

Instructions

Attempt only 40 questions out of the given 50 questions. Each question carries 5 marks. One mark will be deducted for a wrong answer.

Full Marks: 200

(Time: 60 Minutes)

1. The number of atoms per unit cell of bcc structure is:

- (a) 1 (b) 2 (c) 4 (d) 6

2. Match the following:

List-I (lattice point)		List-II (contribution to 1 unit cell)	
A.	Corner	(i)	1
B.	Edge	(ii)	1/8
C.	Face centre	(iii)	1/4
D.	Body centre	(iv)	1/2

- (a) A-(ii), B-(i), C-(iii), D-(iv) (b) A-(ii), B-(iii), C-(iv), D-(i)
(c) A-(i), B-(ii), C-(iv), D-(iii) (d) A-(iii), B-(iv), C-(i), D-(ii)

3. The correct order in aqueous medium of basic strength in case of methyl substituted amines is:

- (a) $\text{Me}_2\text{NH} > \text{MeNH}_2 > \text{Me}_3\text{N} > \text{NH}_3$
(b) $\text{Me}_2\text{NH} > \text{Me}_3\text{N} > \text{MeNH}_2 > \text{NH}_3$
(c) $\text{NH}_3 > \text{Me}_3\text{N} > \text{MeNH}_2 > \text{Me}_2\text{NH}$
(d) $\text{Me}_3\text{N} > \text{Me}_2\text{NH} > \text{MeNH}_2 > \text{NH}_3$

4. Match the items given in Column-I with items given in Column-II.

Column-I		Column-II	
A.	Lysine	(i)	Neutral optically active amino acid
B.	Aspartic acid	(ii)	Basic amino acid
C.	Valine	(iii)	Neutral optically inactive amino acid
D.	Glycine	(iv)	Acidic amino acid

- (a) A-(iv) B-(iii) C-(ii) D-(i)
(b) A-(iii) B-(ii) C-(iv) D-(i)
(c) A-(i) B-(ii) C-(iii) D-(iv)
(d) A-(ii) B-(iv) C-(i) D-(iii)

5. A carbonyl compound reacts with hydrogen cyanide to form cyanohydrin which on hydrolysis forms a racemic mixture of α -hydroxy acid. The carbonyl compound is: (2006)

- (a) Acetaldehyde (b) Acetone
(c) Diethyl ketone (d) Formaldehyde

6. Match the List-I with List-II.

List-I		List-II	
A.	$\text{CH}_3\text{CH}_2\text{NH}_2$	(i)	Undergoes Lieberman nitrosoamine reaction
B.	$\text{C}_6\text{H}_5\text{NH}_2$	(ii)	Undergoes Hoffmann bromamide reaction
C.	$(\text{CH}_3)_2\text{NH}$	(iii)	Gives azo dye test
D.	CH_3CONH_2	(iv)	With alcoholic KOH and CHCl_3 produces bad smell

- (a) A-(iv), B-(iii), C-(i), D-(ii) (b) A-(iii), B-(i), C-(iv), D-(ii)
(c) A-(iv), B-(iii), C-(ii), D-(i) (d) A-(iii), B-(ii), C-(i), D-(i)

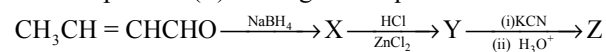
7. Van't Hoff factor more than unity indicates that the solute in solution is:

- (a) Dissociated (b) Associated
(c) Both (a) and (b) (d) Cannot say anything

8. The values of van't Hoff factors for KCl, NaCl and K_2SO_4 respectively are:

- (a) 2, 2 and 2 (b) 2, 2 and 3 (c) 1, 1 and 2 (d) 1, 1 and 1

9. The end product (Z) in the given sequence of reaction is:

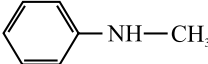
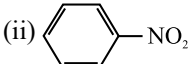
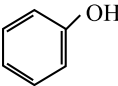
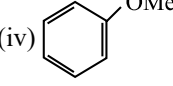
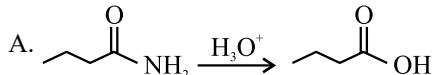
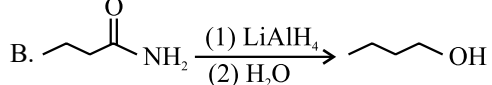
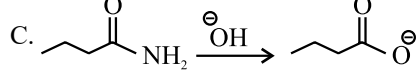
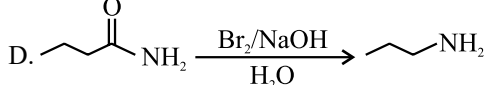


- (a) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{COOH}$ (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
(c) $\text{CH}_3\text{CH}=\text{CHCOOH}$ (d) $\text{CH}_3\text{CH}(\text{Cl})\text{CH}_2\text{COOH}$

10. Electrical conductance through metals is called metallic or electronic conductance and is due to the movement of electrons.

The electronic conductance depends on:


- (a) The nature and structure of the metal
(b) The nature of valence electrons per atom
(c) Change in temperature
(d) All of these

11. Which of the following are essential amino acids?
 A. Arginine, B. Phenylalanine,
 C. Aspartic acid, D. Cysteine,
 E. Histidine, F. Valine,
 G. Proline
 (a) A, B, C and D (b) B, C, D and E
 (c) C, D, E and F (d) A, B, E and F
12. Which of the following is an example of primary battery?
 (a) Lead storage battery (b) Leclanche cell
 (c) Nickel-cadmium cell (d) None of these
13. For which order half-life period is independent of initial concentration?
 (a) Zero (b) First (c) Second (d) Third
14. In the first order reaction the relation between the velocity constant (k_1) and half-life period ($t_{1/2}$) is:
 (a) $t_{1/2} = \frac{0.693}{k_1}$ (b) $k_1 = \frac{t_{1/2}}{0.693}$
 (c) $t_{1/2} = 0.693 + k_1$ (d) $t_{1/2} = \frac{k_1}{0.693}$
15. The effect of temperature on reaction rate is shown by:
 (a) Kirchoff's equation
 (b) Arrhenius equation
 (c) Gibb's- Helmholtz equation
 (d) Clausius- Clapeyron equation
16. Which of the following ion is not diamagnetic?
 (a) La^{3+} ($Z = 57$) (b) Lu^{3+} ($Z = 71$)
 (c) Yb^{2+} ($Z = 70$) (d) Sm^{3+} ($Z = 62$)
17. Which of the following statements is correct about order of a reaction?
 A. The order of a reaction can be a fractional number
 B. Order of a reaction is experimentally determined quantity
 C. The order of a reaction is always equal to the sum of the stoichiometric coefficients of reactants in the balanced chemical equation for a reaction
 D. The order of a reaction is the sum of the powers of molar concentration of the reactants in rate law expression
 (a) (A), (B) and (D) (b) (A), (B) and (C)
 (c) (B), (C) and (D) (d) (A), (C) and (D)
18. Rate of physical adsorption increases with:
 (a) Decrease in temperature (b) Decrease in pressure
 (c) Increase in temperature (d) Decrease surface area
19. Which of the following ores represent the ore of iron?
 (a) Magnetite (b) Siderite (c) Haematite (d) All of these
20. Sulphur (S) containing amino acids from the following are:
 A. isoleucine B. cysteine
 C. lysine D. methionine
 E. glutamic acid
 (a) A, D (b) B, D
 (c) B, C, E (d) A, B, C
21. The increasing order of the reactivity of the following compounds in nucleophilic addition reaction is:
 Propanal, Benzaldehyde, Propanone, Butanone
 (a) Benzaldehyde < Propanal < Propanone < Butanone
 (b) Butanone < Propanone < Benzaldehyde < Propanal
 (c) Propanal < Propanone < Butanone < Benzaldehyde
 (d) Benzaldehyde < Butanone < Propanone < Propanal
22. Which of the following compound(s) do not give Friedel Crafts reaction?
 (i)  (ii) 
 (iii)  (iv) 
 (a) only (iii) (b) only (iv)
 (c) (i) and (iii) both (d) (i) and (ii) both
23. What are the conditions for an ideal solution which obeys Raoult's law over the entire range of concentration?
 (a) $\Delta H_{\text{mix}} = 0, \Delta V_{\text{mix}} = 0, P_{\text{total}} = p_A^0 x_A + p_B^0 x_B$
 (b) $\Delta H_{\text{mix}} = +ve, \Delta V_{\text{mix}} = 0, P_{\text{total}} = p_A^0 x_A + p_B^0 x_B$
 (c) $\Delta H_{\text{mix}} = 0, \Delta V_{\text{mix}} = +ve, P_{\text{total}} = p_A^0 x_A + p_B^0 x_B$
 (d) $\Delta H_{\text{mix}} = 0, \Delta V_{\text{mix}} = 0, P_{\text{total}} = p_B^0 x_B$
24. The correct order of increasing acidic strength is:
 (a) Phenol < ethanol < chloroacetic acid < acetic acid
 (b) Ethanol < phenol < chloroacetic acid < acetic acid
 (c) Ethanol < phenol < acetic acid < chloroacetic acid
 (d) Chloroacetic acid < acetic acid < phenol < ethanol
25. Which of following is incorrect?
 A. 
 B. 
 C. 
 D. 
 (a) Only A (b) Only B
 (c) Both C & D (d) Only D
26. Which of the following pairs of ions have the same electronic configuration?
 (a) $\text{Cu}^{2+}, \text{Cr}^{2+}$ (b) $\text{Fe}^{3+}, \text{Mn}^{2+}$ (c) $\text{Co}^{3+}, \text{Ni}^{3+}$ (d) $\text{Sc}^{3+}, \text{Cr}^{3+}$
27. Hybridization of $[\text{Ni}(\text{CO})_4]$ is
 (a) sp^3 (b) d^2sp^3 (c) sp^3d (d) sp^2
28. The atomic number of 4f-series range from:
 (a) 57 to 71 (b) 58 to 71 (c) 58 to 72 (d) 57 to 92

29. Transition metal show paramagnetic behaviour. This is because of their:

- (a) High lattice energy (b) Variable oxidation state
(c) Characteristic configuration (d) Unpaired electrons

30. Match Column-I with Column-II.

Column-I	Column-II
A.  $\xrightarrow[\text{AlCl}_3/\text{CuCl}]{\text{CO, HCl, Anhyd.}}$	p. Hell-Volhard-Zelinsky reaction
B. $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 + \text{NaOX} \rightarrow$	q. Gattermann-Koch reaction
C. $\text{R}-\text{CH}_2-\text{OH} + \text{R}'\text{COOH} \xrightarrow{\text{Conc. H}_2\text{SO}_4}$	r. Haloform reaction
D. $\text{R}-\text{CH}_2\text{COOH} \xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) X}_2/\text{Red P}}$	s. Esterification

Choose the correct answer from the options given below.

- (a) A-(r); B-(q); C-(p); D-(s) (b) A-(p); B-(s); C-(r); D-(q)
(c) A-(q); B-(r); C-(s); D-(p) (d) A-(s); B-(p); C-(q); D-(r)

31. Stable complex based on EAN rule:

- (a) $\text{K}_4[\text{Fe}(\text{CN})_6]$ (b) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$
(c) $[\text{Ni}(\text{CO})_4]$ (d) All of these

32. In crystal field splitting, in octahedral complexes, the energy order of d-orbitals is:

- (a) $e_g > t_{2g}$ (b) $t_{2g} > e_g$
(c) $d_{xy} > d_{x^2-y^2}$ (d) $d_{z^2} > d_{xz}$

33. The CFSE for octahedral $[\text{CoCl}_6]^{4-}$ is $18,000 \text{ cm}^{-1}$. The CFSE for tetrahedral $[\text{CoCl}_4]^{2-}$ will be:

- (a) $18,000 \text{ cm}^{-1}$ (b) $16,000 \text{ cm}^{-1}$
(c) $8,000 \text{ cm}^{-1}$ (d) $20,000 \text{ cm}^{-1}$

Read the passage given below and answer the questions (Q. 34 - 38):

Nucleophilic substitution reactions are of two types; substitution nucleophilic bimolecular ($\text{S}_{\text{N}}2$) and substitution nucleophilic unimolecular ($\text{S}_{\text{N}}1$) depending on molecules taking part in determining the rate of reaction. Reactivity of alkyl halide towards $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions depends on various factors such as steric hindrance, stability of intermediate or transition state and polarity of solvent. $\text{S}_{\text{N}}2$ reaction mechanism is favoured mostly by primary alkyl halide than secondary and tertiary. This order is reversed in case of $\text{S}_{\text{N}}1$ reactions.

34. Which of the following is most reactive towards nucleophilic substitution reaction?

- (a) $\text{C}_6\text{H}_5\text{Cl}$ (b) $\text{CH}_2 = \text{CHCl}$
(c) $\text{ClCH}_2\text{CH} = \text{CH}_2$ (d) $\text{CH}_3\text{CH} = \text{CHCl}$

35. Isopropyl chloride undergoes hydrolysis by

- (a) $\text{S}_{\text{N}}1$ mechanism
(b) $\text{S}_{\text{N}}2$ mechanism
(c) Both $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ mechanism
(d) Neither $\text{S}_{\text{N}}1$ nor $\text{S}_{\text{N}}2$ mechanism.

36. The most reactive nucleophile among the following is

- (a) CH_3O^- (b) $\text{C}_6\text{H}_5\text{O}^-$
(c) $(\text{CH}_3)_2\text{CHO}^-$ (d) $(\text{CH}_3)_3\text{CO}^-$

37. Tertiary alkyl halides are practically inert to substitution by $\text{S}_{\text{N}}2$ mechanism because of

- (a) Insolubility (b) Instability
(c) Inductive effect (d) Steric hindrance

38. Which of the following is the correct order of decreasing $\text{S}_{\text{N}}2$ reactivity?

- (a) $\text{RCH}_2\text{X} > \text{R}_2\text{CHX} > \text{R}_3\text{CX}$ (b) $\text{R}_3\text{CX} > \text{R}_2\text{CHX} > \text{RCH}_2\text{X}$
(c) $\text{R}_2\text{CHX} > \text{R}_3\text{CX} > \text{RCH}_2\text{X}$ (d) $\text{RCH}_2\text{X} > \text{R}_3\text{CX} > \text{R}_2\text{CHX}$

Read the passage given below and answer the questions (Q. 39 - 43):

Interhalogen compounds are formed when halogen group elements react with each other. These are the compounds which consist of two or more different elements of group-17. A halogen with large size and low electronegativity reacts with an element of group-17 with small size and high electronegativity. As the ratio of radius of larger and smaller halogen increases, the number of atoms in a molecule also increases.

39. The stability of interhalogen compounds follows the order

- (a) $\text{IF}_3 > \text{BrF}_3 > \text{ClF}_3$ (b) $\text{ClF}_3 > \text{BrF}_3 > \text{IF}_3$
(c) $\text{BrF}_3 > \text{IF}_3 > \text{ClF}_3$ (d) $\text{ClF}_3 > \text{IF}_3 > \text{BrF}_3$

40. Identify the correct match from the following.

- (a) $[\text{ICl}_2]^-$ - bent
(b) IF_7 - pentagonal bipyramidal
(c) ClF_3 - trigonal planar
(d) $[\text{BrF}_4]^-$ - square pyramidal

41. In XA_5 , the central atom has (both X and A are halogens)

- (a) 5 bond pairs and no lone pairs
(b) 5 bond pairs and one lone pair
(c) 6 bond pairs and no lone pairs
(d) 4 bond pairs and one lone pair

42. In the known interhalogen compounds, the maximum number of atoms are

- (a) 4 (b) 8 (c) 5 (d) 7

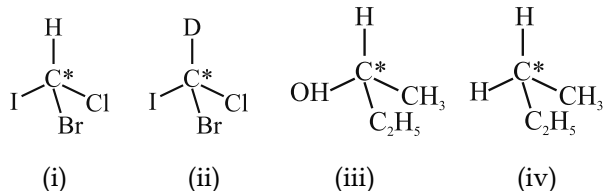
43. Which of the following is not the characteristic of interhalogen compounds?

- (a) They are more reactive than halogens
(b) They are quite unstable but none of them is explosive
(c) They are covalent in nature
(d) They have low boiling points and are highly volatile.

44. The structure of 2 - Bromo - 2 - methyl propane:

- (a) $\text{CH}_3-\overset{\text{Br}}{\underset{|}{\text{C}}}-\overset{\text{CH}_3}{\underset{|}{\text{C}}}-\text{CH}_3$ (b) $\text{CH}_3-\text{CH}_3-\text{CH}_2-\text{Br}$
(c) $\text{CH}_3-\overset{\text{Br}}{\underset{|}{\text{C}}}-\text{CH}_3$ (d) None of these
(d) $\text{CH}_3-\overset{\text{Br}}{\underset{|}{\text{C}}}-\text{CH}_3$

45. A primary alkyl halide would prefer to undergo:
 (a) S_N1 reaction (b) S_N2 reaction
 (c) α - elimination (d) Racemisation
46. Buna-N is used in making oil seals & tank lining because
 (a) It is resistant to action of lubricating oil & organics solvents
 (b) It is more elastic than natural rubber
 (c) It can be stretched twice its length
 (d) It does not melt at high temperatures
47. In which of the following molecules carbon atom marked with asterisk (*) is asymmetric?



- (a) (i), (ii), (iii) and (iv) (b) (i), (ii) and (iii)
 (c) (ii), (iii) and (iv) (d) (i), (iii) and (iv)
48. Lower alcohol are:
 (a) Soluble in water
 (b) Insoluble in organic solvents
 (c) Soluble in water only on heating
 (d) Insoluble in all solvents
49. The strongest acid among the following aromatic compounds is
 (a) p-chlorophenol (b) p-nitrophenol
 (c) m-nitrophenol (d) o-nitrophenol
50. Ethers and alcohols are:
 (a) Chain isomers (b) Positional isomers
 (c) Functional isomers (d) Stereoisomers



Answer Key

(Scan QR Code for Detailed Explanations)

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (b) | 2. (b) | 3. (a) | 4. (d) | 5. (a) | 6. (a) | 7. (a) | 8. (b) | 9. (a) | 10. (d) |
| 11. (d) | 12. (b) | 13. (b) | 14. (a) | 15. (b) | 16. (d) | 17. (a) | 18. (a) | 19. (d) | 20. (b) |
| 21. (b) | 22. (d) | 23. (a) | 24. (c) | 25. (b) | 26. (b) | 27. (a) | 28. (b) | 29. (d) | 30. (c) |
| 31. (d) | 32. (a) | 33. (c) | 34. (c) | 35. (c) | 36. (a) | 37. (d) | 38. (a) | 39. (a) | 40. (b) |
| 41. (b) | 42. (b) | 43. (d) | 44. (c) | 45. (b) | 46. (a) | 47. (b) | 48. (a) | 49. (b) | 50. (c) |