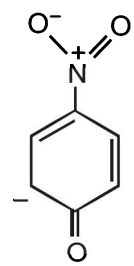
C MCQs with One Correct Answer

1. The compound which on reaction with aqueous nitrous acid at low temperature produces an oily nitrosamine is *(1981 - 1 Mark)*
   (a) methylamine (b) ethylamine
   (c) diethylamine (d) triethylamine
2. Acetamide is treated separately with the following reagents. Which one of these would give methylamine? *(1983 - 1 Mark)*
   (a) PCl_5 (b) $NaOH + Br_2$
   (c) soda lime (d) hot conc. H_2SO_4
3. Carbylamine test is performed in alcoholic KOH by heating a mixture of: *(1984 - 1 Mark)*
   (a) chloroform and silver powder
   (b) trihalogenatedmethane and a primary amine
   (c) an alkyl halide and a primary amine
   (d) an alkyl cyanide and a primary amine
4. The compound that is most reactive towards electrophilic nitration is : *(1985 - 1 Mark)*
   (a) toluene (b) benzene
   (c) benzoic acid (d) nitrobenzene
5. If two compounds have the same empirical formula but different molecular fomulae they must have *(1987 - 1 Mark)*
   (a) different percentage composition
   (b) different molecular weight
   (c) same viscosity
   (d) same vapour density
6. Amongst the following, the most basic compound is : *(1990 - 1 Mark)*
   (a) Benzylamine (b) Aniline
   (c) Acetanilide (d) *p*-Nitroaniline
7. The formation of cyanohydrin from a ketone is an example of: *(1990 - 1 Mark)*
   (a) Electrophilic addition
   (b) Nucleophilic addition
   (c) Nucleophilic substitution
   (d) Electrophilic substiution
8. Butanonitrile may be prepared by heating : *(1992 - 1 Mark)*
   (a) Propyl alcohol with KCN
   (b) Butyl alcohol with KCN
   (c) Butyl chloride with KCN
   (d) Propyl chloride with KCN
9. In the reaction *p*-chlorotoluene with KNH_2 in liq. NH_3,the major product is: *(1997 - 1 Mark)*
   (a) *o*-toluidine (b) *m*-toluidine
   (c) *p*-toluidine (d) *p*-chloroaniline.
10. The most unlikely representation of resonance structures of *p*-nitrophenoxide ion is *(1999 - 2 Marks)*

(a) 

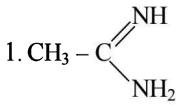
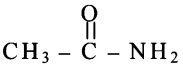
(b) 

(c) 

(d) 

11. Among the following, the strongest base is *(2000S)*
    (a) $C_6H_5NH_2$
    (b) $p\text{-}NO_2.C_6H_4NH_2$
    (c) $m\text{-}NO_2.C_6H_4.NH_2$
    (d) $C_6H_5CH_2NH_2$

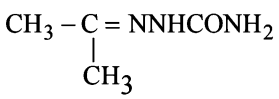
12. The correct order of basicities of the following compounds is *(2001S)*

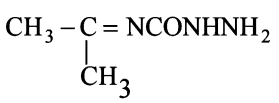
1. 
2. $CH_3-CH_2-NH_2$
3. $(CH_3)_2NH$
4. 

(a) 2 > 1 > 3 > 4 (b) 1 > 3 > 2 > 4
(c) 3 > 1 > 2 > 4 (d) 1 > 2 > 3 > 4

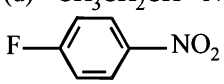
13. Compound 'A' (molecular formula C_3H_8O) is treated with acidified potassium dichromate to form a product 'B' (molecular formula C_3H_6O). 'B' forms a shining silver mirror on warming with ammonical silver nitrate. 'B' when treated with an aqueous solution of $H_2NCONHNH_2.HCl$ and sodium acetate gives a product 'C'. Identify the structure of 'C'.

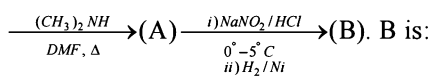
(a) $CH_3CH_2CH=NNHCONH_2$ *(2002S)*

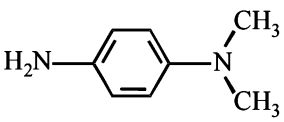
(b) 

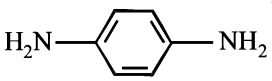
(c) 

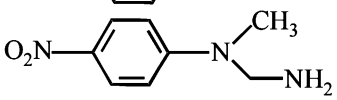
(d) $CH_3CH_2CH=NCONHNH_2$

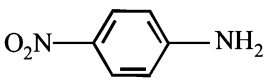
14. 

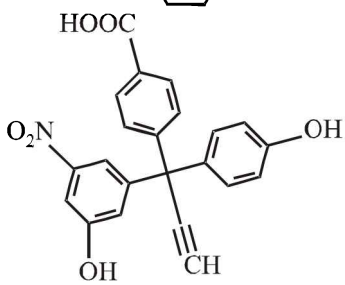

. B is: *(2003S)*

(a) 

(b) 

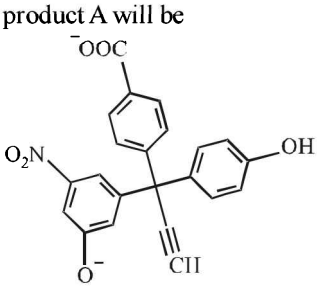
(c) 

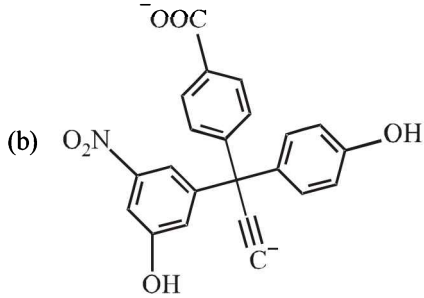
(d) 

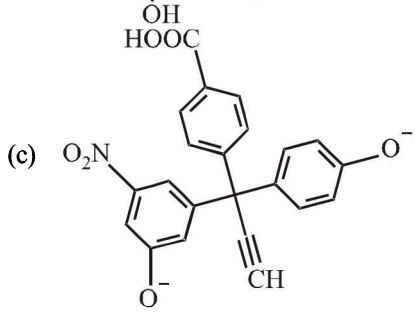
15. 

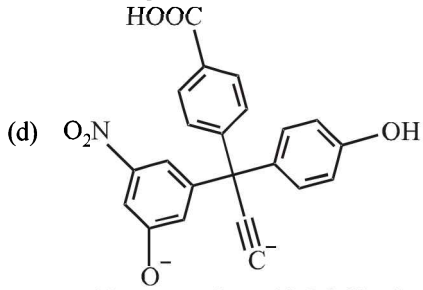
;

The product A will be *(2003S)*

(a) 

(b) 

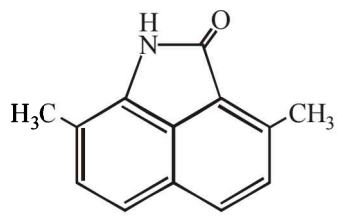
(c) 

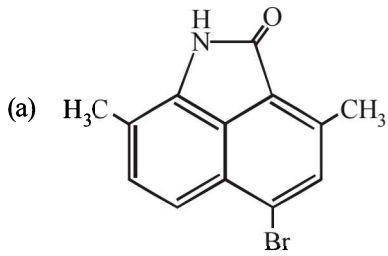
(d) 

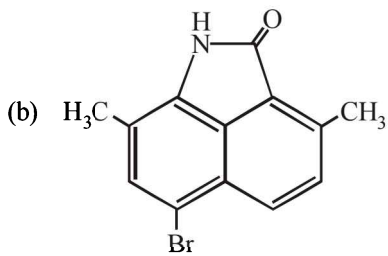
16. Benzamide on reaction with $POCl_3$ gives *(2004S)*

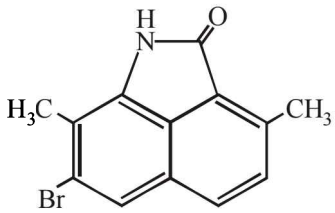
(a) aniline (b) chlorobenzene
(c) benzylamine (d) benzonitrile

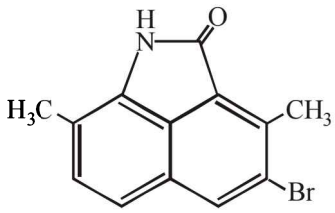
17. The major product obtained when Br_2/Fe is treated with


(2004S)

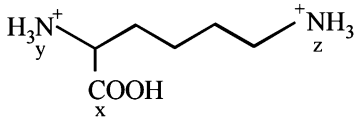
(a) 

(b) 

(c) 

(d) 

18. In the compound given below the correct order of the acidity of the positions X, Y and Z is *(2004S)*



(a) Z > X > Y (b) X > Y > Z

(c) X > Z > Y (d) Y > X > Z

19. When benzenesulfonic acid and *p*-nitrophenol are treated with $NaHCO_3$, the gases released respectively are *(2006)*

(a) SO_2, NO (b) SO_2, NO_2

(c) CO_2, CO_2 (d) SO_2, CO_2

20. In the following reaction, *(2006)*

$CH_3NH_2 + CHCl_3 + KOH$

$\longrightarrow$ Nitrogen containing compound + $KCl + H_2O$.

The nitrogen containing compound is

(a) $CH_3 - NH - CH_3$ (b) $CH_3 - C \equiv N$

(c) $CH_3 - \overset{+}{N} \equiv \overset{-}{C}$ (d) $CH_3 - \overset{-}{N} \equiv \overset{+}{C}$

21. The correct stability order of the following resonance structures is *(2009)*

$H_2C = \overset{+}{N} = \overset{-}{N}$ (I)

$H_2\overset{+}{C} - N = \overset{-}{N}$ (II)

$H_2\overset{-}{C} - \overset{+}{N} \equiv N$ (III)

$H_2\overset{-}{C} - N = \overset{+}{N}$ (IV)

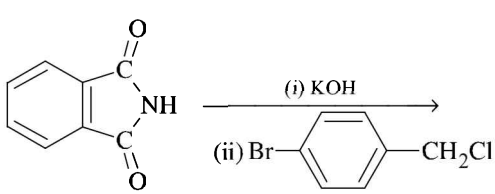
(a) (I) > (II) > (IV) > (III)

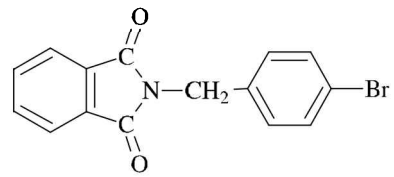
(b) (I) > (III) > (II) > (IV)

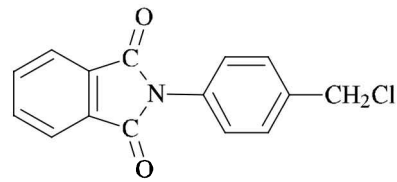
(c) (II) > (I) > (III) > (IV)

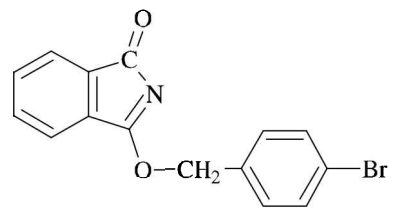
(d) (III) > (I) > (IV) > (II)

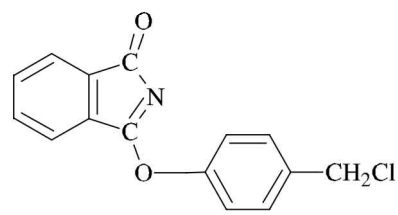
22. The major product of the following reaction is *(2011 - I)*



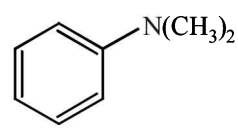
(a) 

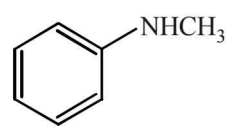
(b) 

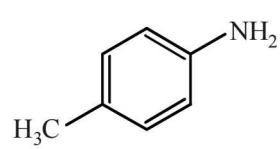
(c) 

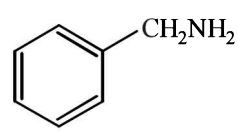
(d) 

23. Amongst the compounds given, the one that would form a brilliant colored dye on treatment with $NaNO_2$ in dil. HCl followed by addition to an alkaline solution of β-naphthol is *(2011 - II)*

(a) 

(b) 

(c) 

(d) 

D MCQs with One or More Than One Correct

1. The products of reaction of alcoholic silver nitrite with ethyl bromide are *(1991 - 1 Mark)*

(a) ethane (b) ethene

(c) nitroethane (d) ethyl alcohol

(e) ethyl nitrite

2. Reaction of $R-\overset{\overset{O}{\|}}{C}-NH_2$ with a mixture of Br_2 and KOH gives R-NH_2 as the main product. The intermediates involved in this reaction are : *(1992 - 1 Mark)*

(a) $R-\overset{\overset{O}{\|}}{C}-NHBr$ (b) $R-NHBr$

(c) $R-N=C=O$ (d) $R-\overset{\overset{O}{\|}}{C}-N\langle^{Br}_{Br}$

3. When nitrobenzene is treated with Br_2 in presence of $FeBr_3$, the major product formed is *m*-bromonitrobenzene. Statements which are related to obtain the *m*-isomer are *(1992 - 1 Mark)*

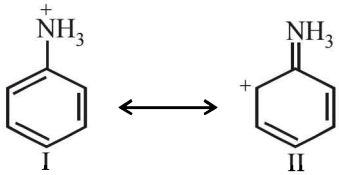
(a) The electron density on meta carbon is more than that on ortho and para positions

(b) The intermediate carbonium ion formed after initial attack of Br^+ at the meta position is least destabilised

(c) Loss of aromaticity when Br^+ attacks at the ortho and para positions and not at meta position

(d) Easier loss of H^+ to regain aromaticity from the meta position than from ortho and para positions.

4. Examine the following two structures for the anilinium ion and choose the correct statement from the ones given below: *(1993 - 1 Mark)*



(a) II is not an acceptable canonical structure because carbonium ions are less stable than ammonium ions.

(b) II is not an acceptable canonical structure because it is non-aromatic.

(c) II is not an acceptable canonical structure because the nitrogen has 10 valence electrons.

(d) II is an acceptable canonical structure.

5. *p*-Chloroaniline and anilinium hydrochloride can be distinguished by *(1998 - 2 Marks)*

(a) Sandmeyer reaction (b) $NaHCO_3$

(c) $AgNO_3$ (d) Carbylamine test

6. Among the following compounds, which will react with acetone to give a product containing > C = N–bond ? *(1998 - 2 Marks)*

(a) $C_6H_5NH_2$ (b) $(CH_3)_3N$

(c) $C_6H_5NHC_6H_5$ (d) $C_6H_5NHNH_2$.

7. Benzenediazonium chloride on reaction with phenol in weakly basic medium gives *(1998 - 2 Marks)*

(a) diphenyl ether (b) *p*-hydroxyazobenzene

(c) chlorobenzene (d) benzene

8. A positive carbylamine test is given by *(1999 - 2 Marks)*

(a) N, N—dimethylaniline

(b) 2, 4–dimethylaniline

(c) N–methyl-*o*-methylaniline

(d) *p*-methylbenzylamine

9. In the reaction $2X + B_2H_6 \rightarrow [BH_2(X)_2]^+[BH_4]^-$ the amine(s) **X** is (are) *(2009)*

(a) NH_3 (b) CH_3NH_2

(c) $(CH_3)_2NH$ (d) $(CH_3)_3N$

10. Hydrogen bonding plays a central role in the following phenomena *(JEE Adv. 2014)*

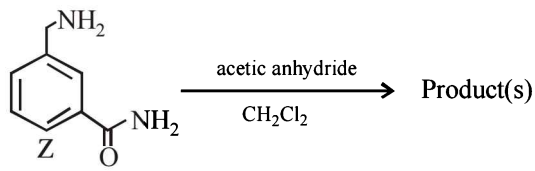
(a) Ice floats in water

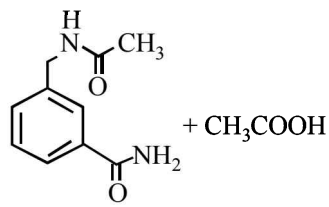
(b) Higher Lewis basicity of primary amines than tertiary amines in aqueous solutions

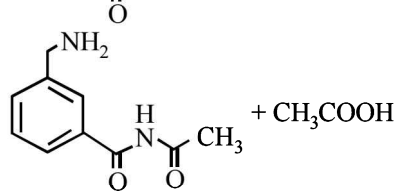
(c) Formic acid is more acidic than acetic acid

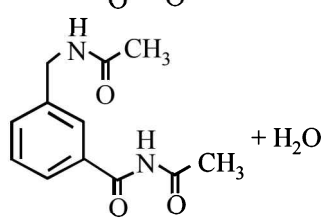
(d) Dimerisation of acetic acid in benzene

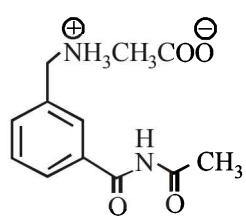
11. In the reaction shown below, the major product(s) formed is/ are *(JEE Adv. 2014)*



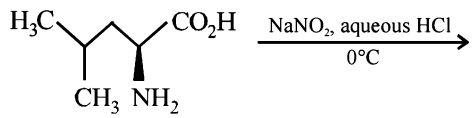
(a) 

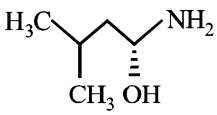
(b) 

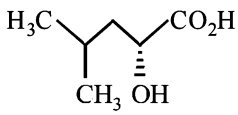
(c) 

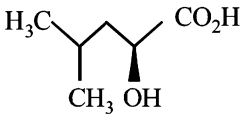
(d) 

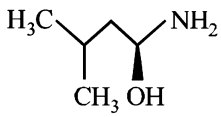
12. The major product of the reaction is *(JEE Adv. 2015)*



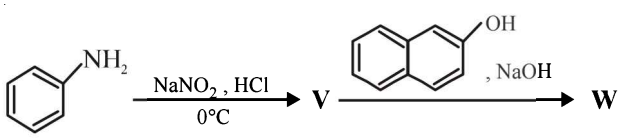
(a) 

(b) 

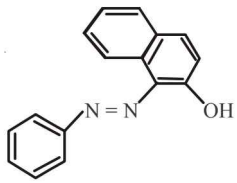
(c) 

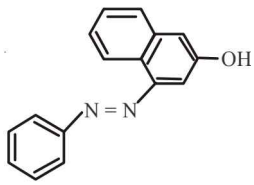
(d) 

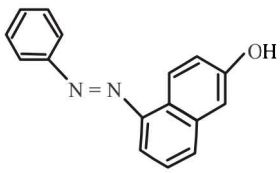
13. In the following reactions, the major product W is

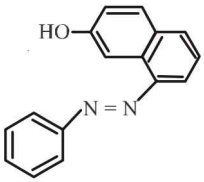


(JEE Adv. 2015)

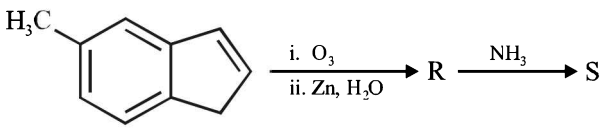
(a) 

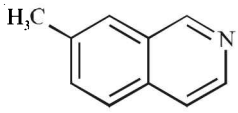
(b) 

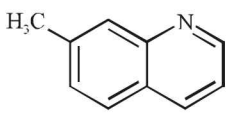
(c) 

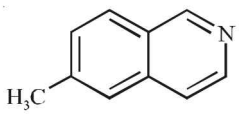
(d) 

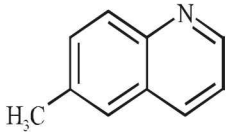
14. In the following reactions, the product S is *(JEE Adv. 2015)*



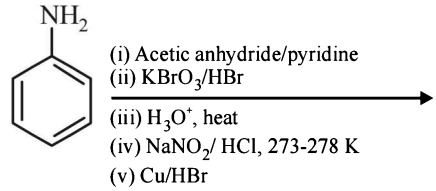
(a) 

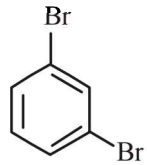
(b) 

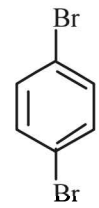
(c) 

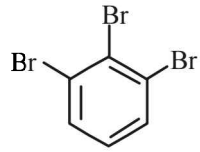
(d) 

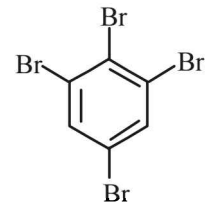
15. The product(s) of the following reaction sequence is(are)
(JEE Adv. 2016)



(a) 

(b) 

(c) 

(d) 

E Subjective Problems

1. Show with equations how the following compounds are prepared (equations need not be balanced) :

(*i*) n-propyl amine from ethyl chloride (in two steps) *(1982 - 1 Mark)*

(*ii*) chlorobenzene from aniline (in two steps). *(1982 - 1 Mark)*

(*iii*) Aniline from benzene *(1983 - 1 Mark)*

(*iv*) Acetoxime from acetaldehyde using the reagents, [$K_2Cr_2O_7/H^+$, $Ca(OH)_2$ and $NH_2OH.HCl$]. *(1984 - 2 Marks)*

(*v*) aniline to chlorobenzene *(1985 - 1 Mark)*

(*vi*) benzaldehyde to cyanobenzene. (in not more than 6 steps) *(1986 - 2 Marks)*

(*vii*) toluene to *m*-nitrobenzoic acid? *(1987 - 1 Mark)*

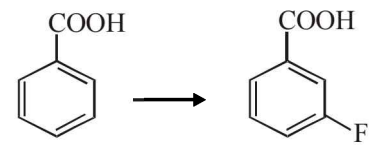
(*viii*) 4-nitroaniline to 1, 2, 3-tribromobenzene. *(1990 - 2 Marks)*

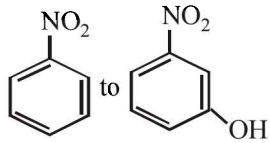
(*ix*) *p*-bromonitrobenzene from benzene in two steps. *(1993 - 2 Marks)*

(*x*) 4-nitrobenzaldehyde from benzene. *(1994 - 2 Marks)*

(*xi*) benzamide from nitrobenzene *(1994 - 2 Marks)*

(*xii*) Aniline $\longrightarrow$ Benzylamine (in 3 steps) *(2000 - 3 Marks)*

(*xiii*)  (in not more than 3 steps) *(2003 - 2 Marks)*

(*xiv*) Convert  to in not more than four steps. ***(2004 - 4 Marks)***

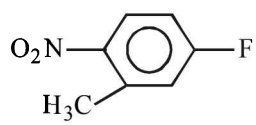
2. Give reasons for the following :

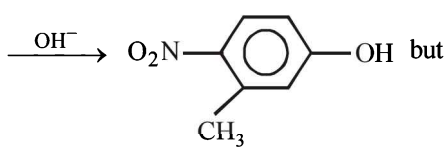
(*i*) Cyclohexylamine is a stronger base than aniline. ***(1982 - 1 Mark)***

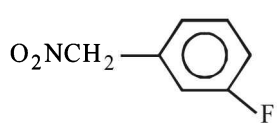
(*ii*) *o*-Nitrophenol is steam volatile whereas *p*-nitrophenol is not; ***(1985 - 1 Mark)***

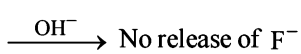
(*iii*) Dimethylamine is a stronger base than trimethylamine. ***(1998 - 2 Marks)***

(*iv*) Nitrobenzene does not undergo Friedel-Crafts alkylation ***(1998 - 2 Marks)***

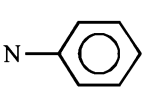
(*v*) (a) 

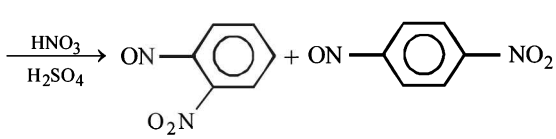


(b) 

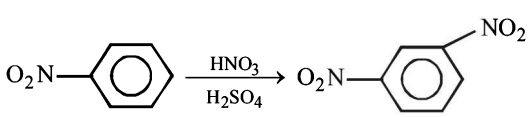


(2005 - 1 Mark)

(*vi*) 



but



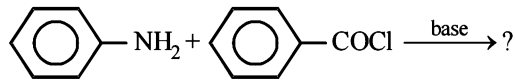
(2005 - 1 Mark)

3. Arrange the following :

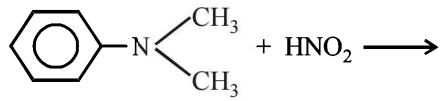
(*i*) *p*-toluidine, N, N-dimethyl-*p*-toluidine, *p*-nitroaniline, aniline in increasing basicity ***(1986 - 1 Mark)***

(*ii*) methylamine, dimethylamine, aniline, N-methylaniline in incerasing order of base strength. ***(1988 - 1 Mark)***

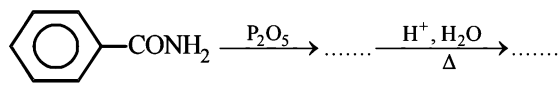
4. Complete the following with appropriate structures :

(*i*) 

(1986 - 1 Mark)

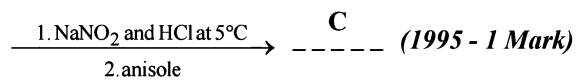
(*ii*) 

(1992 - 1 Mark)

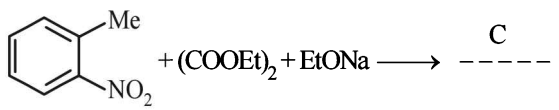
(*iii*) 

(1992 - 1 Mark)

(*iv*) 2, 4-Dinitroaniline



(1995 - 1 Mark)

(*v*) 

(1997 - 1 Mark)

(*vi*) $CH_3CH_2NH_2 \xrightarrow{(CH_3CO)_2O,\ heat}$ 2 products ***(1998 - 2 Marks)***

(*vii*) $CH_3CONHC_6H_5 \xrightarrow{Br_2,\ Fe}$ 2 products ***(1998 - 2 Marks)***

5. Write balanced equations for the following reaction :
Acetamide is reacted with bromine in the presence of potassium hydroxide. ***(1987 - 1 Mark)***

6. Give a chemical test and the reagents used to distinguish between the following pair of compounds :
Ethylamine and diethylamine. ***(1988 - 1 Mark)***

7. An organic compound A, containing C, H, N and O, on analysis gives 49.32% carbon, 9.59% hydrogen and 19.18% nitrogen. A on boiling with NaOH gives off NH_3 and a salt which on acidification gives a monobasic nitrogen free acid B. The silver salt of B contains 59.67% silver. Deduce the structures of A and B. ***(1988 - 3 Marks)***

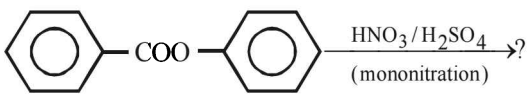
8. A mixture of two aromatic compounds A and B was separated by dissolving a chloroform followed by extraction with aqueous KOH solution. The organic layer containing compound A, when heated with alcoholic solution of KOH produced a compound C(C_7H_5N) associated with an unpleasant odour. The alkaline aqueous layer on the other hand, when heated with chloroform and then acidified gave a mixture of two isomeric compounds D and E of molecular formula $C_7H_6O_2$. Identify the compounds A, B, C, D, E and write their structures. ***(1990 - 4 Marks)***

9. A basic, volatile nitrogen compound gave a foul smelling gas when treated with chloroform and alcoholic potash. A 0.295 g sample of the substance. dissolved in aq. HCl and

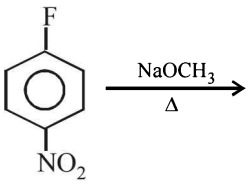
treated with $NaNO_2$ solution at 0°C, liberated a colorless, odourless gas whose volume corresponded to 112 ml at STP. After the evolution of the gas was complete, the aqueous solution was distilled to give an organic liquid which did not contain nitrogen and which on warming with alkali and iodine gave a yellow precipitate. Identify the original substance. Assume that it contains one N atom per molecule.

(1993 - 4 Marks)

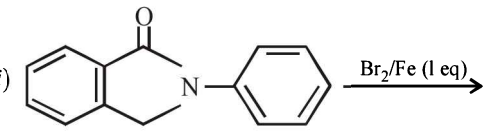
10. Identify the major product in the following reactions :

(*i*) 

(1993 - 1 Mark)

(*ii*) 

(2000 - 1 Mark)

(*iii*) 

(2000 - 1 Mark)

11. Identify, **A** (C_3H_9N) which reacts with benzensulphonyl chloride to give a solid, insoluble in alkali.

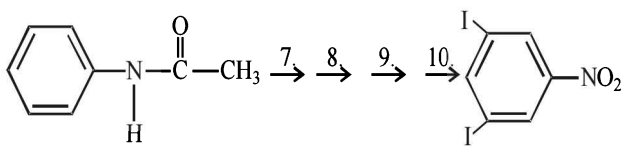
(1993 - 1 Mark)

12. Write the structure of the foul-smelling compound obtained when aniline is treated with chloroform in the presence of KOH. ***(1996 - 1 Mark)***

13. Acetophenone on reaction with hydroxylamine hydrochloride can produce two isomeric oximes. Write structures of the oximes. ***(1997 - 2 Marks)***

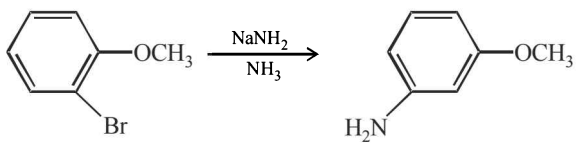
14. Compound A (C_8H_8O) on treatment with NH_2OH. HCl gives B and C. B and C rearrange to give D and E, respectively, on treatment with acid. B, C, D and E are all isomers of molecular formula (C_8H_9NO). When D is boiled with alcoholic KOH an oil F (C_6H_7N) separates out. F reacts rapidly with CH_3COCl to give back D. On the other hand, E on boiling with alkali followed by acidification gives a white solid G ($C_7H_6O_2$). Identify A-G. ***(1999 - 7 Marks)***

15. Complete the following reaction with appropriate reagents :



(1999 - 4 Marks)

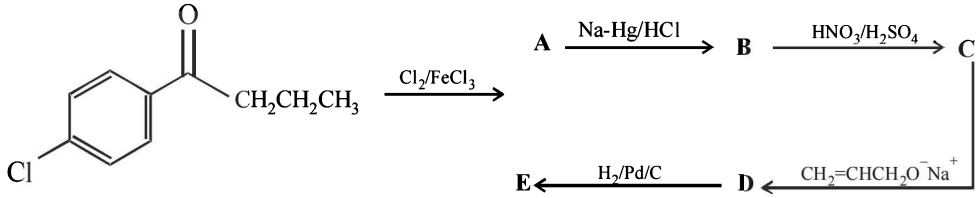
16. Explain briefly the formation of the products giving the structures of the intermediates.



(1999 - 2 Marks)

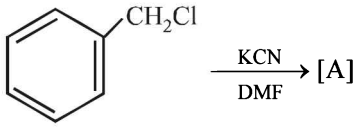
17. How would you synthesise 4–methoxyphenol from bromobenzene in NOT more than five steps? State clearly the reagents used in each step and show the structures of the intermediate compounds in your synthetic scheme. ***(2001 - 5 Marks)***

18. Write structures of the products **A, B, C, D** and **E** in the following scheme. ***(2002 - 5 Marks)***



19. There is a solution of *p*–hydroxybenzoic acid and *p*-aminobenzoic acid. Discuss one method by which we can separate them and also write down the confirmatory tests of the functional groups present. ***(2003 - 4 Marks)***.

20. Identify (A) to (D) in the following series of reactions. ***(2004 - 4 Marks)***



$$\xrightarrow[C_6H_5CHO,\ heat]{C_2H_5ONa,\ C_2H_5OH} [B]$$

$$\xrightarrow[heat]{H_3O^+} [C] \xrightarrow[(ii)\ CH_3NH_2]{(i)\ SOCl_2} [D]$$

21. $\underset{\text{(Optical active) X}}{C_5H_{13}N} \xrightarrow[-N_2]{aq.\ NaNO_2\ /\ HCl} \underset{\text{Tertiary alcohol}}{Y}$ + Some other products *(2005 - 4 Marks)*

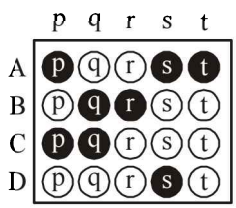
(i) Identify (X) and (Y)

(ii) Is (Y) optically active?

(iii) Give structure(s) of intermediate(s), if any, in the formation of (Y) from (X).

F Match the Following

DIRECTIONS (Q. No.1): *Each question contains statements given in two columns, which have to be matched. The statements in Column-I are labelled A, B, C and D, while the statements in Column-II are labelled p, q, r, s and t. Any given statement in Column-I can have correct matching with ONE OR MORE statement(s) in Column-II. The appropriate bubbles corresponding to the answers to these questions have to be darkened as illustrated in the following example :*
If the correct matches are A-p, s and t; B-q and r; C-p and q; and D-s then the correct darkening of bubbles will look like the given.



1. Match each of the compounds in **Column I** with its characteristic reaction(s) in **Column II**. *(2009)*

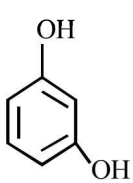
Column I	**Column II**
(A) $CH_3CH_2CH_2CN$	(p) Reduction with Pd–C/H_2
(B) $CH_3CH_2OCOCH_3$	(q) Reduction with $SnCl_2$/HCl
(C) CH_3–CH=CH–CH_2OH	(r) Development of foul smell on treatment with chloroform and alcoholic KOH
(D) $CH_3CH_2CH_2CH_2NH_2$	(s) Reduction with diisobutylaluminium hydride(DIBAL-H)
	(t) Alkaline hydrolysis

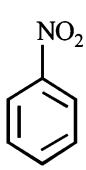
DIRECTIONS (Q. No. 2) : Match the four starting materials **(P, Q, R, S)** given in **List-I** with the corresponding reaction schemes **(I, II, III, IV)** provided in **List-II** and select the correct answer using the code given below the lists.

2. *(JEE Adv. 2014)*

List - I

P. H—C≡C—H

Q. 

R. 

List - II

1. **Scheme I**

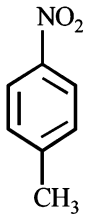
(i) $KMnO_4$, $HO^{\ominus}$, heat (ii) $H^{\oplus}$, H_2O
(iii) $SOCl_2$ (iv) NH_3 ? $\longrightarrow C_7H_6N_2O_3$

2. **Scheme II**

(ii) Sn/HCl (ii) CH_3COCl (iii) conc. H_2SO_4 (iv) HNO_3 (v) dil. H_2SO_4, heat (vi) $HO^{\ominus}$? $\longrightarrow C_6H_6N_2O_2$

3. **Scheme III**

(i) red hot iron, 873 K (ii) fuming HNO_3, H_2SO_4, heat
(iii) $H_2S.NH_3$ (iv) $NaNO_2$, H_2SO_4 (v) hydrolysis
? $\longrightarrow C_6H_5NO_3$

S. 

4. **Scheme IV**

(i) conc. H_2SO_4, 60°C

(ii) conc. HNO_3, conc. H_2SO_4

(iii) dil. H_2SO_4, heat ? ⟶ $C_6H_5NO_4$

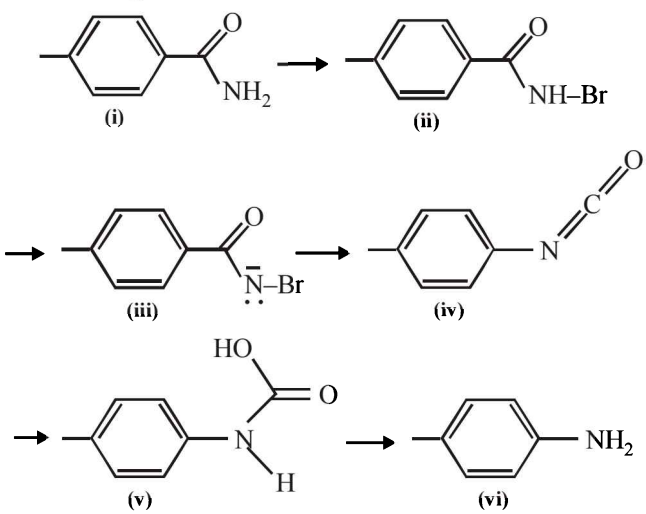
Code:

	P	Q	R	S
(a)	1	4	2	3
(b)	3	1	4	2
(c)	3	4	2	1
(d)	4	1	3	2

G Comprehension Based Questions

PASSAGE - 1

The conversion of an amide to an amine with one carbon atom less by the action of alkaline hydrohalite is known as Hofmann bromamide degradation.



In this reaction, RCONHBr is formed from which the reaction has derived its name. Hofmann reaction is accelerated if the migrating group is more electron-releasing. Hofmann degradation reaction is an intramolecular reaction.

1. How can the conversion of (i) to (ii) be brought about?

(2006 - 5M, –2)

(a) KBr (b) KBr + CH_3ONa

(c) KBr + KOH (d) Br_2 + KOH

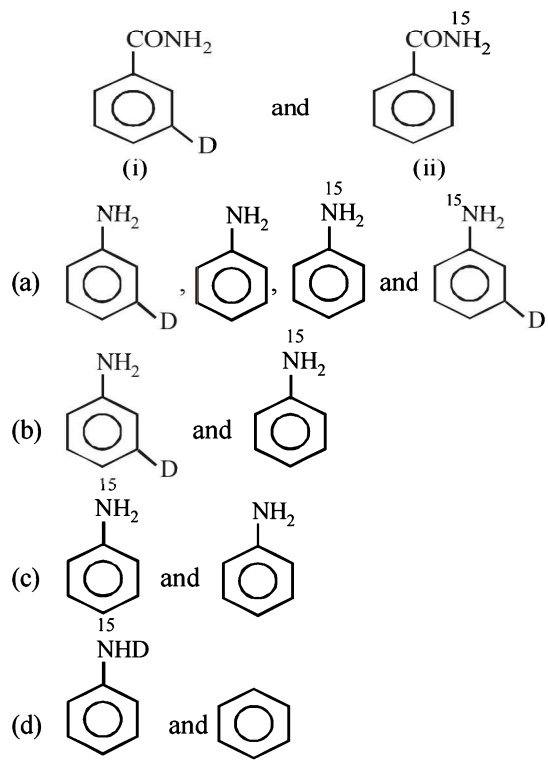
2. Which is the rate determining step in Hofmann bromamide degradation? *(2006 - 5M, –2)*

(a) Formation of (i) (b) Formation of (ii)

(c) Formation of (iii) (d) Formation of (iv)

3. What are the constituent amines formed when the mixture of (i) and (ii) undergoes Hofmann bromamide degradation?

(2006 - 5M, –2)



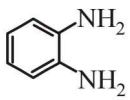
PASSAGE - 2

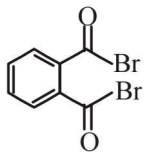
Treatment of compound O with $KMnO_4/H^+$ gave P, which on heating with ammonia gave Q. The compound Q on treatment with Br_2/NaOH produced R. On strong heating, Q gave S, which on further treatment with ethyl 2-bromopropanoate in the presence of KOH followed by acidification, gave a compound T.

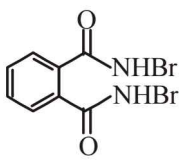
(JEE Adv. 2016)

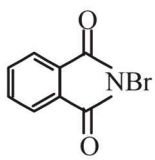
(O)

4. The compound R is

(a) 

(b) 

(c) 

(d) 

5. The compound T is

(a) glycine (b) alanine
(c) valine (d) serine

H Assertion & Reason Type Questions

Read the following Statement-1(Asseration) and Statement -2 (Reason) and answer as per the options given below :

(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(c) Statement-1 is True, Statement-2 is False
(d) Statement-1 is False, Statement-2 is True

1. **Statement - 1:** *p*-Nitrophenol is a stronger acid than *o*-nitrophenol.
Statement - 2 : Intramolecular hydrogen bonding makes the *o*-isomer weaker than the *p*-isomer. ***(1989 - 2 Marks)***

2. **Statement - 1:** Benzonitrile is prepared by the reaction of chlorobenzene with potassium cyanide.
Statement - 2 : Cyanide (CN^-) is a strong nucleophile. ***(1998 - 2 Marks)***

3. **Statement - 1 :** In strongly acidic solutions, aniline becomes more reactive towards electrophilic reagents.
Statement-2 : The amino group being completely protonated in strongly acidic solution, the lone pair of electrons on the nitrogen is no longer available for resonance. ***(2001S)***

4. **Statement - 1 :** Aniline on reaction with $NaNO_2$ / HCl at 0°C followed by coupling with β-naphthol gives a dark blue precipitate.
and
Statement - 2 : The colour of the compound formed in the reaction of aniline with $NaNO_2$/HCl at 0°C followed by coupling with β-naphthol is due to the extended conjugation. ***(2008)***

Section-B JEE Main / AIEEE

1. When primary amine reacts with chloroform in ethanolic KOH then the product is **[2002]**

(a) an isocyanide

(b) an aldehyde

(c) a cyanide

(d) an alcohol.

2. The reaction of chloroform with alcoholic KOH and p-toluidine forms **[2003]**

(a) H_3C–C$_6$H$_4$–N_2Cl

(b) H_3C–C$_6$H$_4$–$NHCHCl_2$

(c) H_3C–C$_6$H$_4$–NC

(d) H_3C–C$_6$H$_4$–CN

3. The correct order of increasing basic nature for the bases NH_3, CH_3NH_2 and $(CH_3)_2NH$ is **[2003]**

(a) $(CH_3)_2NH < NH_3 < CH_3NH_2$

(b) $NH_3 < CH_3NH_2 < (CH_3)_2NH$

(c) $CH_3NH_2 < (CH_3)_2NH < NH_3$

(d) $CH_3NH_2 < NH_3 < (CH_3)_2NH$

4. Ethyl isocyanide on hydrolysis in acidic medium generates **[2003]**

(a) propanoic acid and ammonium salt

(b) ethanoic acid and ammonium salt

(c) methylamine salt and ethanoic acid

(d) ethylamine salt and methanoic acid

5. Which one of the following methods is neither meant for the synthesis nor for separation of amines? **[2005]**

(a) Curtius reaction

(b) Wurtz reaction

(c) Hofmann method

(d) Hinsberg method

6. Amongst the following the most basic compound is **[2005]**

(a) p -nitroaniline (b) acetanilide

(c) aniline (d) benzylamine

7. An organic compound having molecular mass 60 is found to contain C = 20%, H = 6.67% and N = 46.67% while rest is oxygen. On heating it gives NH_3 alongwith a solid residue. The solid residue give violet colour with alkaline copper sulphate solution. The compound is **[2005]**

(a) $CH_3CH_2CONH_2$ (b) $(NH_2)_2CO$

(c) CH_3CONH_2 (d) CH_3NCO

8. Which one of the following is the strongest base in aqueous solution ? **[2007]**

(a) Methylamine (b) Trimethylamine

(c) Aniline (d) Dimethylamine.

9. In the chemical reaction,

$CH_3CH_2NH_2 + CHCl_3 + 3KOH \rightarrow (A) + (B) + 3H_2O$, the compounds (A) and (B) are respectively **[2007]**

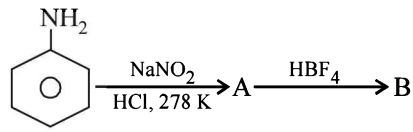
(a) C_2H_5NC and 3KCl

(b) C_2H_5CN and 3KCl

(c) $CH_3CH_2CONH_2$ and 3KCl

(d) C_2H_5NC and K_2CO_3.

10. In the chemical reactions,



the compounds 'A' and 'B' respectively are **[2010]**

(a) nitrobenzene and fluorobenzene

(b) phenol and benzene

(c) benzene diazonium chloride and fluorobenzene

(d) nitrobenzene and chlorobenzene

11. A compound with molecular mass 180 is acylated with CH_3COCl to get a compound with molecular mass 390. The number of amino groups present per molecule of the former compound is : **[JEE M 2013]**

(a) 2 (b) 5

(c) 4 (d) 6

12. An organic compound A upon reacting with NH_3 gives B. On heating B gives C. C in presence of KOH reacts with Br_2 to given $CH_3CH_2NH_2$. A is : **[JEE M 2013]**

(a) CH_3COOH (b) $CH_3CH_2CH_2COOH$

(c) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-COOH$ (d) CH_3CH_2COOH

13. The gas leaked from a storage tank of the Union Carbide plant in Bhopal gas tragedy was : **[JEE M 2013]**

(a) Methyl isocyanate (b) Methylamine

(c) Ammonia (d) Phosgene

14. On heating an aliphatic primary amine with chloroform and ethanolic potassium hydroxide, the organic compound formed is: **[JEE M 2014]**

(a) an alkanol (b) an alkanediol

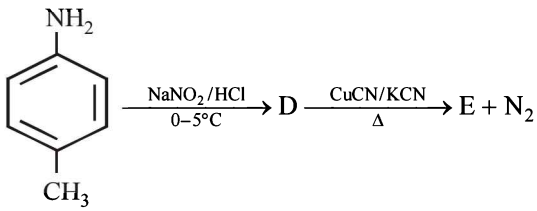
(c) an alkyl cyanide (d) an alkyl isocyanide

15. Considering the basic strength of amines in aqueous solution, which one has the smallest pK_b value? **[JEE M 2014]**

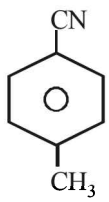
(a) $(CH_3)_2NH$ (b) CH_3NH_2

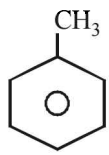
(c) $(CH_3)_3N$ (d) $C_6H_5NH_2$

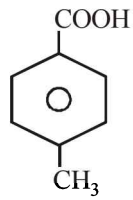
16. In the reaction **[JEE M 2015]**

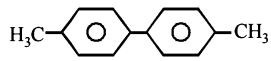


the product E is :

(a) 

(b) 

(c) 

(d) 

17. In the Hofmann bromamide degradation reaction, the number of moles of NaOH and Br_2 used per mole of amine produced are : **[JEE M 2016]**

(a) Two moles of NaOH and two moles of Br_2.

(b) Four moles of NaOH and one mole of Br_2.

(c) One mole of NaOH and one mole of Br_2.

(d) Four moles of NaOH and two moles of Br_2.