I. Multiple Choice Questions (Type-I)

1. Which of the following is a 3° amine?
   (i) 1-methylcyclohexylamine
   (ii) Triethylamine
   (iii) tert-butylamine
   (iv) N-methyl aniline
   **Solution:**
   Option (ii) is the answer.

2. The correct IUPAC name for CH2==CHCH2 NHCH3 is
   (i) Allylmethylamine
   (ii) 2-amino-4-pentene
   (iii) 4-aminopent-1-ene
   (iv) N-methylprop-2-en-1-amine
   **Solution:**
   Option (iv) is the answer.

3. Amongst the following, the strongest base in aqueous medium is ____________.
   (i) CH3NH2
   (ii) NCCH2NH2
   (iii) (CH3)2 NH
   (iv) C6H5NHCH3
   **Solution:**
   Option (iii) is the answer.

4. Which of the following is the weakest Brönsted base?
5. Benzylamine may be alkylated as shown in the following equation:
C₆H₅CH₂NH₂ + R—X → C₆H₅CH₂NHR
Which of the following alkyl halides is best suited for this reaction through SN₁ mechanism?
(i) CH₃Br
(ii) C₆H₅Br
(iii) C₆H₅CH₂Br
(iv) C₂H₅Br
Solution:
Option (iii) is the answer.

6. Which of the following reagents would not be a good choice for reducing an aryl nitro compound to an amine?
(i) H₂ (excess)/Pt
(ii) LiAlH₄ in ether
(iii) Fe and HCl
(iv) Sn and HCl
Solution:
Option (ii) is the answer.

7. To prepare a 1° amine from an alkyl halide with simultaneous addition
of one CH₂ group in the carbon chain, the reagent used as a source of nitrogen is __________.
(i) Sodium amide, NaNH₂
(ii) Sodium azide, NaN₃
(iii) Potassium cyanide, KCN
(iv) Potassium phthalimide, C₆H₄(CO)₂N–K⁺
Solution:
Option (iii) is the answer.

8. The source of nitrogen in Gabriel synthesis of amines is ____________.
(i) Sodium azide, NaN₃
(ii) Sodium nitrite, NaN₂O
(iii) Potassium cyanide, KCN
(iv) Potassium phthalimide, C₆H₄(CO)₂N–K⁺
Solution:
Option (iv) is the answer.

9. Amongst the given set of reactants, the most appropriate for preparing 2° amine is _____.
(i) 2° R—Br + NH₃
(ii) 2° R—Br + NaCN followed by H₂/Pt
(iii) 1° R—NH₂ + RCHO followed by H₂/Pt
(iv) 1° R—Br (2 mol) + potassium phthalimide followed by H₃O+/heat
Solution:
Option (iii) is the answer.

10. The best reagent for converting 2-phenylpropanamide into 2-phenylpropanolamine is ____.
(i) excess H₂
(ii) Br₂ in aqueous NaOH
(iii) iodine in the presence of red phosphorus
(iv) LiAlH₄ in ether
Solution:
Option (iv) is the answer.

11. The best reagent for converting, 2-phenylpropanamide into 1-phenylethanamine is ____.
(i) excess H₂/Pt
(ii) NaOH/Br₂
(iii) NaBH₄/methanol
(iv) LiAlH₄/ether
Solution:
Option (ii) is the answer.

12. Hoffmann Bromamide Degradation reaction is shown by ____________.
(i) ArNH₂
(ii) ArCONH₂  
(iii) ArNO₂  
(iv) ArCH₂NH₂

Solution:
Option (ii) is the answer.

13. The correct increasing order of basic strength for the following compounds is _________.

(i) II < III < I  
(ii) III < I < II  
(iii) III < II < I  
(iv) II < I < III

Solution:
Option (iv) is the answer.

14. Methylamine reacts with HNO₂ to form _________.
   (i) CH₃—O—N═O  
   (ii) CH₃—O—CH₃  
   (iii) CH₃OH  
   (iv) CH₃CHO

Solution:
Option (iii) is the answer.

15. The gas evolved when methylamine reacts with nitrous acid is _________.
   (i) NH₃  
   (ii) N₂  
   (iii) H₂  
   (iv) C₂H₆

Solution:
Option (ii) is the answer.
16. In the nitration of benzene using a mixture of conc. H2SO4 and conc. HNO3, the species which initiates the reaction is __________.
(i) NO2
(ii) NO+
(iii) NO2+
(iv) NO2–
Solution:
Option (iii) is the answer.

17. Reduction of aromatic nitro compounds using Fe and HCl gives __________.
(i) aromatic oxime
(ii) aromatic hydrocarbon
(iii) aromatic primary amine
(iv) aromatic amide
Solution:
Option (iii) is the answer.

18. The most reactive amine towards dilute hydrochloric acid is __________.
Solution:
Option (ii) is the answer.

19. Acid anhydrides on reaction with primary amines give __________.
(i) amide
(ii) imide
(iii) secondary amine
(iv) imine
Solution:
Option (i) is the answer.

20. The reaction \( \text{Ar} + \text{N}_2\text{Cl}^- \rightarrow \text{Cu/HCl} \rightarrow \text{ArCl} + \text{N}_2 + \text{CuCl} \) is named as __________.
(i) Sandmeyer reaction
(ii) Gatterman reaction
(iii) Claisen reaction
(iv) Carbylamine reaction
Solution:
21. The best method for preparing primary amines from alkyl halides without changing the number of carbon atoms in the chain is
(i) Hoffmann Bromamide reaction
(ii) Gabriel phthalimide synthesis
(iii) Sandmeyer reaction
(iv) Reaction with NH₃
Solution:
Option (ii) is the answer.

22. Which of the following compound will not undergo an azo coupling reaction with benzene diazonium chloride.
(i) Aniline
(ii) Phenol
(iii) Anisole
(iv) Nitrobenzene
Solution:
Option (iv) is the answer.

23. Which of the following compounds is the weakest Brönsted base?
Solution:
Option (iii) is the answer.

24. Among the following amines, the strongest Brönsted base is __________.
25. The correct decreasing order of basic strength of the following species is _______. H₂O, NH₃, OH–, NH₂–
   (i) NH₂– > OH – > NH₃ > H₂O
   (ii) OH– > NH₂– > H₂O > NH₃
   (iii) NH₃ > H₂O > NH₂– > OH–
   (iv) H₂O > NH₃> OH– > NH₂–
Solution:
Option (ii) is the answer.

26. Which of the following should be most volatile?

   ![Chemical Structures]

   (i) II
   (ii) IV
   (iii) I
   (iv) III
Solution:
Option (iv) is the answer.

27. Which of the following methods of preparation of amines will give the same number of carbon atoms in the chain of amines as in the reactant?
   (i) The reaction of nitrite with LiAlH₄.
   (ii) The reaction of the amide with LiAlH₄ followed by treatment with water.
   (iii) Heating alkyl halide with potassium salt of phthalimide followed by hydrolysis.
   (iv) Treatment of amide with bromine in the aqueous solution of sodium hydroxide.
Solution:
Option (iii) is the answer.

II. Multiple Choice Questions (Type-II)
Note: In the following questions two or more options may be correct.

28. Which of the following cannot be prepared by Sandmeyer’s reaction?
   (i) Chlorobenzene
   (ii) Bromobenzene
   (iii) Iodobenzene
   (iv) Nitrobenzene
(iv) Fluorobenzene
Solution:
Option (iii) and (iv) are the answers.

29. Reduction of nitrobenzene by which of the following reagent gives aniline?
(i) Sn/HCl
(ii) Fe/HCl
(iii) H2-Pd
(iv) Sn/NH4OH
Solution:
Option (i), (ii) and (iii) are the answers.

30. Which of the following species are involved in the carbylamine test?
(i) R—NC
(ii) CHCl3
(iii) COCl2
(iv) NaNO2 + HCl
Solution:
Option (i) and (ii) are the answers.

31. The reagents that can be used to convert benzene diazonium chloride to benzene are __________.
(i) SnCl2/HCl
(ii) CH3CH2OH
(iii) H3PO2
(iv) LiAlH4
Solution:
Option (ii) and (iii) are the answers.

32. The product of the following reaction is __________.
33. Arenium ion involved in the bromination of aniline is __________.

Solution:
Option (A) and (B) is the answer.

34. Which of the following amines can be prepared by Gabriel synthesis.
(i) Isobutyl amine
(ii) 2-Phenylethylamine
(iii) N-methyl benzylamine
(iv) Aniline
Solution:
Option (i) and (ii) are the answers.

35. Which of the following reactions are correct?
36. Under which of the following reaction conditions, aniline gives p-nitro derivative as the major product?
(i) Acetyl chloride/pyridine followed by reaction with conc. H_2SO_4 + conc. HNO_3
(ii) Acetic anhydride/pyridine followed by conc. H_2SO_4 + conc. HNO_3
(iii) Dil. HCl followed by reaction with conc. H_2SO_4 + conc. HNO_3
(iv) Reaction with conc. HNO_3 + conc. H_2SO_4
Solution:
Option (i) and (ii) are the answers.

37. Which of the following reactions belong to electrophilic aromatic substitution?
(i) Bromination of acetanilide
(ii) Coupling reaction of aryldiazonium salts
(iii) Diazotisation of aniline
(iv) Acylation of aniline
Solution:
Option (i) and (ii) are the answers.

III. Short Answer Type

38. What is the role of HNO_3 in the nitrating mixture used for nitration of benzene?
Solution:
Nitrating mixture is the mixture of 1:1 solution of HNO_3 and H_2SO_4 and is used for the nitration of organic compounds. It acts as a base and provides electrophile in the nitration process of benzene.

39. Why is NH_2 group of aniline acetylated before carrying out nitration?
Solution:
To control the nitration reaction and tarry oxidation products and nitro derivatives products formation, the NH_2 group of aniline is acetylated before carrying out nitration. Here, the major product is p-
nitroaniline.

40. What is the product when C₆H₅CH₂NH₂ reacts with HNO₂?
Solution:
C₆H₅CH₂NH₂ reacts with HNO₂ to form unstable diazonium salt, which in turn gives alcohol.
C₆H₅CH₂NH₂ + HNO₂ → C₆H₅CH₂OH + N₂ + H₂O

41. What is the best reagent to convert nitrile to primary amine?
Solution:
The best reagents for the conversion of nitrile to primary amine are LiAlH₄ and Sodium/Alcohol. By reduction, the nitriles can be converted into a corresponding primary amine.

42. Give the structure of ‘A’ in the following reaction.

Solution:

The product formed in this chemical reaction is 3-Methylnitrobenzene.

43. What is Hinsberg reagent?
Solution:
Benzenesulphonyl chloride or, C₆H₅SOCl is commonly known as Hinsberg’s reagent. Hinsberg’s reagent is be used to distinguish primary, secondary and tertiary amines.

44. Why is benzene diazonium chloride not stored and is used immediately after its preparation?
Solution:
Benzene diazonium chloride is highly soluble in water at high temperature and is itself very stable at low temperature. It should be used immediately after its preparation as it is unstable.
45. Why does the acetylation of —NH2 group of aniline reduce its activating effect?
Solution:
The acetylation of —NH2 group of aniline reduces its activating effect because the lone pair of electrons on the nitrogen of acetonilide interacts with oxygen atom due to resonance.

46. Explain why MeNH2 is a stronger base than MeOH?
Solution:
MeNH2 is a stronger base than MeOH because of the lower electronegativity and the presence of the lone pair of electrons on the nitrogen atom in MeNH2.

47. What is the role of pyridine in the acylation reaction of amines?
Solution:
The activating effect of –NH2 group can be controlled by protecting the -NH2 group by acetylation with acetic anhydride in presence of pyridine and then carrying out the desired substitution followed by hydrolysis of the substituted amide to the substituted amine. Pyridine is a base that is used to get rid of HCl as a side product from the reaction.

48. Under what reaction conditions (acidic/basic), the coupling reaction of aryldiazonium chloride with aniline is carried out?
Solution:
This reaction is carried out in a mild basic medium. This is an electrophilic substitution reaction. Aryldiazonium chloride reacts with aniline to form a yellow dye of p-Aminoazobenzene.

49. Predict the product of the reaction of aniline with bromine in a non-polar solvent such as CS2.
Solution:
The products formed in the reaction of aniline with bromine in a non-polar solvent such as CS2 are 4-Bromoaniline and 2-Bromoaniline where 4-Bromoaniline is the major product.

50. Arrange the following compounds in increasing order of dipole moment.
CH3CH2CH3, CH3CH2NH2, CH3CH2OH
Solution:
CH3CH2CH3 < CH3CH2NH2 < CH3CH2OH
The dipole moment of CH3CH2OH is greater than that of CH3CH2NH2. CH3CH2CH3 has the least dipole moment among the three given compounds because it is almost a non-polar molecule.