DPP - Daily Practice Problems

Name : _____ Date : _____

Start Time : _____ End Time : _____

CHEMISTRY 55

SYLLABUS : Nitrogen Containing Compounds - II

Max. Marks : 120 **Time : 60 min.**

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solution booklet.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus. Refer syllabus sheet in the starting of the book for the syllabus of all the DPP sheets.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

DIRECTIONS (Q.1-Q.21) : There are 21 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE choice is correct.

Q.1 Aniline is reacted with bromine water and the resulting product is treated with an aqueous solution of sodium nitrite in presence of dilute hydrochloric acid. The compound so formed is converted into a tetrafluoroborate which is subsequently heated dry. The final product is

(a) 1,3,5-tribromobenzene
(b) *p*-bromofluorobenzene
(c) *p*-bromoaniline
(d) 2,4,6-tribromofluorobenzene

Q.2 Alkyl cyanides when react with Grignard reagents, the product on hydrolysis gives

(a) Aldehydes (b) Ketones
(c) Alcohols (d) Acids

Q.3 Nitrobenzene on nitration gives

(a) *o*-dinitrobenzene (b) *p*-dinitrobenzene
(c) *m*-dinitrobenzene (d) *o*- and *p*-nitrobenzene

Q.4 Which of following is not a usual method for the preparation of primary amine?

(a) Hofmann's method (b) Curtius reaction
(c) Schmidt reaction (d) Friedel-Craft's reaction

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ

Space for Rough Work

Q.5 Primary nitro compounds when react with HNO_2 forms crystalline solids which on treatment with NaOH gives
(a) Red solution (b) Blue solution
(c) White precipitate (d) Yellow colouration

Q.6 The compound which on reaction with aqueous nitrous acid on HNO_2 at low temperature produces an oily nitrosoamine, it is
(a) Diethylamine (b) Ethylamine
(c) Aniline (d) Methylamine

Q.7 Primary and secondary amines are distinguished by
(a) Br_2/KOH (b) $HClO_4$
(c) HNO_2 (d) NH_3

Q.8 Unpleasant smelling carbylamines are formed by heating alkali and chloroform with
(a) Any amine (b) Any aliphatic amine
(c) Any aromatic amine (d) Any primary amine

Q.9 Aniline reacts with excess of alkyl halide to give
(a) Amino compound
(b) Tertiary compound
(c) Quaternary ammonium compound
(d) Azomethane

Q.10 Which statement is not correct ?
(a) Amines form hydrogen bonds
(b) Ethyl amine has higher boiling point than propane
(c) Methyl amine is more basic than ammonia
(d) Dimethyl amine is less basic than methyl amine

Q.11 In the diazotisation of aniline with sodium nitrite and hydrochloric acid, an excess of hydrochloric acid is used primarily to
(a) Suppress the concentration of free aniline available for coupling
(b) Suppress hydrolysis of phenol
(c) Ensure a stoichiometric amount of nitrous acid
(d) Neutralize the base liberated

Q.12 In the reaction

$$CH_3CN + CH_3MgI \rightarrow A \xrightarrow{H_2O/H^+} B$$

The compound B is
(a) Acetic acid (b) Acetone
(c) Acetaldehyde (d) Ethyl alcohol

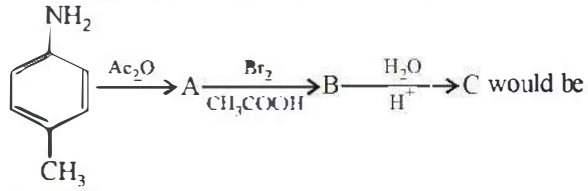
Q.13 Aniline and methyl amine can be differentiated by
(a) Reaction with chloroform and aqueous solution of KOH
(b) Diazotisation followed by coupling with phenol
(c) Reaction with HNO_2
(d) None of these

Q.14 The amine which can react with $C_6H_5 - SO_2 - Cl$ to form a product insoluble in alkali shall be
(a) Primary amine
(b) Secondary amine
(c) Tertiary amine
(d) Both primary and secondary amines

Q.15 Which of the following chemicals are used to manufacture methyl isocyanate that caused "Bhopal Tragedy"?
(i) Methylamine (ii) Phosgene
(iii) Dimethylamine (iv) Phosphine
(a) (i) and (iii) (b) (iii) and (iv)
(c) (i)and (ii) (d) (ii)and(iv)

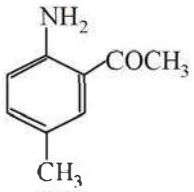
Q.16 *p*-Chloroaniline and anilinium hydrogen chloride can be distinguished by
(a) Sandmaeyer reaction (b) Carbylamine reaction
(c) Hinsberg's reaction (d) $AgNO_3$

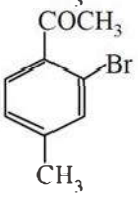
Q.17 The final product C, obtained in this reaction

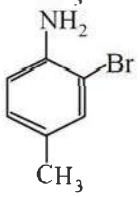


p-Toluidine

(a) 

(b) 

(c) 

(d) 

RESPONSE GRID					
	5. ⓐⓑⓒⓓ	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ
	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ
	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ		

Space for Rough Work

Q.18 The correct order of basicity of amines in water is :

(a) $(CH_3)_2NH > (CH_3)_3N > CH_3NH_2$

(b) $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$

(c) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$

(d) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$

Q.19 Among the following compounds $C_3H_7NH_2$, NH_3, CH_3NH_2, $C_2H_5NH_2$ and $C_6H_5NH_2$, the least basic compound is

(a) $C_3H_7NH_2$ (b) NH_3

(c) CH_3NH_2 (d) $C_6H_5NH_2$

Q.20 A positive carbylamine test is given by

(a) N, N-dimethylaniline

(b) 2, 4-dimethylaniline

(c) N-methyl-*o*-methylaniline

(d) N-methylbenzylamine

Q.21 Benzenediazonium chloride on reaction with phenol in weakly basic medium gives

(a) Diphenyl ether (b) *p*-Hydroxyazobenzene

(c) Chlorobenzene (d) Benzene

DIRECTIONS (Q.22-Q.24) : In the following questions, more than one of the answers given are correct. Select the correct answers and mark it according to the following codes:

Codes :

(a) 1, 2 and 3 are correct **(b)** 1 and 2 are correct

(c) 2 and 4 are correct **(d)** 1 and 3 are correct

Q.22 Mark the incorrect statements.

(1) Methyl amine is slightly acidic

(2) Methyl amine is less basic than NH_3

(3) Methyl amine forms salts with alkalies

(4) Methyl amine is stronger base than NH_3

Q.23 The reagent/s used to distinguish between CH_3NH_2, $(CH_3)_2NH$ is/are –

(1) Benzene sulphonyl chloride

(2) CS_2 followed by $HgCl_2$

(3) Baeyer'sreagent

(4) $NaNO_2$ and HCl

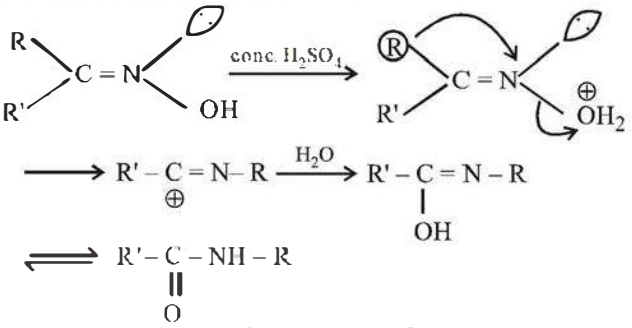
Q.24 Which of the following reacts with nitrous acid ?

(1) Acetamide (2) 2-Nitrobutane

(3) Diethylamine (4) 2-Methyl-2-nitropropane

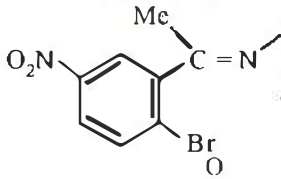
DIRECTIONS (Q.25-Q.27) : Read the passage given below and answer the questions that follows :

Aldehydes and ketones react with NH_2OH to form aldoximes and ketoximes respectively. Configuration of unsymmetrical ketoximes can be determined by Beckmann rearrangement in which that group migrates which is anti w.r.t. – OH.



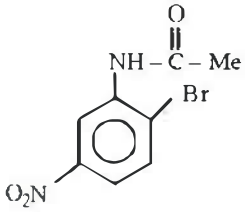
It is interesting to note that the migration of group is completely retentive and no loss of optical activity is seen.

Q.25



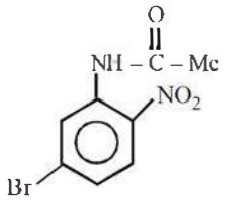
Product is

(a)

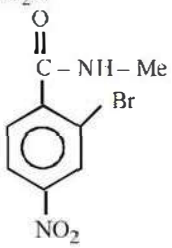


(b)

(c)



(d)



RESPONSE GRID					
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	23. ⓐⓑⓒⓓ	24. ⓐⓑⓒⓓ	25. ⓐⓑⓒⓓ		

Space for Rough Work

Q.26 $CH_3CHO + NH_2OH \longrightarrow P \xrightarrow{H^{\oplus}} \bullet$

Which of the following statement is correct?

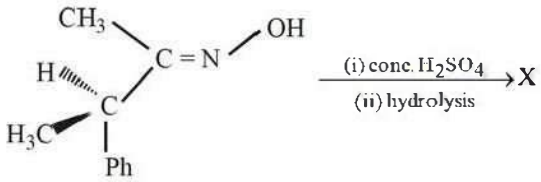
(a) Oxime P is syn form of geometrical isomer

(b) Oxime P is anti form

(c) Q is ethanal

(d) All are correct

Q.27



Which of the following statement is true ?

(a) X is CH_3NH_2

(b) X is CH_3COOH

(c) Rearrangement is intermolecular

(d) Both (b) and (c)

DIRECTIONS (Q. 28-Q.30) : Each of these questions contains two statements: Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

(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 False, Statement-2 is True.

(d) Statement -1 is True, Statement-2 is False.

Q.28 Statement-1 : Benzene diazonium chloride does not give tests for nitrogen.
Statement-2 : N_2 gas releases during heating.

Q.29 Statement-1 : In strongly acidic solutions, aniline becomes more reactive towards electrophilic reagents.
Statement-2 : The amino group is protonated in strongly acidic solution, and thus the lone pair of electrons on the nitrogen is no longer available for resonance.

Q.30 Statement-1 : Pyridine is basic.
Statement-2 : Lone pair of electrons on its nitrogen is not involved in aromatic sextet.

RESPONSE GRID	26. ⓐⓑⓒⓓ	27. ⓐⓑⓒⓓ	28. ⓐⓑⓒⓓ	29. ⓐⓑⓒⓓ	30. ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM SHEET 55 - CHEMISTRY			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	36	Qualifying Score	56
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

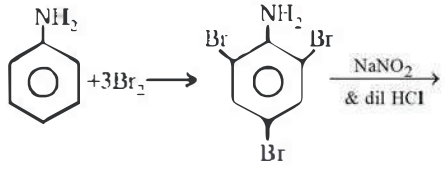
Space for Rough Work

DAILY PRACTICE PROBLEMS

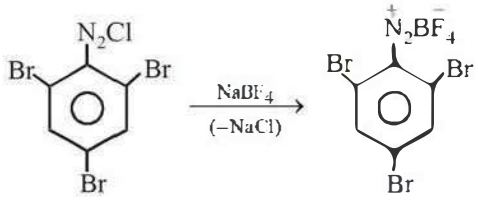
CHEMISTRY SOLUTIONS

55

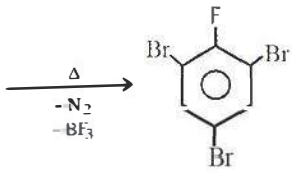
1. **(d)**



2, 4, 6 tribromoaniline



Diazonium salt — Diazonium tetra fluro borate



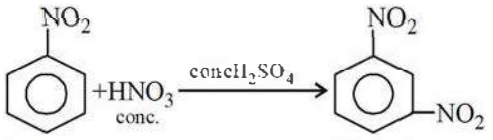
2,4,6 tribromofluorobenzene

2. **(b)** $R-C\equiv N + R-Mg-X \rightarrow R-\underset{\underset{R}{|}}{C}=N-Mg-Br$

Alkylcyanide

$\xrightarrow{\text{hydrolysis}} \underset{\text{Ketone}}{R-CO-R} + NH_3 + Mg\begin{matrix}Br\\OH\end{matrix}$

3. **(c)**



Nitrobenzene — *m*-Dinitrobenzene

4. **(d)** Friedel-Craft's reaction is not a method to prepare amine.

5. **(a)** $\underset{1^\circ \text{ nitro}}{R-CH_2-NO_2} \xrightarrow{HNO_2} \underset{\underset{N-OH}{\|}}{R-C-NO}$

Nitroloic acid

$\xrightarrow{NaOH} \underset{\underset{N^-\ Na^+}{\|}}{R-C-NO_2}$ (Blood red)

Recall Victor-Meyer method for distinction between 1°, 2° and 3° alcohols.

6. **(a)** $(C_2H_5)_2NH + (aq.)H\bullet N\bullet \rightarrow \underset{\text{Diethyl nitrosoamine}}{(C_2H_5)_2N-N=O} + H_2\bullet$

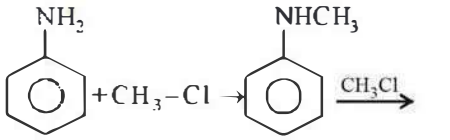
7. **(c)** $\underset{1^\circ \text{Amine}}{CH_3CH_2-NH_2} + HNO_2 \rightarrow \underset{\text{Alcohol}}{CH_3CH_2-OH} + N_2 + H_2O$

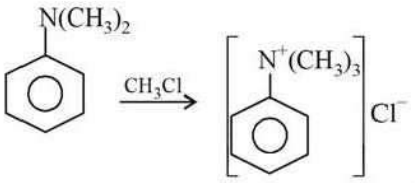
$\underset{2^\circ \text{Amine}}{(CH_3CH_2)_2NH} + HNO_2 \rightarrow \underset{\text{Nitrosoamine}}{(CH_3CH_2)_2N-N=O} + H_2O$

8. **(d)** $R-NH_2 + CHCl_3 + 3NaOH \rightarrow R\overset{\ominus}{N}\overset{\oplus}{\equiv}C + 3NaCl + 3H_2O$

The unpleasant smell is due to the formation of isocyanide (carbylamine).

9. **(c)**





Quaternary ammonium salt

10. **(d)** In methyl amine, only one electron releasing group is present but in dimethyl amine two electron releasing groups are present which increase basicity.

11. **(a)** To suppress the concentration of free aniline which otherwise would undergo coupling reaction with the benzenediazonium salt.

12. **(b)** $CH_3CN + CH_3MgI \rightarrow \underset{(A)}{(CH_3)_2CNMgI} \xrightarrow[-NH_3]{H_2O/H^+}$

$(CH_3)_2CO + Mg\begin{matrix}OH\\I\end{matrix}$

(B)

13. **(b)** Aniline, on diazotisation gives benzenediazonium salt which undergoes coupling reaction with phenol to form azodyes. Methyl amine on diazotisation ($NaNO_2 + HCl$) gives methyl alcohol which does not couple with phenol.

14. **(b)** $C_6H_5SO_2Cl$ is called Hinsberg's reagent which reacts with sec amine to form a product insoluble in alkalies. This reaction is used to separate 1°, 2° and 3° amines from their mixture.

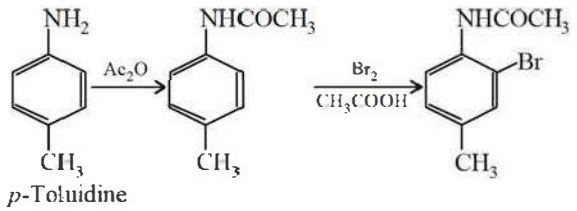
15. **(a)** Methyl isocyanate is industrially prepared by the action of methyl amine with phosgene.

$CH_3NH_2 + COCl_2 \xrightarrow{-HCl} [CH_3NH-CO-Cl]$

$\xrightarrow[-HCl]{\Delta} \underset{\text{methyl isocyanate}}{CH_3-N=C=O}$

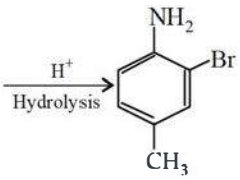
16. (d) Anilinium hydrogen chloride has chloride ion which gives white precipitate with $AgNO_3$.

17. (d)



p-Toluidine

(A) (B)

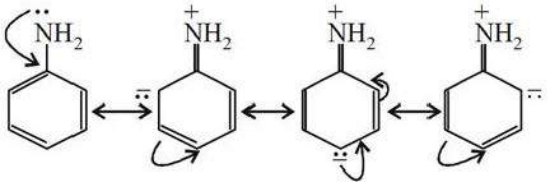


(C)

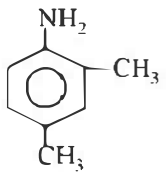
18. (a) Basicity of amines increases with increase in number of $-CH_3$ groups due to increase in electron density on N atom. As a result, basicity of *ter*-amine should be more than that of *sec*-amine, but actually it is found to be less than *sec*-amines. This is due to steric hinderance of bulkier alkyl groups which decrease the availability of lone pair of electrons on the N atom of the amino group. Hence the correct order of basicity is :

$$(CH_3)_2NH > (CH_3)_3N > CH_3NH_2$$

19. (d) Here, $C_6H_5NH_2$ is least basic as the lone pair of electrons on N is delocalized into benzene ring by resonance



20. (b)



It is a type of 1° amine and hence gives positive carbylamine test.

21. (b)

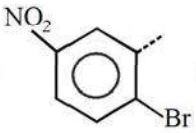
22. (a) Presence of alkyl group increases electron density on nitrogen atom due to + I effect. Thus, CH_3NH_2 is stronger base than NH_3.

23. (b) Benzenesulphonyl chloride reacts with primary amine and forms N-alkylbenzene sulphonamide which is soluble in alkali, secondary amine forms N, N-dialkylbenzene sulphnoamide which is insoluble in alkali.
Primary amine forms a black precipitate with $CS_2/HgCl_2$.
Secondary amine does not form any precipitate.

24. (a) *tert*-Nitro compounds do not react with HONO because they do not have any α-H.

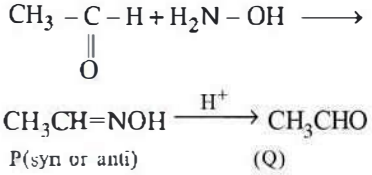
2-Methyl-2-nitropropane

25. (a)



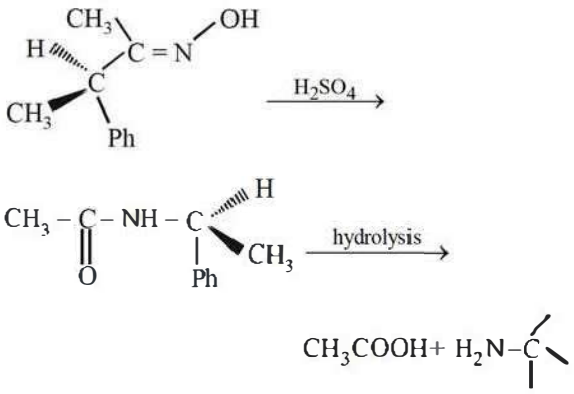
group is anti to –OH, therefore, it will migrate forming (a) as the fuiol product

26. (d).



P(syn or anti) (Q)

27. (b).



28. (a) It is true that benzene diazonium chloride does not respond Lassaigne's test of nitrogen because benzene diazonium chloride loses N_2 on heating and thus it can't form NaCN with sodium metal.

29. (c) In strongly acidic conditions, aniline becomes protonated with the result lone pair of electrons is not available to produce +E and +M effects. On the other hand, the $-\overset{\oplus}{N}H_3$ group exerts strong –I effect causing deactivation of the ring.

30. (a)