

Rekha V.V.I. Questions for 2023 Examination

*Answer of below mentioned V.V.I. questions are present in your
Rekha Examination Guide and Guess Part - I Chemistry - 1*

1. Explain the following :
 1. Van der Waals constant 'a' is the measure of cohesive force. **V.V.I.** 9
 2. Kinetic energy of one mole of an ideal gas is $3/2 RT$. **V.V.I.** 9
 3. Compressibility factor of Van der Waals gas. 9
 4. Molecular velocities of molecules are function of temperature. 10
 5. Most Probable velocity, Average Velocity and Root mean square velocity. 10
 6. NaCl has FCC Structure. **V.V.I.** 11
 7. Lyophilic colloids are more stable than lyophobic colloids. **V.V.I.** 12
 8. Gold number is the measure of stability of colloids. 12
 9. de – Broglie concept is insignificant for macroscopic objects.
Or, Only sub–microscopic particles obey de-Broglie hypothesis. 12
 10. Ideal gases do not show Joule –Thomson effect. **V.V.I.** 12
 11. Ionisation potential of Nitrogen is greater than that of Oxygen. 13
 12. Metals are conductors of heat and electricity. 13
 13. Density of water is maximum at $4^{\circ}C$ 13
 14. NH_3 molecule is pyramidal in shape. **V.V.I.** 14
 15. HF is liquid while HCl is gas. **V.V.I.** 14
 16. CH_4 is tetrahedral in shape while H_2O is angular in shape. **V.V.I.** 14
 17. Li^+ ion gets hydrated to a larger extent in comparison to Na^+ ion gets hydrated. 15
 18. Carbon tetrachloride is non–polar. **V.V.I.** 15
 19. Graphite is relatively soft and conductor of electricity. 15
 20. CCl_4 does not hydrolysed but $SiCl_4$ is hydrolysed. 15
 21. Oxygen is paramagnetic. **V.V.I.** 15
 22. SF_6 molecule is octahedral in shape. 16
 23. H_2O is liquid but H_2S is gas at room temperature. **V.V.I.** 16
 24. CH_4 is tetrahedral and NH_3 is pyramidal in shape. **V.V.I.**
Or, Bond angle in NH_3 is less than that of CH_4 molecule. 16
 25. Iodine is volatile solid, bromine is liquid and chlorine is gas at room temperature. 16
 26. Ethanol is soluble in water. 17

27. dz^2 has a conical nodal plane. 17
 28. He_2^+ exists but He_2 does not exist. 17

Group–A
PHYSICAL CHEMISTRY

1. Gaseous State

1. Write down the postulates of kinetic theory of gases? Explain kinetic gas equation. 18
2. Explain two major defects in postulates of kinetic theory of gas. **V.V.I.** 20
3. Find out an expression of RMS velocity. Calculate RMS velocity of H_2 gas at 300 K. ($R = 8.32 \text{ JK}^{-1} \text{ mol}^{-1}$) 20
4. Establish Van der Waals equation of gaseous state.
Or, What are Van der Waals corrections? Write Van der Waals equation for 'n' Mole of a real gas. 20
5. (a) Explain the physical significance of Van der Waals gases. **V.V.I.** 23
 (b) Establish the relationship of Critical constants with Van der Waals constants. 24
6. (a) State and explain the law of corresponding states. **V.V.I.** 26
 (b) Derive reduced equation of state from van der waals equation. 26
7. Write short notes on : **V.V.I.**
 (a) Critical constant and Van der Waals constants 27
 (b) Van der Waals equation of state 27
 (c) Liquification of gas 29
 (d) Boyle's Temperature 29

2. Solid State

1. Describe the characteristic features of different crystalline systems. 30
2. What are Bravais Lattice or Crystal Lattice ? Explain all crystal lattice with suitable diagram.
Or, What is a Lattice ? Describe various types of lattices and mention their distinguishing features. 33
3. Sketch the crystal structure of NaCl and find the number of Na^+ and Cl^- in its unit cell.
Or, Explain FCC structure of NaCl.
Or, Write down the crystal structure of NaCl. What is its ionic radius ratio and its co-ordination number ? **V.V.I.** 36
4. (a) Distinguish between amorphous and crystalline solids. 37
 (b) Calculate the number of atoms in primitive, BCC and FCC unit cells. **V.V.I.** 38

5. (a) Define Co-ordination Number and Radius ratio (or limiting radius ratio) V.V.I.	.... 39
(b) Explain the importance of radius ratio effect in crystal structure.	.... 39
6. Explain the following :	
(a) Miller Indices	.... 40
(b) Weiss Indices	.... 41
7. Write short notes on : V.V.I.	
(a) Unit Cell	.... 41
(b) Space Lattice	.... 42
(c) Crystal Structure of NaCl and KCl	.... 42
(d) Law of Crystallography	.... 43
(e) X-ray diffraction of Crystal	.... 45

3. Colloidal

1. Differentiate between true, colloidal and suspension solution. V.V.I.	.... 46
2. (a) Explain coagulation of colloids and Hardy-Schulze law. V.V.I.	.... 47
(b) Differentiate between lyophilic and lyophobic colloids.	.... 48
3. Write some important properties of colloids. Or, Explain kinetic, optical and electrical properties of colloids.	.... 48
4. (a) Explain Gold number and its relation with stability of colloids. V.V.I.	.... 49
(b) What is Tyndall effect? Describe ultra-microscope.	.... 50
5. Describe the important applications of colloids.	.... 51
6. Write short notes on :	
(a) Gold Number V.V.I.	.... 52
(b) Tyndall effect V.V.I.	.... 52
(c) Electrophoresis V.V.I.	.... 53
(d) Hardy Schulze Law	.... 54
(e) Electrokinetic Phenomena V.V.I.	.... 55
(f) Dialysis V.V.I.	.... 55
(g) Gels	.... 56
(h) Peptisation	.... 56
(i) Emulsion	.... 57

Group–B
INORGANIC CHEMISTRY

1. Atomic Structure

1. (a) State and explain de–Broglie waves and equation and its significance. 58
- (b) Find out the de–Broglie wavelength of an electron ejected as P.D. of 100 volt. 59
- (c) Calculate de–Broglie wavelength of an electron moving with a velocity of 10^7 m/sec. 60
2. (a) Explain the difference between Orbit and Orbital. **V.V.I.** 60
- (b) State and explain Heisenberg's uncertainty principle. Explain its significance. **V.V.I.** 61
3. An electron is moving with uncertainty in velocity of 1 cm/sec. Calculate the uncertainty in location of its position. 61
4. What are Quantum numbers? Write four quantum numbers and discuss each in brief. 62
5. (a) Define isotopes, isobars and isotones. 63
- (b) Sketch shapes of s, p and d orbitals. Locate nodal planes. **V.V.I.** 63
- (c) Find out all the four quantum numbers of $2p^3$ orbital. 65
6. (a) Derive the general form of the Schrodinger's wave equation and define each of the terms in it. 66
- Or**, Write down Schrodinger's wave equation. 66
- (b) Explain the significance of wave function. 68
7. Explain Hund's rule or, Hund's rule of maximum multiplicity. 68
8. (a) Describe Millikan's method for determination of charge of an electron. 70
- (b) Discuss Pauli's exclusion principle and Aufbau principle. **V.V.I.** 71
9. Describe J. J. Thomson's method of determining the charge of an electron. 74

2. Periodic Properties

1. Write down the electronic configuration of elements with following atomic number : 11, 17, 24, 29, 36, 37, 47 and 57. **Or**, Ascertain the position of elements in P.T. having atomic number 11, 17, 24, 29, 36, 37, 47 and 57. **V.V.I.** 76
2. Define ionisation potential, atomic radii, electron affinity and electro-negativity. Explain their method of determination. **Or**, Explain the variation of I.P., atomic radii, electron affinity and electronegativity of elements in groups and period in P.T. **V.V.I.** 76
3. Explain s, p, d and f block elements giving example. **Or**, Name the different blocks of the periodic table. Give general characteristics of each block. 80

4. Define ionic radii. How does they vary in the periodic table (P.T.)? 81
5. What is periodicity? How it is applicable to the periodic classification of the elements on Modern periodic table. 82
6. Write down the electronic configuration of the following elements as ions : **V.V.I.**
(i) Cu^{2+} (29), (ii) Ag^+ (47), (iii) Cr^{3+} (24), (iv) Fe^{2+} (26), (v) Kr (36) 84
7. Write short notes on Diagonal relationship. **V.V.I.** 84

3. Chemical Bonding

1. Explain Born Haber Cycle. 85
2. State and explain Fajan's rule. 86
3. Explain Valence Bond Theory and its limitations. 87
4. Discuss VSEPR theory and linear combination of atomic orbital (LCAO). 88
5. Write short notes on :
 - (a) Molecular Orbital Theory 90
 - (b) Hydrogen bonding 90
 - (c) Metallic Bonding 91

4. s-Block

1. (a) How H_2O_2 can be prepared in the laboratory? Write down the structure of H_2O_2 , **V.V.I.** 92
(b) Show that H_2O_2 behaves as an oxidising agent and as a reducing agent. 92
(c) What does '20V' H_2O_2 mean? 93
2. Discuss diagonal relationship and anomalous behaviour of Li and Mg. 93
3. How do alkali and alkaline earth metal react with hydrogen and halogens? 95
4. Explain hydration energy, solvation and complexation tendencies of alkali and alkali earth metal.
Or, Compare group I and group II elements w.r.t.
(i) hydration energy (ii) solvation and (iii) complex formation 96

5. p-Block

1. (a) Discuss the structure of diborane and borazine. **V.V.I.** 97
(b) Discuss the principles involved in the extraction of Boron from "borax". 98
2. Give the preparation, properties and uses of the following compounds : (a) White lead (b) Red lead. 99
3. (a) Give a brief account of charcoal separation method to isolate different inert gases from the inert gases mixture. **V.V.I.** 100
(b) Liquefaction of noble gases is difficult. Why ? 101

4. Write down the shape, structure and hybridisation of XeF_2 , XeF_4 and XeF_6 . **V.V.I.** 101
5. Write short notes on :
- (a) Oxyacids of Halogens 104
 - (b) Borax Bead Test **V.V.I.** 104
 - (c) Red Lead (Pb_3O_4) **V.V.I.** 105
 - (d) Borazines 105
 - (e) White lead ($\text{Pb}(\text{OH})_2 \cdot 2\text{PbCO}_3$) **V.V.I.** 106
 - (f) Boranes **V.V.I.** 106
 - (g) Silicones **V.V.I.** 106
 - (h) Fluorides of Xenon
Or, Compounds of Xenon V.V.I. 107
 - (i) Structure and shape of Ozone 108
 - (j) Silicates 108

6. Air Pollution and Soap

1. What are major air pollutants ? Describe sources of pollution, sinks harmful effects and methods to control the following pollutants : CO , NO_x and SO_x .
Or, Name the common air pollutants. How were they monitored ? What procedures are adopted to control pollution of air by these pollutants ? 110
2. What are soaps ? How are they manufactured ? Explain the cleaning action of soaps. 114
3. Write short notes on **V.V.I.**
- (a) Air pollution and its control 117
 - (b) Air Pollutants 118

CHEMISTRY - 1 (Hons.) (2022)

Answer five questions, selecting at least one
from each group in which Question No.1 is compulsory.

1. Explain any three of the following :
 - (a) Shape of XeF_4 is square planar. 101
 - (b) CCl_4 does not hydrolyse whole SiCl_4 is hydrolysed. 15
 - (c) Oxygen has higher Ionisation potential than nitrogen. 13
 - (d) The size of Zirconium (Zr) is almost similar to Hafnium (Hf).
 - (e) Sn^{+2} is Ionic whole Sn^{+4} is covalent.

Group–A

2. (a) Write down the postulate of kinetic theory of gas. 18
 (b) Discuss Vander Waal's equation of state. Write the relationship between critical constant and Vander Waals' constant. 20, 24
3. (a) Describe various types of solids with example. 37
 (b) Discuss crystal structure of KCl with neat diagram. 42
4. (a) Distinguish between Lyophilic and Lyophobic colloids. 48
 (b) What are different applications of colloids? 51
 (c) Discuss optical and electrical properties of colloids. 48
5. Write notes on any three of the following :
 - (a) Hardy Schulz Rule. 54
 - (b) RMS, average and most probable velocities.10
 - (c) Miller and Weiss Indices.40, 41
 - (d) Types of Emulsions. 57
 - (e) Reduced equation of states.26

Group–B

6. (a) Describe Born-Haber cycle for the calculation of Lattice energy with an example. 85
 (b) Discuss different types of Lattice defects.
7. (a) What are quantum number ? Calculate all the four quantum number for the last-electrons in $\text{Cr}(24)$ 62
 (b) Describe Millikan's method to determine charge on an electron. 70
8. (a) Explain hydrogen bonding and its types. 90
 (b) Write the geometry and shape of the following :
 (i) SF_6 (ii) I_3 (iii) CH_4
9. (a) What are the steps involved in extraction of lead from its ore? 99
 (b) Define carbides. Explain its types with example.
10. Write notes on any three of the following :
 - (a) Types of Silicates. 108
 - (b) Deadening of Tin.
 - (c) Diagonal relationship of Bi and Be. 84
 - (d) Fajan Rule 86
 - (e) Hand's Multiplicity rule 68

CHEMISTRY - 1 (Hons.) (2021)

Answer five questions, selecting at least one
from each group in which Question No.1 is compulsory.

1. Explain any three of the following:
 - (a) Na^+ is smaller than Na while Cl^- is bigger than Cl in size.
 - (b) Why Pb^{2+} is more stable than Pb^{+4} ?
 - (c) H_2O_2 acts as both oxidizing and reducing agent. 92
 - (d) BF_3 is a Lewis Acid. 12
 - (e) H_2O is a liquid while H_2S is a gas. 16

Group –A

2. (a) Derive kinetic gas equation $PV = \frac{1}{3} mnc^2$ 18
 (b) Derive Avogadro's law and Graham's law of diffusion from kinetic gas equation.
3. (a) Explain with diagram Body-Centred Cubic Unit Cell and Face-Centred Cubic Unit Cell. 38
 (b) Derive Bragg's equation.
4. (a) Distinguish true solution, colloidal solution and suspension. 46
 (b) What do you mean by stability of colloids. 49
 (c) What is difference between gels & emulsions. 56,57
5. Write notes on any three of the following:
 - (a) Law of corresponding states.... 26
 - (b) Radius ratio rule 39
 - (c) Gold number 52
 - (d) Dialysis.... 55
 - (e) Co-ordination number.... 39

Group –B

6. (a) What do you mean by matter-wave duality. Derive de-Broglie's equation.
 (b) What do you mean by Aufbau principle? 71
7. (a) Explain Groups & Periods of Periodic Table.
 (b) Determine the position of following elements having atomic numbers 8, 20, 25, 27 & 30. 76
8. (a) State and explain hybridization.
 (b) Write the shape and structure of the following.
 - (i) H_2O
 - (ii) SF_4
 - (iii) NH_3
9. (a) How Tin is extracted from its ore.
 (b) Describe analytical test of Sn^{+2} & Sn^{+4}
10. Write notes on any three of the following :
 - (a) Diborane 97
 - (b) Ozone layer
 - (c) Acid rain
 - (d) Atomic and ionic radii
 - (e) White lead and Red lead 105, 106

CHEMISTRY - 1 (Hons.) (2020)

Answer five questions, selecting at least one from each

Group in which Q. No.1 is compulsory.

1. Explain any three of the following :
 - (a) Hydrogen bond 90
 - (b) NaCl has FCC structure 11
 - (c) NH₃ molecule is pyramidal in shape 14
 - (d) van der Waals constant "a" is the measure of cohesive force 9
 - (e) Kinetic energy of one mole of an ideal gas is 3/2 RT 9

Group-A

2. (a) Explain two major defects in postulate of Kinetic Theory of gas. 20
 (b) Establish van der Waals equation of gaseous state. 20
3. (a) Differentiate between lyophilic and lyophobic colloids. 47
 (b) Explain Coagulation of Colloids and Hardy-Schulze Law. 48
4. Write notes on any three of the following :
 - (a) Tyndall effect 52
 - (b) Electrophoresis 53
 - (c) Critical constants and van der Waals Constant 27
 - (d) Miller indices 40
5. What are the relationships between the following :
 - (i) K_p and K_c
 - (ii) Differentiate among average RMS and Most probable velocities 10

Group - B

6. (a) State and explain Heisenberg uncertainty principle. Explain its significance. 61
 (b) Explain the differences between orbit and orbital. 61
7. (a) Explain Hund's rule. 68
 (b) Write down electronic configuration of element with atomic numbers 24, 29, 18, 47, 54 and locate their position in periodic table. 76
8. (a) How will you separate noble gases from the mixture? 100
 (b) Write the shape and structure of the following :
 - (i) XeF₂ 101
 - (ii) XeF₆
9. (a) How do atomic radii, ionisation potential and electronegativity of elements vary in periodic table? 76
 (b) State and explain Fajan's rule. 86
10. Write notes on any two of the following :
 - (a) Air pollution and its control 117
 - (b) Diagonal relationship 84
 - (c) Structure and shape of Ozone 108
 - (d) Oxygen is paramagnetic 15
 - (e) CH₄ is tetrahedral in shape while H₂O is angular in shape. 14

CHEMISTRY - 1 (Hons.) (2019)

Answer five questions selecting at least one from each
Group, in which Q. No.1 is compulsory.

1. Explain any three of the following :
 - (a) Carbon tetrachloride is non-polar. 15
 - (b) Average velocity, RMS velocity, Most probable velocity. 10
 - (c) Ideal gases do not show Joule-Thomson effect 12
 - (d) Lyophilic colloids are more stable than lyophobic colloids. 12
 - (e) HF is liquid while HCl is gas. 14
 - (f) CCl_4 does not hydrolysed but SiCl_4 is hydrolysed. 15

Group-A

2. (a) Explain the physical significance of van der Waals gases. 23
 (b) Establish the relationship of critical constant with van der Waals constant. 24
3. (a) How are lattice planes indexed? Explain.
 (b) Find out Bragg's equation and explain its importance.
4. (a) Write down the crystal structure of NaCl. 36
 (b) What is its Ionic radius ratio and its co-ordination number? 36
5. Write notes of any two of the following :
 - (a) Electro-kinetic phenomena 55
 - (b) Gold number 52
 - (c) Gels 56

Group - B

6. (a) State and explain de-Broglie waves and equation and its significance. 58
 (b) Discuss diagonal relationship and anomalous behaviour of Li and Mg. 84
7. (a) Define Ionization potential, Electron affinity and Electronegativity. 76
 (b) Ionisation potential of N-atom is greater than oxygen. Why? 13
8. (a) How H_2O_2 can be prepared in the Laboratory? Write down the structure of H_2O_2 92
 (b) Show that H_2O_2 behaves as an oxidising agent as well as reducing agent. 92
9. (a) Give the electronic configuration of the following elements as ions:
 (i) Cu^{++} (29) (ii) Ag^+ (47) (iii) Cr^{+3} (24) (iv) Fe^{++} (26) (v) Kr (36) 84
 (b) Sketch the shapes of s, p, d orbitals. 63
10. Write notes on any two of the following :
 - (a). Air Pollution 117
 - (b) Compound of Xenon 107
 - (c) Chemistry of Borax Bead Test 104
 - (d) CH_4 is tetrahedral and NH_3 is pyramidal in shape 16



Rekha V.V.I. Questions for 2023 Examination

*Answer of below mentioned V.V.I. questions are present in your
Rekha Examination Guide and Guess Part-I Chemistry-2*

Short Answer Type Questions

1. Explain the following :
 - (i) Colligative properties of aqueous solution of NaCl are abnormal. **V.V.I.** 7
 - (ii) Precipitation occurs only when Ionic product exceeds Solubility product. 7
 - (iii) pH of 10^{-8} (M) HCl is less than 7. 7
 - (iv) Acid hydrolysis of an ester is pseudo-unimolecular reaction. 8
 - (v) Inversion of cane sugar is pseudo-unimolecular reaction. **V.V.I.** 8
 - (vi) Half-life period of first order reactions is independent of initial concentration of reactant. 8
 - (vii) Zero order reaction. **V.V.I.** 10
 - (viii) Benzene molecule is planar in shape and structure. 10
 - (ix) CCl_4 molecule is tetrahedral in shape. 11
 - (x) Phenol is acidic and ethanol is neutral. 11
 - (xi) Ortho nitrophenol and para nitrophenol can easily be separated. 11
 - (xii) BF_3 is a Lewis acid and NH_3 is Lewis base. 12
 - (xiii) Trimethylamine is weaker base than dimethylamine. **V.V.I.** 12
 - (xiv) Dimethylamine is more basic than methylamine. **V.V.I.** 12
 - (xv) Acetaldehyde undergoes Aldol Condensation. 12
 - (xvi) Chloroacetic acid is stronger than acetic acid. 13
 - (xvii) Trichloroacetic acid is stronger than dichloroacetic acid. 13

Group – A (Physical Chemistry)

■ Solution (Colligative Properties) ■

1. Define solute and explain different types of solution. 14
2. (a) State and explain Raoult's law of relative lowering of vapour pressure. **V.V.I.** 14
- (b) Explain the method of determination of molecular weight of non-volatile solute by the method of lowering of vapour pressure. **V.V.I.** 16
3. Explain lowering of vapour pressure and depression of freezing point. **V.V.I.** 17

4. Explain molal elevation constant and molal depression constant. **V.V.I.** 18
5. How is molecular weight determined by depression of freezing point method ? **V.V.I.**
Or, Discuss, how depression of freezing point is utilised in the determination of molecular weight of non-volatile solute. 19
6. (a) Define Osmosis and Osmotic pressure of solutions. 21
 (b) Discuss a suitable method of determination of Osmotic pressure. 23
7. State the law of osmotic pressure and the condition under which these laws are true.
Or, Establish the relation between osmotic pressure concentration and temperature. 24
8. Write short notes on :
 - (a) Elevation of boiling point 25
 - (b) Abnormal Osmotic Pressure 26
 - (c) Abnormal Colligative Properties 26
 - (d) Ideal and Non-ideal solutions 26
 - (e) Van't Hoff Factor **V.V.I.** 28

■ **Ionic Equilibrium** ■

1. Explain Arrhenius theory of acid and base. 29
2. (a) Define Ionic product and Solubility product of an electrolyte. 29
 (b) Discuss the application of Solubility product principle in qualitative analysis of salts. 30
3. (a) Discuss buffer solution and their types. Obtain Henderson's equation. 32
 (b) Establish relationship of pH, pOH and pKw.
Or, Prove that $\text{pH} + \text{pOH} = \text{pKw}$. **V.V.I.** 34
4. Write short notes on : **V.V.I.**
 - (a) Bronsted acids and bases 36
 - (b) Lewis Acid and Bases 37
 - (c) Applications of solubility product principle 38
 - (d) Buffer solution **V.V.I.** 38

■ **Chemical Kinetics** ■

1. (a) Find out expression of rate constant of first order reactions. 40
 (b) What are the characteristics of first order reaction ? 41
 (c) Prove that half life period of first order reaction is independent of initial concentration. **V.V.I.** 41

2. (a) Discuss any two suitable methods of determination of order of reaction. 42
- (b) Write down the units of 1st and 2nd order reactions. 43
3. (a) Derive an expression for rate constant of second order reaction when
 - (i) Initial concentration of reactants are same. 43
 - (ii) Initial concentrations are different. **V.V.I.** 44
- (b) Determine the unit of k and t^{1/2} of second order reaction. 45
- (c) Prove that if one of the reactions is in excess the second order reaction reduces to first order reaction. **V.V.I.** 45
4. Write short notes on :
 - (a) Order and Molecularity of reaction 46
 - (b) Arrhenius equation of rate constant 47

Group – B (Organic Chemistry)

■ Bonding and General Concepts ■

1. Explain sp³ or tetrahedral hybridisation in organic compound. 49
2. Explain sp² or trigonal hybridisation in organic compound. 50
3. Give a brief of geometrical and optical isomerism. 51
4. Explain the nomenclature of polycyclic hydrocarbons. 53
5. Explain the term bond length, bond angle and bond energy. 54
6. Explain the following: **V.V.I.**
 - (a) Tetravalency of carbon 55
 - (b) Alkynes do not exhibit geometrical isomerism. 55
 - (c) Tartaric acid exhibits optical isomerism. **V.V.I.** 56
 - (d) Alcohols are stronger acids than alkanes. 57
 - (e) Phenol is stronger acid than alcohol (ethanol). 57
7. Write short notes on :
 - (a) Stereoisomerism 58
 - (b) Hydrogen bonding 58

■ Reaction Mechanism ■

1. Explain reagents. State different types of reagents. 60
2. Define Homolytic and Heterolytic bond fission (cleavage). 60
3. Explain – Benzene exhibits electrophilic substitution reaction. 61
4. Write short notes on :- **V.V.I.**
 - (a) Inductive effect 61
 - (b) Reaction intermediate 63
 - (c) Electromeric effect 63
 - (d) Hyperconjugation 65
 - (e) Elimination reaction 66

■ Polyhydroxy Compound ■

1. What are glycols? Describe the method of preparation and chemical properties of ethylene glycol. 68
2. What are oil and fats? How is glycerol extracted from them ? Discuss. Give its synthesis. 69
3. Describe the chemical properties of glycerol.
Or, How does glycerol reacts with : (a) Sodium (b) HCl (c) HI (d) Oxalic acid (e) Nitric acid. Explain with chemical reactions. 71
4. What happen when :
 - (a) Glycol is treated with HIO_4 73
 - (b) Glycerol is treated with ethanoic acid. 73
 - (c) Glycerol is heated with KHSO_4 73
 - (d) Isopropyl alcohol is oxidised. 74
5. How will you distinguish between primary, secondary and tertiary alcohols? Explain with suitable examples. 74
6. What is pinacol-pinacolone rearrangement? Give its mechanism. **V.V.I.** 75
7. Explain the following : **V.V.I.**
 - (a) Glucose is soluble in water. 76
 - (b) Ethanol is miscible with water but chloroform is immiscible. 76
 - (c) Ethanol is neutral and phenol is acetic. 77
 - (d) Benzene is immiscible and ethanol is miscible in water. 77

■ Amines and Urea ■

1. (a) Distinguish between primary, secondary and tertiary amines. **V.V.I.** 78
- (b) Explain the method of their separation from a mixture of amines. 79
2. Describe general methods of preparation of amines. 82
3. Discuss physical properties and stereochemistry of amines. 83
4. Why is urea called carbamide? **V.V.I.** 84
5. (a) Give methods of preparation of Urea. 84
- (b) Discuss some important reactions of Urea. 86
6. What happens when : **V.V.I.**
 - (a) Urea is treated with aq. KOH. 88
 - (b) Methyl amine is treated with HCl acid. 88
 - (c) Aniline is treated with NaNO_2 and HCl in ice-cold bath. 88
7. Explain Methyl amine is a stronger base than aniline. 88
8. Write short notes on : **V.V.I.**
 - (a) Diazo coupling reaction 88
 - (b) Carbylamine reaction 89
 - (c) Hofmann's bromamide reaction 89

■ Aldehydes and Ketones ■

1. (a) Give general methods for the preparation of Aldehydes and Ketones. 91
- (b) Aldehydes and Ketones behave similarly as well as differently. Elaborate by two reactions for each case. 93
2. Compare reactivities of aldehydes and ketones. **V.V.I.** 94
3. Explain the following : **V.V.I.**
 - (a) Acetaldehyde gives silver mirror test. 95
 - (b) Acetaldehyde undergoes aldol condensation. 95
 - (c) Benzaldehyde undergoes Cannizzaro reaction. 96
4. What happens when : **V.V.I.**
 - (a) Formaldehyde is treated with ethyl magnesium bromide. 96
 - (b) Trichloroacetaldehyde is treated with conc. KOH.
Or, Trichloroacetaldehyde undergoes Cannizzaro reaction. 96
 - (c) Acetaldehyde is treated with dil. NaOH. 96
5. Write short notes on : **V.V.I.**
 - (a) Cannizzaro reaction 96 (b) Aldol Condensation 98
 - (c) Wolf-Kishner Reduction...99 (d) Clemmensen Reduction... 99
 - (e) Popoff's Rule 100

■ Carboxylic Acid and Derivatives ■

1. Discuss the structure of carboxylic group. Why are carboxy compounds stronger acids than phenols and alcohols? 101
2. Describe the general methods of preparation of carboxylic acids giving the mechanism wherever applicable. 102
3. (a) Explain various factors influencing acid-strength of carboxylic acids. 103
- (b) Discuss chemical properties of carboxylic acids. 103
4. Describe the decarboxylation reactions of carboxylic acids. 106
5. Explain the following : **V.V.I.**
 - (a) Carboxylic acid (methanoic acid) is stronger acid than phenol. 107
 - (b) Trichloroacetic acid is a powerful acid or it is as strong as HCl. 108
 - (c) Formic acid is stronger acid than acetic acid. **V.V.I.** 108
6. Write short note on HVZ reaction. **V.V.I.** 108

CHEMISTRY - 2 (Hons.) (2022)

Answer any five questions, selecting at least one from each group in which Q.No.1 is compulsory.

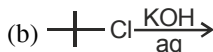
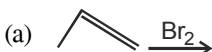
1. Explain any three of the following :
 - (a) BF_3 is Lewis acid and whereas NH_3 is Lewis base. 12
 - (b) Acidic hydrolysis of ester is Pseudo unimolecular reaction. 8
 - (c) Chloro acetic acid is stronger acid than acetic acid. 13
 - (d) Ortho nitrophenol and para nitrophenol can easily be separated by steam distillation. 11
 - (e) Benzene molecular is planar in shape & structure. 10

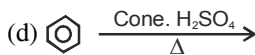
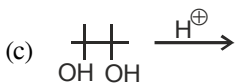
Group–A

2. (a) Explain "Osmosis" & "Osmotic Pressure". 21
 (b) How can you determine the osmotic pressure of a solution? 23
 (c) Calculate the osmotic pressure of 5% urea solution.
3. (a) Differentiate order & molecularity of reaction. 46
 (b) Derive an expression for the rate constant for first order reaction. 40
 (c) How is half life of first order reaction independent of initial concentration ? 41
4. (a) Illustrate solubility & solubility product. 29
 (b) What are the applications of solubility product in salt analysis. 30
5. Write notes on any two of the following :
 (a) Abnormal colligates properties 26
 (b) Ideal and non-ideal solution 26
 (c) Ionic product of water 29

Group–B

6. (a) Explain sp , sp^2 & sp^3 hybridisation in organic molecules. 49,50
 (b) Explain geometrical isomeric with examples. 51
7. (a) How will you distinguish among primary, secondary and tertiary alcohols. 74
 (b) Write in brief preparation & properties of glycerol. 69,71
8. Write an account of any three of the following :
 (a) Hofmann Bromamide reaction 89
 (b) Cannizzaro reaction 96
 (c) Wolf Kishner reduction 99
 (d) Carbylamine reaction 89
9. Predict the product giving mechanism of any three of the following :





10. Write notes on any three of the following :

- | | |
|---|----------|
| (a) Electrophiles & Nucleophiles | 60 |
| (b) Inductive effect | 61 |
| (c) Decarboxylation of carboxylic acids | 106 |
| (d) Hydrogen Bond | 58 |

CHEMISTRY - 2 (Hons.) (2021)

1. Explain any three of the following question :

- | | |
|--|----------|
| (a) What is abnormal colligative properties? | 26 |
| (b) What is Zero order reaction. | 10 |
| (c) Acetaldehyde undergoes Aldol condensation. | 12 |
| (d) Dimethyl amine is more basic than trimethyl amine. | 12 |
| (e) Formic acid is strong acid than acetic acid. | 108 |

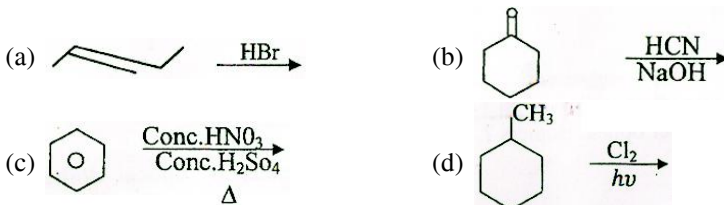
Group–A

- | | |
|--|------------|
| 2. (a) What is Raoult's law of lowering of vapour pressure ?
Lowering of vapour pressure is a colligative property explain. | 14 |
| (b) Explain the method of determination of molecular weight of non- volatile solute by lowering of vapour pressure. | 16 |
| 3. (a) What is depression to freezing point ? Explain molal depression constant. | 17,18 |
| (b) What is the method to determine molecular weight by depression of freezing point method? | 19 |
| 4. (a) Explain rate constant of second order reaction in which initial concentrations are different. | 44 |
| (b) Prove that the second order reaction reduces to first order reaction of one if the reactants is in excess. | 45 |
| 5. Write notes on any two of the following: | |
| (a) Buffer Solution | 38 |
| (b) pH, pOH & pKc | 34 |
| (c) Vant Hoff's Factor | 28 |

Group–B

- | | |
|--|----------|
| 6. (a) What do you mean by optical isomers ? What are the condition for optical isomers? | 51 |
| (b) Illustrate different optical isomers possible by tartaric acid. | 56 |
| 7. Write an account of any three of the following: | |
| (a) Pinacol Pinacolone rearrangement | 75 |
| (b) Diazo reaction | 88 |
| (c) Aldol condensation | 98 |
| (d) Hell Volhard Zelinsky reaction | 108 |

8. Predict the product giving the mechanism of the following:



9. (a) Distinguish among primary, secondary & tertiary amines. 78
 (b) Discuss preparation, properties & uses of urea. 84, 86
10. Write notes on any three of the following: 60,66
 (a) Homolytic & Heterolytic fission. (b) Peroxide effect
 (c) Elimination reaction (d) Oxidation of glycol.

CHEMISTRY - 2 (Hons.) (2020)

Answer five questions, selecting at least one from each
 Group, in which Q. No.1 is compulsory.

1. Explain any three of the following :
- (a) Hydrolysis of ester shows pseudo unimolecular reaction. 8
 (b) BF_3 behaves as Lewis acid whereas NH_3 behaves as Lewis base. 12
 (c) Urea is also called carbamide. 84
 (d) Benzene is a planar molecule. 10
 (e) Formaldehyde shows Cannizzaro reaction whereas acetaldehyde shows Aldol condensation. 95

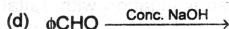
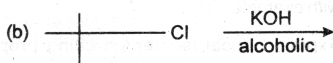
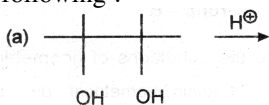
Group-A

2. (a) Differentiate Osmosis and Osmotic pressures. 21
 (b) How can you determine the osmotic pressure of a solution? 23
 (c) Find out the Osmotic pressure of 5% Urea solution.
3. (a) Explain solubility and solubility product. 29
 (b) Give the applications of solubility product in qualitative analysis. 30
4. (a) Explain order and molecularity of reaction. 46
 (b) Derive the rate constant for first order reaction. 40
 (c) Half life period of First order reaction is independent of initial concentration. Justify. 41
5. Write notes on any two of the following :
- (a) Ideal and non-ideal solution 26 (b) Ionic product of water.... 29
 (c) Bronsted and Lewis theory 36, 37

Group- B

6. (a) What are the conditions of geometrical isomerism? Explain geometrical isomerism with examples. 51
 (b) Explain optical isomerism citing proper example. 51
7. (a) Explain Hyperconjugation with suitable example. 65
 (b) Describe Inductive effect 61

- (c) Explain electrophiles and nucleophiles. 60
8. Write an account of any three of the following reactions :
 (a) Diazo coupling reaction. 88
 (b) Carbylamine reaction 89
 (c) Wolf Kishner's reduction 99
 (d) Hofmann Bromamide 89
9. Predict the product giving the mechanism of any three of the following :



10. Write notes on any three of the following :
 (a) Periodic acid
 (b) Decarboxylation of carboxylic acids 106
 (c) Reactivity of aldehydes and ketones 94
 (d) Tetravalency of carbon 55

