DEPARTMENT OF CHEMISTRY
Derabis College , Derabis Kendrapara
QUESTION BANK
+3 1st Year Science

Inorganic Chemistry **Semester - I** **Core -1**

Group- A

Each question carries 1 mark. (Fill in the blanks)

1. When n=3, the shell is called_____.
2. L- shell contains maximum _____ no. of electrons.
3. When an electron jump from lower orbit E_1 to higher orbit E_2, the energy is absorbed_____.
4. Orbits are allowed for circular motion of electron, the angular momentum = _____.
5. Energy of an electron for n^{th} orbit is _____.
6. Radius of an electron for n^{th} orbit is _____.
7. _____ is the spectral series when n1=2 and n2= 3,4,5……
8. Shape of S orbital is _____.
9. The value of Rydberg's constant R_H is _____.
10. In De-Broglie equation, the relation of λ is equal to _____.
11. De-Broglie equation has significance for_____ particle.
12. In uncertainty principle, - X – h/ λπ.
13. Uncertainty principle in applicable for_____ particle.
14. Schrodinger wave equation is applicable for _____ system.
15. For Normalised wave function,
16. For orthogonal wave function,
17. For 3d - sub shell, the n + l value is _____.
18. In 2P – sub shell, the value of n= _____ and l= _____.
19. _____ quantum represent the shape of sub shell or orbital.
20. d- sub shell confirm _____ no. of electron maximum.
21. Long form of periodic table is consisting of _____ no. of period.

22. Long form of periodic table is consisting of _____ no. of groups.

23. 6^{th} period contain _____ no. of elements.

24. _____ period is incomplete.

25. 2,8,8,18,18 and 32 is called _____ number.

26. halogen placed in _____ group in the periodic table.

27. Group- IA elements are called _____ elements.

28. Group- IB elements are called _____ elements.

29. Be, Mg, Cu…… are placed _____ group in the periodic table.

30. d- block elements are called _____.

31. The general E.C of D- block elements is _____.

32. The E.A of noble gas elements is _____.

33. I.E of the elements are _____ along a period.

34. I.E of the elements are _____ along a group.

35. _____elements have maximum E.A value.

36. The size of Na is _____ than Na^+.

37. The size of F is _____ than Cl.

38. The size of Cl is _____ than Cl.

39. The E.A of Cl is _____ than F.

40. E.A values of the elements are _____ along a period.

41. The N_2 is _____in magnetic character.

42. The O_2 is _____ in magnetic character.

43. N_2 is _____ stable than O_2.

44. The molecule contain 3bp and 1lb, the shape is _____.

45. The Born-londe equation is _____.

46. Born-Haber cycle in used for determination of _____.

47. For stable ionic compound, the I.E. is _____ and E.A is _____.

48. In NH_3, the N has _____ no. of ion pair of element.

49. O_2 is _____ stable than O_2+.

50. Bond order of He_2 is _____.

Group- B

Each question carries 1.5 marks.

1. Give the energy relation of nth orbit of an atom.
2. Define Pauli's Exclusion Principle.
3. What is the value of n, l, m and s of 4s' electron.
4. Define screening constant.
5. What is the Shielding constant and effecting nuclear charge on 4s electron of Ca?
6. Give Kapustinskii expression for calculation of lattice energy with one importance.
7. Define Bent's Rule.
8. Why is HF less volatile than HCl?
9. Give the stability order of N_2, N_2^- & N_2^+.
10. Why is NH_3 liquid while pH_3 gas?
11. What is bond order? How does it relate to the stability of molecule?
12. Define and give the expression of dipole moment.
13. Why is the difference observed between the <FOF angle (103^0) and <ClOCl angle (111^0) in F_2O and Cl_2O respectively?
14. Which has higher energy : 2s orbital of H or 2s orbital of He^+?
15. What is the difference between conductor and semiconductor?
16. PCl_5 exists while NCl_5 does not. Give reason.
17. What do you understand by anti-bonding concept of MOT?
18. Write the molecular electronic configuration of He_2^+ molecule.
19. Why is the vanderWaal's radii greater than the covalent radii of chlorine?
20. Which has higher ionisation energy between S and P?
21. Give examples of a molecule with sp^3d hybridisation.
22. Why is not HNO_3 a reducing agent?
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42. Which has higher ionisation energy between S and P?
43. Give examples of a molecule with sp^3d hybridisation.
44. Why is not HNO_3 a reducing agent?
45. Find out the bond order of C_2.
46. Define dipole –dipole interaction.
47. What is volumetric analysis?
48. What is standard electrode potential?
49. What is shape and hybridization of NH_3 / NH_{4+}? 50. What is the Sederson's electron density ratio?

Group- C

Each question carries 2.5 marks.

1. Write four limitations of Bohr's atomic theory.
2. What do you understand by $2p^5$ and $2p^1_x$?
3. Find the m value for p, d and f orbital?
4. Give four characteristics of d_z^2 orbital?
5. How do dx^2y^2 orbital differ from d_{xy} orbital?
6. Derive the formula for 2th orbit of Bohr's atom.
7. Calculate energy of electron of nth orbit of H atom.
8. Calculate the frequency of radiation formula from energy calculation.
9. Calculate the energy of electron in the third orbit He^+ cation.
10. Calculate the frequency of first line in Balmer series. R = 109677.8 cm^{-1}.

11. What is Zeeman and stark effect?

12. Derive De-Broglie equation for matter wave.

13. Using Heisenberg Uncertainty principle. Show that an electron cannot exist in nucleus.

14. The mass of an electron is 9.11×10^{-31}Kg. Calculate the uncertainty in its velocity.

15. How many electrons in the ground state a Zn atom (Z=30) has

(a) Angular momentum l = 1

(b) Magnetic quantum number m = 1

16. Write Schrodinger wave equation and also write the significance of Ψ and Ψ^2.

17. What do you understand by Radical and Angular wave function?

18. Using Schrodinger equation $\nabla^2\Psi + 8\pi^2 m/h^2 (E-V) \Psi = 0$. Derive the energy of an electron in H atom.

19. Write the condition for normalized and orthogonal wave function.

20. Draw radical wave function for 1s orbital and 2s orbital of H atom.

21. Find the frequency of first line of Lyman series.

22. Find the wave number of third line in Pfund series.

23.Calculate energy of hydrogen atom in first excited state.The value of $e = 4.8 \times 10^{-10}$esu, mass of electron = 9.1×10^{-28}g.

24. Differentiate between particle and wave.

25. State Slater's rule.

26. Why the cation been smaller size than the parent atom? Explain using Slater's rule?

27. Calculate the Z* (Effective nuclear charge) of I^+ ion.

28. What are the limitation of Slater's rule?

29. Write general electronic configuration of d and f block elements.

30. Write 5 general characteristics of p- block element.

31. Write five general characteristics of d block element.

32. Calculate C – F bond length of covalent radius of C = $0.77A^0$, F = $0.72\ A^0$, $X_c = 2.5$, $X_f = 4.0$

33. What are the formula of ionic radius of cation and anion by Pauling method?

34. Find the ionic radius of the ion in KCl if intermolecular distance of KCl is $3.14\ A^0$. The effective nuclear charge of K^+ and Cl^- ions are 7.40 and 5.40 respectively.

35. Write the decreasing order of C, Al, Si and explain.

36. Explain why I.E of Be is more than B.
37. Explain why I.E of N is more than O.
38. Explain why I.E of Li^+ > I.E of the d.
39. Electron affecting of N is positive. Explain.
40. Electron gain enthalpy of F is less than Cl.
41. Give difference between electron affecting and Electro negativity.
42. Give the relationship between Pauling scale and Mullikan scale foe electron.
43. On basis of electro negative concept explain the basic nature of NaOH.
44. Hcl (g) is polar covalent but Hcl (aq.) is ionic.
45. Calculate lattice energy of Nacl using the data electronic charge 4.8 x 10^{-10}esu.

    Born exponent = 9

    Madelung constant for Nacl = 1.748

    Ionic radius of Na^+ = 0.85A^0, Cl^- = 1.8 A^0
46. Calculate lattice energy of MgF_2 from following data

    Δ H_{sub} = 146.4 KJ mol^{-1}

    Δ H_D = 158.8 KJ mol^{-1}

    IE_{mg} = 2186.0 KJ mol^{-1}

    EA = -332.6 KJ mol^{-1}

    ΔH_f of Mgf = -1096.5 KJ mol^{-1}
47. How electron affinity of atom can be calculated by Born Haber cycle?
48. Describe five characteristic of Ionic compound.
49. What is inert pair effect? Give example.
50. Write two limitations of radius ratio rules.
51. Define resonance energy and resonance hybrid.
52. Draw resonance structure of Co molecule.
53. Draw resonance structure of CO_3^{2-} molecule.
54. Draw resonance structure of O_3 molecule.
55. What are non equivalent hybrid orbital's, give example.
56. What is the structure of $[Ni(CN)_4]^{2-}$ on basic of VBT?
57. Write 4 postulates of MOT.

58. Write MO configuration of O_2.

59. Write MO configuration of N_2^{2-}.

60. Draw MO diagram of He_2.

61. Draw MO diagram of Be_2.

62. Find bond order of O_2^{2-} and state whether it is para magnetic.

63. What is HUMO and LUMO?

64. Which of the following species has short bond length No or No^+.

65. Why shape of NH_3 is pyramidal?

66. State Fajan's rule.

67. Explain the size order of $Al^{3+} < mg^{2+} < Na^+$.

68. What are the favourable character of for ionic character according to fajan's rule?

69. What are the favourable condition for covalent character according to Fajan's rule?

70. Calculate % ionic character of Hcl given $\mu_{experimental}$ = 1.03D and $\mu_{theoretical}$ = 6.1D.

71. What are Keesom forces?

72. Why BF_3 is planer and NF_3 is pyramidal?

73. Why $AlCl_3$ is covalent and AlF_3 is ionic?

74. What are the products of electrolysis of aqueous solution of $CuSO_4$.

75. Calculate the max work available for redox reaction at 25^0C for the cell.

$Zn(s) / Zn^{2+}$ (0.0004m) // Cd^{2+} (0.2m) / Cd(s) 76.

Explain auto oxidation with example.

Group-D

Each question carries 8 marks.

1. (a) Derive Schrodinger wave equation for H-atom and give its importance.

(b) What are quantum numbers? Briefly describe all the quantum numbers.

2. (a) What is shielding effect? Describe various Slater's rules to calculate shielding constant.

(b) Write Notes on :-

(i) Ionisation Enthalpy (ii) Electronegativity

3. (a) Define Lattice energy. Derive Born-Lande equation for calculation of Lattice energy.

(b) Discussion valence bond theory to explain the nature of co-valent bond and explain its Limitations.

4. (a) What is metallic bond? Explain Band theory to explain metallic bond.

(b) What is vander Waal's force? Discuss the origin of different types inter molecular forces and factors affecting this force.

5. (a) Give the MO structure of NO with magnetic character and stability. Compare the stability of NO_2, NO^+ and NO^-

(b) What are the postulates of VSEPR theory? On thin basic, explain the structures of ClF_3 & ICl_2.

6. (a) What are the different quantum numbers known? Explain the significance of each Quantum number. .

(b) Calculate the wave number of emitted spectral line when electron jumps from

(i) n=3 to n=1 and (ii) n=2 to n=1 in a hydrogen atiom.

7. (a) Write the Schrodinger wave equation for atomic model indicating all terms and draw the graphical representations of radial distribution functions of 3s and 3d orbitals. (b) Calculate the de Broglie wavelengths of an electron moving with $1/10^{th}$ of light speed and a bullet (m=2gm.) moving with a speed of $300ms^{-1}$. Comment on the result. 8.

(a) What is the ionisation energy? Discuss the factors affect the ionisation energy

(b) The radius of F^- and K^+ are same, yet the hydration energy of F^- is greater than that of K^+. Explain.

9. (a) Valence shell electeronic configuration of both Ca and Zn is $4s^2$ but first ionisation energy of Ca is lower than Zn. Justify.

(b) $(SiH_3)_3N$ and $(CH_3)_3N$ react with HCl to give different products. Explain.

10. (a) Draw the molecular orbital diagrams of O_2^+ and O_2^- and calculate the bond order.

(b) Draw the Born-Haber cycle for formation of Nal from their elements.

11. (a) NO molecule prefers to form NO^+. Explain.

(b) Deduce the shape of the NH_3 and PF_5 from VB theory.

12. (a) Write the principle and redox reaction involved in Fe (II) estimation by $K_2Cr_2O_7$.

(b) Give an account of dipole-dipole and ion-dipole forces with examples.

(c) $KMNO_4$ acts as stronger oxidising agent in acidic solution compared to neutral medium. Explain

(d) How does volume increase on freezing of liquid water to ice?

13. Write notes on the following :

(a) Band Theory of metallic bonding

(b) Slater's rule

14. Write notes on the followings:

(a) Derive the geometry of NO_3^- and ClO_3^- ions.

(b) Describe the trend of ionic radii and covalent radii in first transition metals.

15. Give the MO diagram of O_2 .Compare its stability with O_2^- ,O_2^{-2} and O_2^+.

16. State and explain structures and hybridizations of ICl_2^- , PCl_5 and C_2H_4.
17. What is vander Waal forces? Explain all the three types of its interaction.
18. State and explain Fajan's rules. What are its consequences?
19. State and explain hydrogen bonding. What are its applications? Why boiling point of water is more than that of H_2S?
20. Give the principle and procedure involving extraction of ferrous iron from its salt solution.

Physical Chemistry Core -II

Group- A

Each question carries 1 marks.

1. The Kinetic energy of the gas molecules are _____ with rise in temperature.
2. The pressure of the gas due to_____.
3. The large fraction molecules moving with velocity at given temperature is called _____.
4. At temperature increases, the most probable velocity of the molecules are _____.
5. The probability of the molecules are _____ with rise in temperature.
6. The collision frequency of the molecules are _____ with increase in molecular diameter.
7. As temperature, the collosion frequency of the molecules are _____.
8. When molecular diameter increases, the mean free path of the molecules are _____.
9. The mean free path of the molecules are increases when pressure of the gas _____.
10. At _____temperature and _____pressure, the real gases approach towards ideality.
11. The unit of vander-Wall's constant 'a' is _____.
12. At _____ temperature and _____ pressure, the gases are deviate from ideality.
13. The unit of vander-Walls constant 'b' is _____.
14. The temperature below which the gases are liquefied under pressure is called _____.
15. Vander-wall's equation for 1 mole is _____.

16. Vander-wall's equation in valid for _____ gas only.

17. The value of Critical co-efficient RT_C/T_cV_c = _____.

18. The law of corresponding state is _____.

19. The value of critical Vd. In terms of vander-Walls constant is _____

20. The surface tension of the liquid_____with rise in temperature.

21. A shaving blade & needle floats on water surface due to _____.

22. Small liquid drops are always spherical in shape due to _____.

23. The S.I unit of surface tension is _____.

24. Liquid rise in the capillary tube due to_____.

25. The viscosity of the liquid is _____with rise in temperature.

26. The practical unit of co-efficient of viscosity of liquid is _____.

27. The viscosity of liquid is _____ with increase inter molecular forces.

28. For given liquid, the viscosity is _____ with increase in molecular cut.

29. The S.I unit of co-efficient of viscosity of liquid is _____

30. On dilution, the degree of dissociation α is _____.

31. For endothermic substance, the degree of dissociation is _____ with rise in temperature.

32. For exothermic substance, the degree of dissociation is _____with rise in temperature.

33. Due to common ion, the degree of dissociation 'α' is_____.

34. The value of K_w at 25^0C is _____.

35. The value of K_w is _____ with rise in temperature.

36. The pH of solution _____ with rise in temperature.

37. The sum of p^H and p^{OH} is _____.

38. If the p^H of solution is greater than 7, the solution is _____ in nature.

39. In pure water, p^H is _____.

40. In acidic solution, P^H is_____ than 7.

41. _____ solid has sharp MP.

42. _____ solid is anisotropic in nature.

43. The defect in which pair of holes are developed called_____.

44. The defect in which cation is shifted to the interstitial sites called _____.

45. Henderson equation for acidic buffer is _____.

46. Henderson equation for basic buffer is _____.

47. NaCl is _____ stable than CsCl.

48. The small unit which define completely 3D structure of solid is called_____.

49. The NH4Cl dissolve in water to produce _____ solution.

50. The p^H of an aqueous solution of NaCl is _____.

Group-B

Each question carries 1.5 marks

1. What is the value C_P / C_V for CO_2?
2. In between H_2 and O_2 molecule, which will have higher kinetic energy at 25^0C?
3. Define Collision diameter.
4. Arrange H_2, O_2 and CO_2 in the order of their deviation from ideality under similar condition of temperature and pressure.
5. What is the co-ordination number of each ion of C_SCl?
6. What do you mean by anisotropy in solids?
7. How does the viscosity of water vary with the dissolution of covalent solutes?
8. What is the effect of temperature on vapour pressure of liquid?
9. What is ionic product of water?
10. What is that substance on mixing with NH_4OH gives a buffer?
11. Define compressibility factor.
12. In vander Waals gas, describe the term which accounts for intermolecular forces.
13. What is law of equipartition of energy?
14. Name four important physical properties of liquid.
15. How many crystal systems and Bravies lattices are there for solids.
16. Which crystal plane have interplanar spacing $d_{hkl} = \sqrt{12}$?
17. Calculate the pH of 0.04M HNO_3 solution assuming complete dissociation.
18. Define solubility product.
19. What is the Henderson-Hasselbalch equation?
20. What is buffer capacity?
21. Define collision number.
22. What is mean free path? Give the equation.
23. Define coefficient of viscosity. Give the equation.
24. What is root mean square velocity? Give the equation.
25. What is most probable velocity? Give the equation.

26. What is compressibility factor?
27. Define degrees of freedom.
28. Give real gas equation for 1 mole of gas.
29. Find out rms speed of CO_2 at 27 ^oC.
30. Define equipartition of energy.
31. Define surface tension. Give its unit.
32. Define vapour pressure.
33. What is ionic product of water. Give its equation.
34. Define common ion effect.
35. What is pH of 1M HCl/ 0.001M NaOH?
36. Define law of rational indices.
37. Define law of constancy of interfacial angle.
38. Give Bragg's equation.
39. Define solubility. Give equation.
40. Define solubility product. What is the solubility product of AgCl.
41. Give the relationship between solubility and solubility product.
42. What is the solubility product of AgCl whose solubility is 10^{-8} g^2/ l^2 at 97 ^0C ?
43. Define an indicator with an example.
44. What is buffer solution? Give an example.
45. Give Henderson-Hasselbalch equation for acidic buffer.
46. Give Henderson-Hasselbalch equation for basic buffer.
47. What is the pH of 0.63 g of HNO_3 dissolved in 200 ml of solution?
49. Give the formula of Miller indices.
50. What is the pH of blood?

Group- C

Each question carries 2.5 marks.

1. Write the equation for probability of finding of molecules with velocity c.
2. Define and give formula of average velocity.
3. What is rms velocity and give its formula?
4. Calculate rms speed of an Oxygen molecule at 288K in SI unit.
5. Calculate ration of rms velocities of O_2 and HI at 320K.
6. Calculate kinetic energy (in joules) of 1 mole of ideal gas at 320K.
7. A linear molecule and a linear molecule how many vibrational degree of freedom.
8. Calculate the no of modes of vibration in case of CH_4 molecule.

9. What is law of equipartition of energy?

10. Using principle of equipartition of energy and various degree of freedom estimate the value of C_V for SO_2 (sent molecule).

11. What is collision frequency? Write its formula.

12. Give formula of mean free path. Give its formula and explain its terms.

13. Calculate mean free path of O_2 molecule at 298K and 10^{-3}mm Hg. Given =3.61 x 10^{10}m.

14. Why correction in volume factor necessary in ideal gas equation?

15. Write the units of van der Waal constants a and b.

16. Define Critical pressure, critical volume, critical temperature.

17. Calculate the T_C for a van der Waal's gas for which P_C is 100 atm and b is 50cm^2 mol^-

20. Name two factors and explain how they affect vapour pressure.

21. What is continuity of states? Explain.

22. Explain the cleansing action of soap.

23. Derive Ostwald's dilution law.

24. 0.1m solution of monobasic acid dissociation to the extent of 10%. Calculate dissociation constant of the acid.

25. What happens to the p^H when a few drops of acid or alkali are added to CH_3COONH_4?

26. Define Crystal lattice, Unit cell, Lattice point.

27. What is difference between Weiss and Miller indices?

28. What is formula of interplanar distance?

29. Write notes on Schottky defect.

30. Write notes on Frenkel defect.

31. What are nematic liquid crystals? Give example.

32. What are cholestric liquid crystals? Give example.

33. State and explain surface tension. Give its unit.

34. What is coefficient of viscosity? Give the equation and unit.

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18. What is compressibility factor and name the gases which show positive deviation at all pressure?

19. State vapour pressure. Give the factors affecting it.

35. Explain two factors affecting surface tension.

36. State and explain p^H.

37. State and explain ionic product of water.

38. State and explain common ion effect with an example.

39. How can common ion effect help in the separation of group II cations?

40. What is element of symmetry? Explain.

41. What is line of symmetry? Explain.

42. State and explain law of constancy of interfacial angle.

43. Give the powder diffraction pattern of NaCl.

44. What is a liquid crystal? Explain.

45. What is a buffer solution? Give one example of each acidic and basic buffer.

46. What are buffer capacity and buffer range? Explain.

47. Derive Henderson's equation for acidic buffer.

48. Give the theory of acid base indicator.

49. Define solubility and solubility product.

50. Derive the relationship between solubility and solubility product.

Group -D Each

question carries 8 marks.

1. (a) Derive kinetic gas equation, $PV = \frac{1}{3}mNu^2$

(b) What is mean free path? Discuss the various factors affecting it.

(c) Discuss the law of equipartition of energy.

2. (a) Reduce van der Waal's equation to viral form and calculate Boyle temperature from this.

(b) Give the significance of vander Waal's constants.

(c) Derive vander Waal's equation of state for 1 mole of a real gas?

3.(a) Give an account of powder pattern method for study of crystals.

(b) In a diffraction experiment, angle of diffraction (Q) is 17^0 and wavelength of x-ray used is 136pm. Calculate the distance between the layers of atoms assuming n=1.

4. (a) Discuss the law of rational indices and Miller indices.

(b) What are liquid crystals? Discuss the structure of various types of liquid crystals.

5. (a) Calculate the pH of 10-3 (M) HCl

(b) Discuss the cleansing action of soap and detergents.

6. (a) Discuss the structure of liquids by means of distribution curve making comparison with solids and liquids.

(b) Establish the relation between dissociation constant of a weak mono basic acid and its degree of dissociation.

7. (a) Discuss Ostwald's theory of acid-base indicator considering the case of Phenolphthalein.

(b) Why does solution of CH_3COONH_4 act as a buffer?

8. (a) Define hydrolysis of salt. Derive an expression for the calculation of pH of CH_3COONa solution.

(b) Calculate the solubility of AgCl in presence of 0.01(M) HCl at 25^0C where the solubility of AgCl is 10^{-10}.

9. (a) Discuss in details, the Maxwell's distribution of molecular velocities. (b) Derive the vander Waals equation of state for real gases. Explain how this equation explains the departure of real gases from ideal behaviour at different pressure and temperature

10. (a) Define the term surface tension and surface energy. Derive an expression for determination of surface tension by capillary rise method.

(b) Discuss the following :

(i) Common ion effect

(ii) Ionisation of weak acid and bases.

(iii) Find pH of 1×10^{-5}M solution of

(a) NaOH (b) $Ba(OH)_2$

11. (a) Discuss the rotating crystal method and powder pattern technique for determination of crystal structure of solid

(b) Discuss the Schottky and Frenkel defect in solid.

(i) Common ion effect

(ii) Ionisation of weak acid and bases.

12. (a) Discuss in details, the phenomenon of hydrolysis of salts taking examples of :

(i) A weak acid and a strong base

(ii) A weak base and a strong acid

(b) Give an account for the qualitative treatment of acid base titration curve taking example of: (i) A strong acid with a strong base

(ii) A weak acid with a strong base

Organic Chemistry

Core – III

Group - A

Each question carries 1 mark. (Fill in the blanks)

1. In open chain compounds, the ‘c’ atom is connected with _____ no. of ‘c’ atom directly maximum.
2. One physical property of compound is mainly depends upon _____.
3. _____ part of the compound is responsible for chemical properties.
4. – O – is the functional group of _____ family.
5. The F.G at esters is _____.

Cl

|

6. The IUPAC name of the compound $CH_2 = CH – C = CH – CH_3$ is _____

7. The IUPAC name of the compound $CH_3 – CH_2 – CH – CH_2 - CH_2 – CH_3$ is _____

|

COOH

8. The IUPAC name of the compound CHO – CH – CH_2 – CHO is _____

|

Cl

9. The IUPAC name of the compound COOH is _____

|

COOH

10. The IUPAC name of the compound CH2 – CN is _____

|

CH2 – CN

21. As the bond strength increases, then the bond length is _____.
22. As S- character increases, the bond angle is _____.
23. As S- character of bonded electron increases, the bond energy is _____.

24. Polarisation of single bond is called _____.

25. – I effect group _____ the clarity of the substance.

26. Formic acid is _____ than acetic acid.

27. +I effect _____ the acidity of the substance.

28. α- electro acetic acid is _____ than p- cloro acetic acid.

29. Aniline is _____ them ethylamine on basic strength.

30. Chloro acetic acid is _____ than fluro acetic acid on the acid strength.

31. Phenol is unit due to_____.

32. The transfer of π- electron in the presence of reagent is called _____.

33. An electron rich species is called_____

34. _____ exchanges produce free radicals.

35. An electron deficient species is called _____.

36. Heterolytic cleavage produce _____ fragments.

37.Carbon carries +ve change is called _____

38. _____ carbon intermediate is nucleophile in nature.

39. Carbine contains _____ no. of electron.

40. Free radical is _____ stable than nuclear molecule from which it is formed.

41. _____ type of alkanes are produce in water reaction.

42. _____ type compound shows geometrical isomerism.

43. Meso compounds are optically _____ in nature.

44. Lactic acid contain _____ no. of chiral centre.

45. The compounds which are mirror image to each other called _____.

46. The mixture contain 50% d and 50% 1 called _____

47. Alkenes shows _____ type of reaction.

48. Alkene is _____ reactive than alkyne forwards electrophilic addition reaction.

49. According to Saytzeffs, _____ alkene is stable.

50. _____ theory determine the stability of alicyclic compound.

51. In sulphonation of benzene, _____ is an electrophile.

Group-B

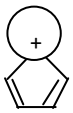
Each question carries 1.5 marks

1. How many sp hybridised carbon atoms ate there in

   $CH_2 = C = CH - CH_2 - \underline{C} = CH$
2. In between water molecule and CH_3OH molecule which has higher dipolement?
3. Draw the structure of syn and anti acetaldoxime.
4. Meso compounds are optically inactive due to_____.
5. n-propane reacts with Cl_2 in 1:1 ratio under the influence of u.v. light to give_____.
6. What happens when Al_4C_3 is hydrolysed by boiling with water?
7. What is produced when propyne undergoes hydration with 30% dil. H_2SO_4 in presence of Hg^{2+} salt?
8. In between alkenes and alkynes, which are more reactive towards electrophilic addition reaction?
9. What is that electrophile acting during sulphonation of benzene?
10. Select the activating substituent's for elctropholic substituents across benzene ring.

    – Cl, $-CH_3$, $-NH_2$, –COOH.

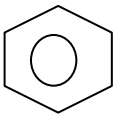
11. In between aniline and benzyl amine, which is more basic?
12. What is the shape of $^+CH_3$ ion?
13. Racimic mixture is optically inactive due to_____.
14. Write the Fischer projection formula of 2-chloro butane.
15. Among the different conformational isomers of cyclo-butane, which is more stable?
16. What is the order of selectivity of carbon atoms for halogenations?
17. What is the major product when propene reacts with HBr in the presence of organic peroxide? 18. $CH_3 - C \equiv C - CH_3 + H_2 \xrightarrow[\text{xylene}]{\text{Pd-BaSo4}}$ A (What is A?).
19. What is the name of electrophile acting during sulphonation of benzene?
20. Give an example of a cyclic carbanion having aromatic nature.
21. What is the shape and hybridisation of acetylene?
22. Define homolytic bond fission with one example.
23. Define nucleophilic with two examples.
24. What is electrophilic addition reaction? Give one example.
25. Define enentiomer with example.
26. What is Wurtz-Fitting reaction? Give one example.
27. What is ozonolysis of alkene? Give one example.
28. Give one reaction to explain the acidity of acetylene.
29. Which of the two is aromatic and why?

30. What is nitration of benzene? Give examples.
31. What is nucleophile? Give one example.
32. What are the hybridisation, shape and bond angle of acetylene?
33. Define dipole moment with mathematical relation.
34. Why is ethyl amine more basic than methyl amine?
35. What is enantioner? Give one example.
36. What is the formal change on 'C' in CH_3^+?
37. Give the different resonating forms ofi cyclopentadienyl cation.
38. Define Markownikoff's rule with one example.
39. $CH_3 - CH - CH_2 + O_3 \xrightarrow{H2O}$? Complete the reaction.
40. Show all the axial and equatorial H-atoms in chair form of cyclohexane.
41. Define Huckel's rule of aromaticity.
42. Which of the following groups are O & P - directing?

    - NO_2, - Cl, - NH_2, - SO_3H
43. Between fluoro acetic acid and chloro acetic acid which is stronger and why?
44. Write the stability order of alkyl free radicals.
45. Give an example of E_2 reaction.
46. Between cis-isomer and trans-isomer which generally possesses lower melting point and why?
47. What is racemisation?
48. Give an example of Nucleophilic addition reaction.
49. Write the product for the following reaction :

    $CH_3 - CH = CH_2 \xrightarrow{NBS}$
50. Give an example of anti-Markownikoff's addition reaction.
51. State Huckel's rule.
52. Complete the following reaction.


+ CH3CH2CH2Cl → Anhy ALCL3

53. What is an electrophile? Give one example.
54. What does half headed arrow indicate?
55. Give the factors responsible for the order of basicity of 1^0, 2^0 and 3^0 amines in aqueous solution.
56. Find out the formal charge on carbon in CH_3^-.

57. Why is phenoxide ion stable?
58. Define diastereomers with example.
59. Represent cis and trans isomers of the compound HOOC – CH = CH – COOH and write their names.
60. What is Wurtz-fittig reaction? Give example.
61. Why is cyclopropane unstable according to Baeyer-strain theory?
62. Give nitration of benzene. What is the electrophile in this reaction? **Group -C**

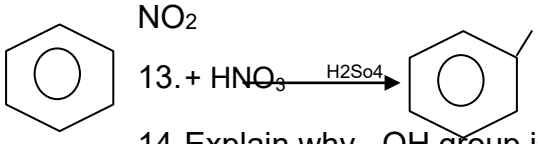
Each question carries 2.5 marks.

1. Give an example of α- Elimination.
2. What is Cope reaction? Give an example.
3. $CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CN \rightleftharpoons$ Predict the product using E_{ICB} mechanism
4. Show mechanism of Markownikoff addition. Why the halogen is added to C having lower no. of H atom?
5. Why is presence of peroxide during addition of HBr to alkene, the Br goes to C having higher no of H atom.
6. What is regioselective reaction? Give one example.
7. Show mechanism of Hydroboration reaction.
8. 1,3- butadiene + Maleic $\xrightarrow[\text{quantitative}]{\text{benzene, 20 C}}$ anhydride _____

Complete the product and name the reaction.

9. Write the postulates of Bayer Strain theory.
10. Write two difference of Saytzeff and Hofmann elimination.
11. $CH_3 - CH = C - CH_3 \xrightarrow[\text{Quinoline}]{Pd/BaSo4}$ _____

$CH_3 - CH = C - CH_3 \xrightarrow{Na/Liq.\ NH3}$ _____

12. Show mechanism of Ozonolysis.
13.  + H_2O
14. Explain why –OH group is ortho, para directing.
15. Why Cl is ortho directing although deactivating?

16. How will you convert n-Propyl bromide to n-propane.

17. Identity P, Q, R

$CH_3 - CH2 - CH2 - Br \xrightarrow{\text{alcoholic KOH}} P \xrightarrow{H2O/H+} Q$ R 18.

Show the mechanism of benzyne formation from chloro benzene in presence NH_2.

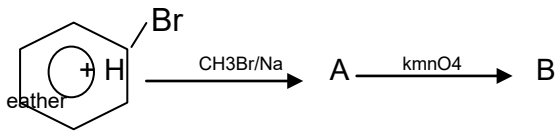
19. What are drawbacks of Kekule structure of benzene?

20. Show mechanism of sulphonation of Benzene.

21. What happen when Benzyl Chloride is subjected to oxidation with Lead Nitrate?

22. What happens when Cl_2 passed through boiling toluene?

23. Identity A and B



24. Identity A, B and C

Toluene $\xrightarrow{KMnO4}$ A $\xrightarrow{NaOH}$ B $\xrightarrow{HNO2}$ C $\xrightarrow[H+]{H2SO4}$ 25. How benzene converted to acetophenone.

Name the reaction.

26. What are the synthetic application of Friedal Craft reaction?

27. What happens when 0- xylene is heated with $KMnO_4$.

28. Show the difference between SN^1 and E_1 reaction in alkyl halide.

29. Show the difference between SN^2 and E_2.

30. What happens when toluene is subjected to chromyl chloride?

31. What is field effect? Explain with one example.

32. Between formic acid and acetic acid which is stronger why.

33. Secondary amine is more basic than tertiary amine. Explain.

34. Aniline is a weaker base than para -toludine.

35. Draw hyper conjugative structure of

$CH_3 - CH = CH_2$

36. What is Carbene. Draw the structure of singlet and triplet Carbene.

37. Draw the structure of cyclopentadienyl carbanion.

38. What is Wurtz reaction? Give two examples.

39. Show the mechanism of chlorination of methane.

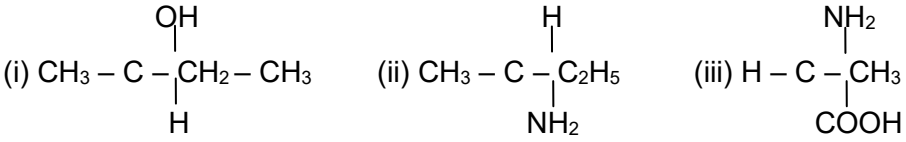
40. Define specific rotation and write the formula.

41. What are the proportions of enantiomers?

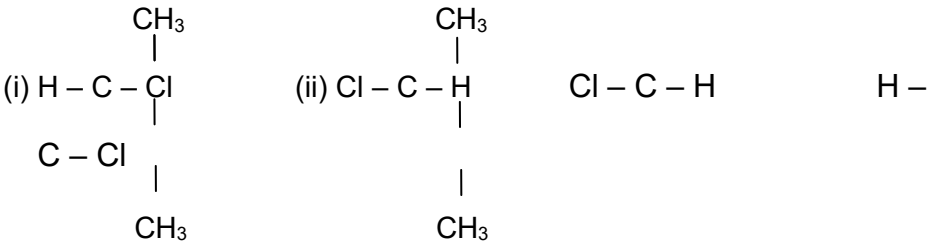
42. What are diastereo isomers? Give examples.

43. What are erythro and threo isomers? Give one example of each.

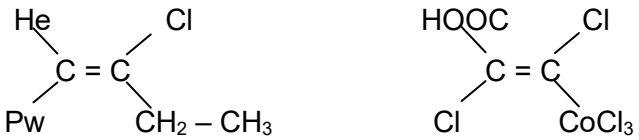
44. Give R and S configuration to



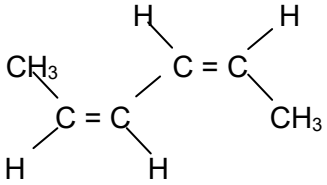
45. Specify the configuration of



46. Give I, Z notation to



47. Give E, Z notation to



48. What are Carbonations? Arrange the following in order of their stability

$CH_3 – CH_2 – CH_2 – CH_2^+$, $(CH_3)_3\ C^+$, $CH_3 – CH^+ – CH_2 – CH_3$

Group-D

Each question carries 8 marks.

1. (a) Define hyper conjugation. Apply it to determine the relative stability of 1^0, 2^0 and 3^0 carbocation.

(b) In between 2-chloropropionic acid and 3-chloro propionic acid which is stronger and why?

2. (a) What are Carbanion? Discuss their structure and stability.

(b) What are Carbenes? Classify them.

3. (a) What is optical isomerism? What are its conditions? Discuss the optical activity of different stereo isomers of tartaric acid.

(b) How do Cis and trans isomers of compound differ in their physical characteristic.

4. (a) Discuss E/Z notations of geometrical isomers with examples using C.I.P. rule.

(b) How do erantiomers differ from diastereo isomers?

5. (a) Discuss the conformational analysis of cyclohexane with relative stability and energy diagram.

6. (a) What happens when methyl iodide in heater with ethyl iodide in presence of sodium metal in etheral medium? Write with equation. (b) Why cyclopentane is more stable than cyclopropane?

7. (a) Discuss E_1CB mechanism with an example.

(b) What product is formed when But-1-ene is subjected to hydroboration oxidation? Discuss with mechanism.

8. (a) Discuss the acidic nature of terminal alkynes with supporting reaction.

(b) How can you convert acetylene to propyne?

9. (a) How does benzene react with n-propyl chloride in the presence of anhydrous $AlCl_3$? Write with mechanism.

(b) Discuss the mechanism of nitration of benzene.

10. (a) Why benzene can't be converted into tri-nitrobenzene directly?

(b) Test for the aromaticity for the following species.

(i)  =O

(ii) 

11. (a) Discuss Freundlich adsorption isotherm of a gas in a solid surface. How the constants in this isotherm are are determined.

(b) Write Notes on:-

(i) CMC (ii) Micelles

12. (a) What is adsorption? How does physical adsorption differ from Chemical adsorption.

(b) Write Notes on :-

(i) Zeta potential (ii) Electrophoresis

13. (a) Discuss collision theory of reaction rate.

(b) Derive the rate equation of a second order reaction.

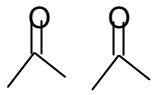
$2A \longrightarrow$ Production

14. (a) Discuss Arrhenius equation for temperature dependence of reaction rate.

(b) How is the order of a reaction determined by

(i) Differential method (ii) Half life method

15. (a) Give the IUPAC name of the following compounds.

(i) 

(ii) 

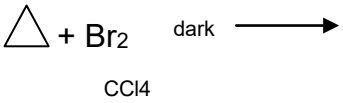
(iii) $CH_2 - \underset{\displaystyle CN}{CH} - \underset{\displaystyle CN}{CH_2}$ $\quad CN$

(iv) $CH_3 - \underset{\displaystyle Br}{CH} - CH_2 - COOH$

16. (a) Write Short Notes on 'Hyper conjugation'.

(b) (i) What happens when cyclopropane reacts with HBr.

(ii) Complete the reaction –



17. (a) Write a note on inclusion compounds.

(b) Write notes on Diels-Alder reaction.

18. (a) What are electrophiles and nuclophiles? Illustrate with two examples of each.

(b) Explain with examples the mechanism of SE_1 reaction.

(c) Allyl free radical is more stable than alkyl free radical. Explain.

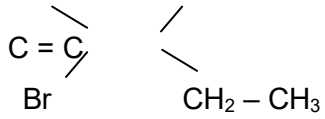
19. (a) Define the term reactive intermediate.

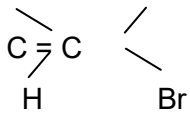
(b) Discuss the structure and stability of carbocation.

(c) Explain with examples the mechanism of AdE reaction.

20. (a) Differentiate between enantiomers and diastereomers.

(b) What are the principles of deciding R and S notations for chiral centers. (c) Assign E and Z configuration to the following compounds.

(i) 

(ii) 

21. (a) Discuss conformation of 1, 4-dimethyl cyclohexane.

(b) Draw Newman Projection for chair and boat conformation of cyclohexane.

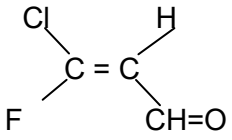
(c) Write notes on resolution of racemic mixture.

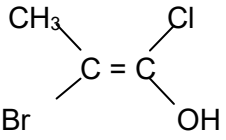
22. Write note on inductive effect. How does the acidity of mono, di and tri-chloro acetic acids explain on thin basic.

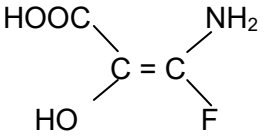
23. What are carbon free radicals? Explain their shape and stabilities. Give different tupes of substitutions with examples.
    (i) Iodoform reaction
    (ii) Diels-Alder reaction

24. Write note on Cis and trans Isomerism.

Represent the following compounds as E or Z Isomer.

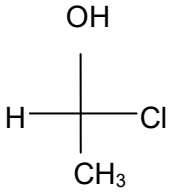


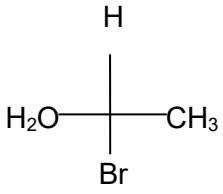




25. (a) What is Racemic mixture? Give two methods of resolution of racemic mixture.

(b) Identity the followings compounds on R or S configuration.





26. Write notes on with mechanism.

(a) Wurtz reaction

(b) Chlorination of Methane

27. Write Notes on :-.

(a) Baeyer Strain theory

(b) Confirmational analysis of butane

28. Write notes on ***(any Two)***:-

(a) E_2 reaction

(b) Markownikoff's reaction

(c) Oxymercuration - demercuratin reaction.

29. Write Notes on ***(any Two)***:-

(a) Diel's-Alder reaction

(b) Saytzeff's rule

(c) Syn-hydroxylation of alkene

30. Write notes on ***(any Two)***:-

(a) Huckel's rule of aromaticity

(b) Friedel-Craft acylation

(c) Chloro benzene is o, p- directing but deactivating for electrophilic substitution.

31. Write Notes on ***(any Two)***:-

(a) Halogenation

(b) Sulphonation

(c) Benzoic acid is meta directing and deactivating for electrophilic substitution reaction.

32. (a) Define adsorption. Discuss Freundlich adsorption isotherm and write its limitation.

(b) Write notes on :

(i) Zetapotential (ii) Brownian movement

33. (a) State and derive Gibb's adsorption isotherm.

(b) What are the differences between physical adsorption and chemical adsorption?

34. (a) What is the zero order reaction? Derive an expression for the rate constant of a zero order reaction. Give one example of a zero order reaction.

(b) Discuss the different methods of determining the order of a chemical reaction.

35. (a) What is a second order reaction? Derive an expression for the rate constant of a second order reaction. $2A \longrightarrow$ Product. Give one example of second order reaction.

(b) Write Notes on :

(i) Half life period (ii) Activation energy

36. (a) Write the IUPAC name of the following compounds.

(i) $CH_3 - \underset{CN}{CH} - \underset{CN}{CH_2}$ (ii) $CH_3COCH = CH - COOH$

(iii) $CH_2 - CH = CH_2$ (iv) $CH_3 - \overset{O}{\overset{\|}{C}} - CHO$

CH_3

(v) $CH_3 - C \equiv C - CH - CH_3$

(b) Write Notes on :-

(i) Steric effect

(ii) Diels Alder reaction (iii) Hyper conjugation

37. (a) Write the structural formula of the following compounds.

(i) 4, 5-dimethyl – 2 – hexyne

(ii) 2-Butenoic acid

(iii) 3-chloro-2-ethyl-butanol

(iv) N-ethyl-2-amino propane

(v) 4-Bromo-3-buten-2-one

(b) What is resonance? What are the essential conditions for resonance. Write any two of its applications.

38. (a) What is carbocation? Explain the structure, stability and formation of carbocation.

(b) What are electrophiles and nucleophiles? Give example of different types of electrophiles and nucleophiles.

39. (a) What do you understand by and and AdE reaction? Explain them with suitable examples.

(b) Write Notes on :- \

(i) Free radical

(ii) Benzyne

(iii) Nitrenes

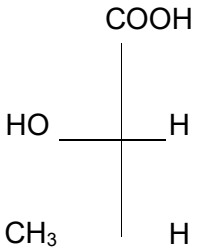
40. (a) What do you mean by Geometrical isomerism? Discuss the geometrical isomerism in aldoxime and Ketoxime. (b) Write Notes on :-

(i) Optical isomerism

(ii) Enantiomers

(c) Write R and S notation of the following compounds :-

(i)



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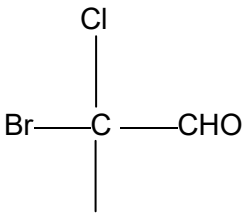
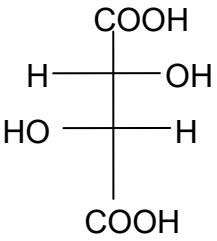


(iii)

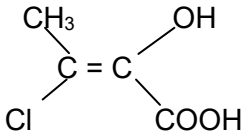


41 (a) Discuss the conformation of cyclohexane and their relation stability.

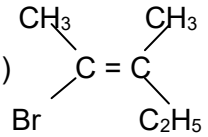
(b) Explain the term conformation and configuration.

(c) Write the E and Z notation of the following compounds.

(i)



(ii)



42.(a) Write note on Resonance.

(b) Why is chloro acetic acid stronger acid than acetic acid?

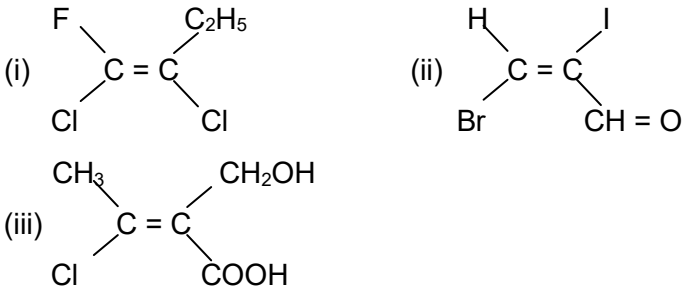
(c) What is substitution reaction? Explain with example.

43. (a) Discuss the structure and stability of carbenes.

(b) Write note on Wurtz-Fitting reaction.

44.(a) State and explain E and Z isomerism with necessary conditions involved.

(b) Assign E and Z configuration of the following compounds.



45. (a) What is racemic mixture? Give three important methods of resolution of racemic mixture.

(b) What are important conditions for a compound to be asymmetric?

46. Write Notes on:

(a) E_2 reaction (b) Ozonolysis

(c) Hofmann Elimination

47. Write Notes on :

(a) Hydroboration-oxidation reaction

(b) Hydration of acetylene

(c) Anti-Markownikoff's addition.

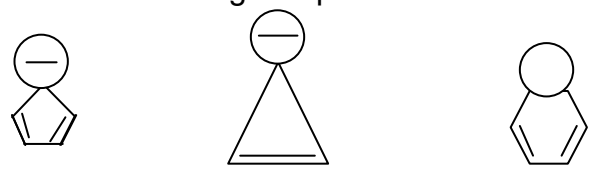
48. (a) Discuss the different conformations of ethane with potential energy diagram.

(b) Give the different conformations of n - butane.

49. (a) Write energy diagram, show the different conformations of cyclohexane. Which form is stable form among them.

(b) What is electrophillic aromatic substitution reaction? Give the mechanism of nitration of benzene.

(c) Which of the following compounds / ions are aromatic and why?



50. (a) Write Notes on :-

(i) Halogenation

(ii) Nitration

(b) Why is phenol and p-directing and activating? Explain.

51. Define resonance. What are the conditions of resonance? How does resonance explain acidic character of phenol?

52. What are Carbonations and carbanions? Explain their structure and stability.

53. Define Geometrical isomerism. What are the conditions if Geometrical isomerism? Explain cis-trans and syn-anti isomers with examples

54. What are enantiomers and diastereo isomers? How they can be distinguished?

55. Discuss the formation of alkane by elimination reaction and also its mechanism. How does propane react with HBr in presence and in absence of organic peroxide?

56. Discuss Baeyer Strain theory. How does it explain the relative stability of cyclo alkanes? Write its limitations.

57. Discuss Friedel-Craft's alkyation and acylation of benzene with mechanism.

58. Explain the following :

(a) Nitration of toluene takes place more readily than that of benzene.

(b) – OH group in phenol is ortho-para directing.

(c) – CHO group in benzaldehyde is meta directing.

(d) Chlorine deactivates to benzene ring yet it is ortho-para directing.

59. Write the following reactions with mechanism **(Any Two):**

(a) Diel's Alder Reaction

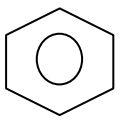
(b) Wurtz-Fittig Reaction

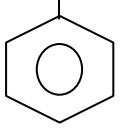
(c) E_1cb Reaction

60. Complete the following reactions and name the product:

(a) $CH_3 - C \equiv CH + H_2O \xrightarrow[H_2SO_4]{Hg2+}$?

(b) $CH_3 - CH = CH - CH_3 \xrightarrow[(ii)\ Zn\ dust]{(i)\ O_3}$?

(c)  $+ CH_3 - C = CH_2 \xrightarrow{H^+}$?

(d)  Br2 $+ Br_2 \xrightarrow{\Delta}$?

61. Define resonance. Give six important conditions of resonance with example.

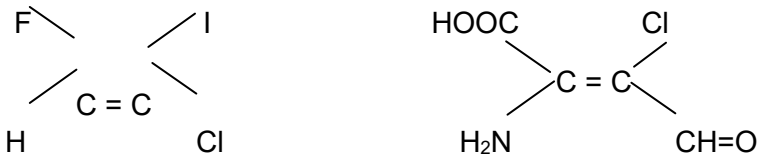
62. Write Notes on :- ***(any Two)***

(i) Carbocation

(ii) Inductive effect

(iii) carbene

63. What do you mean by E, Z notation? Write the sequence rules for assigners E and Z configuration to the geometrical isomer. Assign E or Z configuration of the following compounds.



64. What is resolution of racemic mixture. Discuss various methods of resolution of racemic mixture. 65. Write Notes on :-

(a) Wurtz reaction

(b) Reactivity and selectivity on halogenation of alkane.

66. Give the postulates of Baeyer strain theory. On this basis explain the stabilites of cyclo-alkanes. 67. Write Notes on :-

(a) E_2 reaction

(b) Diels-Alder reaction

68. Write Notes on :-

(a) Saytzeff Rule

(b) Oxymercuration demercuration of alkene.

69. Write Notes on :-

(a) State and explain Huckel's rule of aromaticity.

(b) Write Friedel-craft acylation reaction with mechanism.

70.(a) Give halogenations reaction of benzene with mechanism.

(b) Why is halogen atom in Halo-benzene o and p-directing but deactivating?

71. (a) Define Hyper conjugation. Apply it to determine the relative stability of the following carbocation.

$CH_3\overset{\oplus}{}$, $(CH_3)_2\overset{\oplus}{}CH$, $(CH_3)_3C$

(b) Arrange the order of basic nature of

NH_3, CH_3NH_2, $C_6H_5NH_2$ with explanation.

72. (a) What is cabenes? Discuss its classification and structure.

(b) Arrange the stability order of the following carbanions with reason.

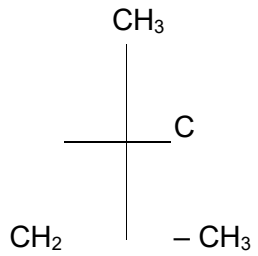
$CH_3 - \overset{\ominus}{C}H_2,\ CH_2 = \overset{\ominus}{C}H,\ C\underline{H} = \overset{\ominus}{C}$

73. (a) Distinguished between Enantiomers and Diastereo isomers with examples.

(b) Assign R and S configuration to the following compounds.

c) Write R and S notation of the following compounds :-

(i)



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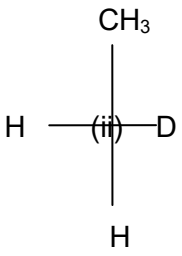
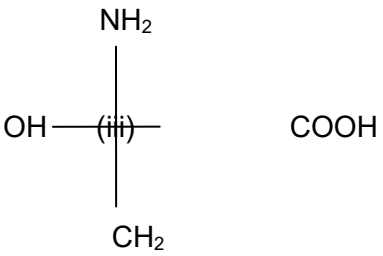


(iii)



74. (a) Distinguish between threo and erythro diastero isomers with examples.

(b) Explain the terms Chiral, achiral and pro-chiral as applied to stereo chemistry.

75. Write Notes on :-

(a) Wurtz-Fitting reaction

(b) Iodination of alkane

76. Discuss the various confirmations of cyclohexane with relative stability and necessary energy diagram. 77. Write Notes on :-

(a) Antimarkownioff's rule

(b) Mechanism of E_1CB reaction.

78. Write Notes on :-

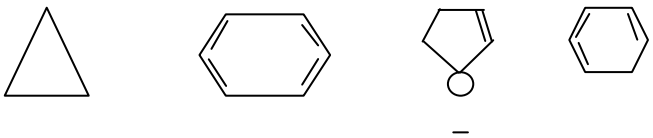
(i) Hydroboration oxidation of alkenes.

(ii) Acidity of terminal alkynes.

79. (a) Discuss the mechanism of nitration of benzene.

(b) What happens when benzene reacts with n-propyl chloride in the presence of anhydrous $ALCl_3$? Discuss with mechanism.

80. (a) Apply Huckel's (4n+2) rule to test the aromaticity of the following species.



(b) Arrange benzene, nitrobenzene and toluene in the order of their reactivity towards electrophilic substitution reaction with appropriate expiation.

81. (a) Write the IUPAC name of the following compounds :-

(i) $CH_3 - CH = \overline{CH -} CH_2 - CH_3$

(ii) $CH_3 - CO - CH_2 - CO - CH_3$

(iii) $OHC - CH_2 - CH_2 - CH(CH_3) - CHO$

(iv) $CH_2(OH) - CH(OH) - CH_2(OH)$

(v) $HOOC - CH_2 - CH(CH_3) - COOH$

(vi) $CH_3 - CH = CH - C \equiv CH$

(b) Write Note on : (i) Inductive effect.

(ii) Hyper conjugation

82. (a) Write the structural formula of the following compounds :-

(i) 1, 3-Butadiene

(ii) 4-methyl - 2 - Pentyne

(iii) But-1-yne

(iv) Pent-3-ynal

(v) 3-Butyn-2-one

(b) Write Notes on :

(i) Dieckmann's reaction

(ii) Bayer's Strain Theory

83. (a) What is Carbanion? Discuss the formation, structure and stability of Carbanion.

(b) Define the term Carbene. What are singlet and triplet carbine?

84. (a) Discuss the mechanism of SN1 and SN2 reaction with suitable examples in each case.

85. (a) Discuss various confirmations of n-butane with special reference to their stability.

(b) Differentiate between axial and equatorial bonds.

(c) Give 'R' and 'S' configuration to each of the following compounds.

(i) $F - C(Cl)(I) - Br$ (ii) $HO - C(COOH)(CH_3) - H$

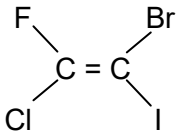
86.(a) What is optical isomerism? Discuss the optical Isomerism of Tartaric acid.

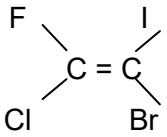
(b) Write Notes on :-

(i) Diasteromers

(ii) Meso compounds

(c) Give E and Z notation to the following compounds.



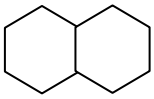


87. (a) Writ IUPAC name of the following compounds.

(i) $HOOC - CH_2 - CH(COOH) - CH_2 - COOH$

(ii) $NC - CH_2 - CH_2 - COOH$

(iii)



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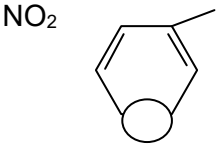
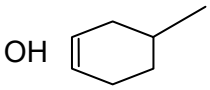


(v)



(b) Define resonance. Draw the resonating structures of benzene. The enthalpy of hydrogenation of hypothetical cyclo hexatriene is 85.8 kcal / mole while that of benzene is 49.8 kcal / mole. Calculate the resonance energy of benzene and explain its stability.

(c) Explain intramolecular hydrogen bonding with an example. How does it influence boiling Point of a compound?

88. (a) Write the structure formulae of the following compounds :

(i) N, N-Dimethylaniline

(ii) 2 – Ethoxybutane

(iii) 3 - Iodobutanamide (iv) 0 – Toludine

(b) Write notes on the following :

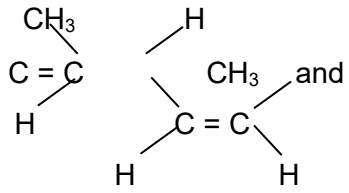
(i) Clathrates

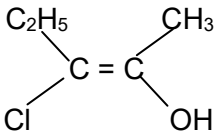
(ii) Aromaticity

89. (a) What are Carbanions? Explain the stability order of the following carbanions.

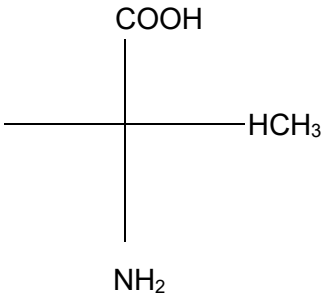
$\bar{C}H_3 > R - \bar{C}H_2 > R_2\bar{C}H > R3\bar{C}$

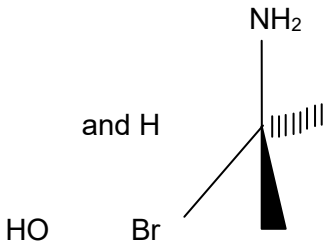
(b) Assign E, Z naming to the following compounds :

(i) 



(ii) Assign R, S notation to be following compounds :





(c) Explain “Isotope effect’ for determination of reaction mechanism.

(d) Discuss “Resolution of a racemic mixture”.

89. (a) Discuss mechanism of SN2 reaction with an example. Explain the effect of solvent on SN2 reaction.

(b) Draw the Newmann projections of the conformations of n-butane along with the energy profile curve. Write their decreasing order of stability. (c) Assign the mechanism of the following reactions and write the products of the reactions :

(i) $CH_3 - \underset{\underset{O}{\|}}{C} - H + HCN \xrightarrow{OH^-}$

(ii) $CH_3 - CH = CH_2 + \text{Bromine water} \longrightarrow$

(iii) $CH_3 - \underset{\underset{CH_3}{|}}{CH} - CH_2 - OH \xrightarrow[H_2SO_4]{\text{Conc. } 170C}$

(iv) $(CH_3)_3\, C - Br \xrightarrow[RO]{}$

Semester- II

Physical Chemistry

Core -IV

Group -A

Each question carries 1 mark.

1. The properties of the system depends upon the state are called_____. 2.

In _____ system the energy and matter both are exchanged with surrounding.

3. The system which exchange only energy but not matter called_____.

4.The properties which depends upon the amount of the substance present in the system called _____.

5. Neither matter nor energy exchanged with surrounding called _____.
6. The properties which do not depend upon the amount of the substance present in it called_____.
7. Internal energy is _____ property.
8. Temperature in _____ property.
9. The relationship in between Δ E and Δ H is _____.
10. Surface is _____ property.
11. The relationship in between ΔH and ΔE at isothermal condition is _____.
12. The relationship in between C_p and C_v is_____.
13. The rate of change of internal energy w.r.t. temperature is called_____.
14. The rate of exchange of enthalpy w.r.t temperature at constant process is called_____.
15. In exothermic reaction ΔH is _____
16. If ΔH = +ve, the reaction is _____.
17. Reversible expansion of an ideal gas under isothermal process, the work done is _____.
18. Reversible expansion of an ideal gas under adiabatic process, the work done expression is _____.
19. Kirchhoff's equation at constant pressure is _____.
20. If the strength of bond increases, the bond energy is _____.
21. Kirchhoff's equation Is _____.
22. Resonance energy in terms of bond energy is _____.
23. In spontaneous process, the change in enthalpy is _____.

24. The temperature at which Joule Thomson - co-efficient is zero called _____.
25. Gibb's-Helmholtz equation in terms of free energy is _____.
26. According to 3rd law of TD, the entropy of perfect crystalline substance is _____.
27. Gibb's-Helmholtz equation in terms of work function is _____.
28. For feasibility process, the ΔG = _____.
29. The entropy of the system $CaCO_3 \longrightarrow CaO + CO_{2(g)}$ is _____
30. Entropy change for 'n' mole of gas is _____.
31. Enthalpy change for '1' mole of gas is ----------.
32. Entropy change for irreversible process is _____
33. The relationship between K_p and K_c is _____.
34. The relationship in between K_p and K_x is _____.
35. The relationship in between Kp and Kc for the system $H_{2(g)} + I_{2(g)} \longrightarrow 2HI_{(g)}$ is called _____
36. For this system $N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$,if the pressure increases, the equilibrium shifts towards _____.
37. For $N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$, ΔH= -ve, If the temperature increases, the equilibrium will shift towards_____.
38. The rate of change of free energy w.r.t composition ,T, P is called _____.
39. The property of the solution which depends upon amount but not nature is called_____.
40. The V.P of solution is _____ than pure solvent.
41. The difference in V.P of solvent and solution is called _____.
42. Raoult's law for non-volatile solute is _____.
43. The boiling point of solution is _____ than pure solvent.
44. The difference in boiling point of solvent and solution is called_____.
45. Colligative property varies _____ of the solute.
46. Freezing point of solvent is _____ than solution.
47. The difference in freezing point of the solvent and solution is called _____
48. At. constant temperature, the osmotic pressure varies _____ with of the solution.
49. The pressure exerted on the solution side to check flow of solvent is called -------.

50. The process in which only solvent flows towards solution side when both are separated by semipermeable membrane is called_____.

Group- B

Each question carries 1.5 marks

(1) Define extensive property?

(2) What is the unit of entropy?

(3) What is the relation between Δ H and Δ U for in reaction

PCl_5 (g) $\longrightarrow$ PCl_3 (g) + Cl_2 (g)

(4) What is the effect of temperature on entropy?

(5) What must be the value of Δ G for a spontaneous process?

(6) Define fugacity?

(7) What is the effect of a catalyst on equilibrium?

(8) What is the relation between K_P and K_X?

(9) What is vant-Hoff factor?

(10) Which will boil at a higher temp.? 0.1 (M) Urla or 0.1(M) NaCl or 0.1M $CaCl_2$ under 1 atm pressure.

(11) Give an example of extensive property.

(12) What do you mean by isothermal process?

(13) What must be the value of ΔH, ΔS and ΔG for a process to be spontaneous?

(14) What do you mean by entropy?

15. What is adiabatic flame temperature?
16. State third law of thermodynamics?
17. What is explosion temperature?
18. What is Raoult's law?
19. What is osmotic pressure?
20. What is the relation between entropy change and heat of reaction for a reversible process?
21. Define enthalpy. Give the relation of enthalpy with internal energy.
22. Define heat capacity at constant volume with relation.
23. Define Isothermal condition.
24. Calculate the bond energy of C – H bond in CH_4 which dissociation energy in 398 KJ/mole.
25. State the Second Law of thermodynamics.
26. Define inversion temperature and give the relation to calculate that temperature.
27. Give the expression for calculation of free energy.

28. What is the condition of reaction to be spontaneity.
29. Give Gibbs - Duhem equation.
30. What is colligative property? What are the different colligative properties?
31. Define Raoult's law.
32. Define Le-chatelier's principle.
33. What is the efficiency of carnot cycle.
34. Does efficiency of a machine exceed one?
35. What is an irreversible system give an example?
36. What is the effect of temperature and pressure on K_p of dissociation of HI?
37. What is the value of K_p for the dissociation gaseous $CaCO_3$?
38. What is colligative property?
39. What is Henry's law?
40. Define boiling point.
41. Define freezing point.
42. Define vapour pressure.
43. What is elevation in boiling point.
44. Between sea water and drinking water, which has higher boiling point?
45. What is depression in freezing point.
46. Between tea and drinking water, which has higher freezing point?
47. Between lemon juice and drinking water, which has higher boiling point?
48. Define osmosis.
49. Give the equation of determination of molecular mass of solute by osmotic pressure method.
50. Give the equation of determination of molecular mass of solute by elevation in boiling Point.

Group -C

Each question carries 2.5 marks.

1. State Henry's law and calculate value of Henry's constant K.
2. Write two application of Henry's law?
3. What is ideal solution and non ideal solution? Give one example of each.
4. What are azeotopes? Give two example.
5. Calculate Vapour pressure of a solution containing 0.1 mole glucose in 500 gm of water at 373K.
6. State Boyle's Vant Hoff law and prove πV = constant.

7. State combined Vant Hoff's law and prove that $\pi V = \frac{w}{m}RT$.

8. What is degree of association? Calculate vant Hoff's factor i from it.

9. Explain why

(a) Liquid drops are spherical.

(b) The boiling point of water is more than that of ether.

10. Explain difference between Osmosis and diffasion.

11. Why in chemistry molarity is preferred over molality?

12. Write the main use of Osmotic pressure measurement.

13. Depression in freezing point of 0.01 molal solution of HF is - 0.201^0C. Calculate percentage degree of dissociation of HF (Kf = 1.86kg mol^{-1})

14. Write three factors affecting boiling point of a solution.

15. Write three limitation of Cryoscopic constant.

16. What is Zeroth law of Thermodynamics? Give its mathematical expression.

17. Derive the expression for work of expansion against constant pressure.

18. Derive the relation $\Delta H = \Delta V + \Delta nRT$

19. Derive the relation $C_P - C_V = R$

$C_P = dH/dT$, $C_V = dU/dT$

20. Calculate the pressure volume work performed by the system during reversible isothermal expansion of two moles of an ideal gas from 2 liter to 10 liters at 20^0C.

21. Define heat of hydration and heat up sublimation.

22. Write expression for Gibb's Duhem equation.

23. Under what condition K_P, K_C, K_G and K_X are all equal?

24. Can the equilibrium $CaCO_3(s) \longrightarrow CaO(a) + CO_2(g)$ attached in an open vessel? Why or why not?

25. Give Clausius-Clapeyrin equation for liquid $\rightleftharpoons$ Vapour equilibrium and write its application.

26. Why ΔG^0 obtain from Kp and Kc has different values?

27. Write Vant Hoff's equation. Explain that it lead to the same effect of temperature on equilibrium constant as predicted by Le-chateliers.

28. Write Clausius-Clapeyron equation both in differential form and integrated form.

29. What is Vant Hoff reaction isotherms. Why it is so called.

30. What are Electrolytes? Discuss briefly the classification.

31. Can we have a solution of P^H more than 14 or less than zero?

32. How is the solubility product related to solubility of Ag_2CrO_4?

33. How do you compare the relative strength of weak acids and weak bases?

34. Why the P^H of an aqueous solution of Sodium acetate is more than seven.

35. In the salting out of Sodium stearate, Sodium chloride is added. Explain.

36. Why NH_4Cl is used in Gr III of inorganic analysis?

23. Explain why a solution of $FeCl_3$ in water. Give a brown ppt on standing.

37. Give the reason that an aqueous solution of borax is alkaline.

38. Explain the concept of exchange energy.

39. What is buffer capacity and buffer index?

40. Calculate the pH of a mixture containing 0.01m CH_3COOH and 0.03m Sodium acetate P^{Ka} = 4.8

41. Write one application of Le-chatelier principle.

42. How thermodynamic equilibrium constant in terms of activities (K_a) is related to K_p and K_c.

43. What is resonance energy? Give the equation.

44. Differentiate between bond energy and bond dissociation energy.

45. What is residual entropy? Give its concept.

46. Give the concept of fugacity in brief.

47. What is osmotic pressure? Give the equation of mass of solute from this.

48. What is abnormal colligative property? Explain.

49. Give the relation of degree of dissociation for dissociated molecules in solution.

50. State and explain Raoult's law.

Group-D

Each question carries 8 marks.

1. (a) What are heat capacities? Derive a relation between them.

(b) State and explain the term heat of formation with example. 2 (a) Define adiabatic flame temperature. Derive an expression for this.

(b) Calculate the heat reaction, $H_2 + F_2$ 2HF. Given that the bond enthalpy of H – H, F–F and H-F bonds are 434, 158 and 565 Kg./mole respectively. What are heat capacities? Derive a relation between them.

3. (a) Write the different statements of second law of thermodynamics. What are its important features?

(b) Calculate the entropy change associated with the fusion of 3 mole of ice to liquid water at 273 K. Given that the latent heat of fusion of ice is 80 cal/gm.

4. (a) Derive an expression for calculation of entropy change of one mole of ideal gas considering temperature and volume variables.

(b) Write notes on residual entropy

5. Write notes on Joule-Thomson coefficient and its relationship with other thermodynamic parameters.

6. (a) Explain Maxwell's relationships

(b) Write notes on thermodynamic equation of state.

7. (a) Give brief account of equilibrium constants and their quantitative dependence on temperature, pressure and concentration.

(b) Derive thermodynamically the relation between Gibb's free energy and reaction quotient of reaction.

8. Derive thermodynamically the relation between depression in freezing point and the molecular Mass of dissolved solute. .

9. (a) Derive the relation between Vant-Hoff factor and degree of dissociation.

(b) Derive the boiling point of 10% (w/w) aqueous solution of urea at 1 atm. Pressure. Given that the K_b for water is 0.52K.Kg. $mole^{-1}$

10. State and explain heat capacity at constant volume and at constant pressure. Derive a relation between them. Define heat of reaction, give an example. Calculate ΔH^0 for the reaction:-

$CH_4 (g) + 4F_2 (g) \quad CF_4 (g) + 4HF (g)$

Given that the enthalpies of formation of CH_4, CF_4 and HF are -75kJ, -680kJ and -269kJ respectively.

11. State and explain second law of thermodynamics, what was the necessity of second law?

12. Write Notes on :-

(a) Concepts of residual entropy

(b) Absolute entropy in liquids

13. What is the significance of Joule-Thomson coefficient and how it is related to other thermodynamic quantities.

14. Write Notes on :-

(a) Maxwell's relation

(b) Thermodynamic parameters

15. Derive a relation between Gibbs free energy and reaction quotient thermodynamically.

16. Write Notes on :-

(a) Le-chatelier's principle

(b) Equilibrium constants

17. Derive thermodynamic relation between relative lowering of vapour pressure and molecular mass of non-volatile solute. A solution containing 10g. of a non-volatile compound is 100g. of ether has a vapour pressure of 426mm. if the vapour pressure ethen is 442.2mm. Calculate the molecular mass of the solute (mm of ether = 58)

18. Derive a relation between depression in freezing point and molecular mass of non- volatile solute. 5g. of a substance dissolved in 50g. of water lowered the freezing point by 1.2^0C. Calculate the molecular mass of the substance. The molal depression constant of water is 1.85^0C.

19. (a) Prove that for reversible adiabatic change of one mole of ideal gas, PV^r = Constant.

(b) Show that $C_P - C_V = R$ for 1 mole of ideal gas.

20. (a) Write Notes on bond energy.

(b) Calculate the bond energy of HCl molecule. Given below are the heats of atomisation H_2 and Cl_2.

$\frac{1}{2} H_2(g) \longrightarrow H(g)$; $\Delta H = 52.4$Kcal,

$\frac{1}{2} Cl2(g) \longrightarrow Cl(g)$; $\Delta H = 28.9$Kcal,

21. (a) Discuss the variation of free energy change with pressure and temperature.

(b) State and explain third law of thermodynamics.

22. (a) What is meant by residual entropy?

(b) Deduce the entropy changes of an ideal gas by varying temperature and volume.

23. (a) What are partial molar quantities? Explain.

(b) Derive Gibbs-Duhem equation.

24. (a) Derive an equation for chemical potential of ideal mixtures.

(b) Explain change in Thermodynamics functions in mixing of ideal gases.

25. (a) Derive the Law of chemical equilibrium in term of K_P thermodynamically.

(b) Write note on Le-Chatelier's principle.

26. (a) For a gaseous reaction prove that $\Delta G = \Delta G^0 + RT \ln K_P$

(b) What are coupling of exoergic and endoergic reactions? Explain.

27. (a) Write note on Raoult's law.

(b) Derive thermodynamically the relationship between depression in freezing point and molecular mass of solute.

28. (a) What is Osmotic pressure? How is it related to the molecular mass of solute in dilute solution?

(b) Determine the molecular mass of solute in case of association in solution.

DEPARTMENT OF CHEMISTRY
Derabis College , Derabis Kendrapara

QUESTION BANK (Hons.)

+3 2nd Year Science

Semester - III

Inorganic Chemistry

Core – V

Group-A

Each question carries 1 mark.

1. The metal found in nature is called ---------- .
2. All the ores are ------- but all the ------ are not ores.
3. Highly electropositive metals are extracted by ------- process.
4. Sulphide ore of copper is --------.
5. Reduction of Cr_2O_3 to Cr by Al is called ----- process.
6. In carbon reduction process ------ is used as reducing agent.
7. In electrolytic reduction , ------- is extracted at cathode .
8. $\Delta G = \Delta H - T -$.
9. $Ni + 4CO \xrightarrow{60\ ^oC}$ ---------.
10. In Mond's process, -------- metal is extracted.
11. Ellingham diagram is a plot of ------- versus --------.
12. Froth flotation process is used for concentration of ----- ores.
13. In Zone refining, ------- technique is adopted .
14. Van Arkel process is used for purification of ----- metal.
15. HSAB represents ----------.

16. Hard acid has -------- polarising power.
17. Soft acid has ------- size.
18. Hard acid has -------- oxidation state.
19. Li^{+}, Be^{+2}, Cr^{+3} etc are ----- acids.
20. Cu^{+} , Hg^{+2}, Pb^{+2} etc are ----- acids.
21. F^{-},H_2O,NH_3, Cl^{-} etc are ----- bases.
22. According to Bronsted - Lowry theory, acids are ----- and bases are ----.
23. According to Lewis theory, acids are ----- and bases are ----.
24. Conjugate acid of H_2O is ----.
25. Conjugate base of HSO_4^{-} is ----.
26. ------ is an amphiprotic substance.
27. Alkali metals have ---- electro negativity and ----- heat of atomization.
28. ------ is the most powerful reducing agent in aqueous solution.
29. ----- is the most electronegative element in the periodic table.
30. ----- is the most electropositive element in the periodic table.
31. A macrocyclic poly ether which contains the repeating unit $(-CH_2-CH_2-O-)_n$ is called -------.
32. The poly cyclic compounds having bridge donor atoms like O, N and S which bind the metals and most ions very strongly are called ------.
33. The elements of second period which diagonal to elements of third period are called -------- elements.
34. In solid state $BeCl_2$ has -------- chain structure.
35. Carbon differs from rest of the elements in group 14 due to its ----- property.
36. Allotropic forms of sulphur are -------.
37. Structure of Se_8 is -------.
38. ----- is formed on heating orthoboric acid.
39. B-B bonds in Boranes are --------- type bond.
40. General formula of Boranes is ------.

41. --------- is called inorganic benzene.
42. Graphene is --------.
43. Structure ClO_3^- is -------.
44. Structure ClO_4^- is -------.
45. The structure of H_3PO_4 is ------.
46. P_2O_5 in water forms -------.
47. Interhalogens are the compounds of --------.
48. The structure of IF_5 / IF_7 /IF_3 1s ------/ ----/ ----.
49. The hybridization of IF_5 / IF_7 /IF_3 1s ------/ ----/ ----.
50. Pseudo halogens are --------.
51. The sickness bends is called --------.
52. --------- is used for the treatment of tumor.
53. The structure of XeF_2 / XeF_4 /XeO_3 1s ------/ ----/ ----.
54. Borazine is --------. 55. Silicone is ---------.

Group-B

Each question carries 1.5 mark.

1. Give the differences between ore and minerals.
2. In which form the most electropositive metals and b) less electropositive or weak metals occur in nature.
3. Based on standard electrode potential value(E^o) which type of metal oxide can be reduced.
4. $E^o_{Cu^{2+}}/Cu$ = +0.34V. Can it be easily oxidised or4 reduced?
5. What is zone refining? Give one example.
6. Using principle of standard electrode potential , which type of metal cannot be easily reduced.
7. Give one limitation of Ellingham diagram.
8. Give one advantage of Ellingham diagram.
9. Find the conjugate acid and base of HCl and H_2O.

10. Give one limitation of Bronsted-Lowry concept.
11. Define Lewis acid.
12. Define Lewis acid.
13. Define Bronsted acid.
14. Define Bronsted acid.
15. Define soft acid and soft base.
16. What is the effect of inductive effect on strength of Lewis acid?
17. What is the effect of inductive effect on strength of Lewis base?
18. Give one limitation of HSAB principle.
19. Why B^{3+} is not formed.
20. NF_3 is gas and inert in nature. Why?
21. Define inert pair effect.
22. Explain diagonal relationship.
23. Define catenation. Give one example.
24. Define allotropy. Name two allotropic form of phosphorus.
25. Give example of interstitial hydrides.
26. What are covalent hydrides? Give one example.
27. Why CO_2 is called dry ice?
28. Why Ti^{+} compounds are more stable than Ti^{3+}?
29. Why oxygen is a gas at room temperature but other members are solid?
30. Why phosphorus acids act as a reducing agent?
31. What happens when HNO_3 react with N_2O_5.
32. Which type of hybridisation is there in IF_7 molecule?
33. What are boranes?
34. Why boric acid cannot be titrated against sodium hydroxide?
35. How is boron nitrides prepared from boron oxide?
36. What is $B_{10}H_{14}$.
37. What are polyhalide ions?
38. What are pseudohalogens ions?
39. Describe the structure of ICl_3.

40. Give one method of preparation orthophosphoric acid.
41. What are graphite compounds?
42. What are interhalogen compounds?
43. Write the chemical formula of metaboric acid.
44. What is the hybridisation of boron in diborane?
45. Why noble gases form compounds with F_2 and O_2?
46. Why noble gases are inert in nature?
47. Give two uses of neon gas.
48. What are clatharates?
49. Complete the reaction $XeF_6 + SiO_2 \longrightarrow$
50. Give the hybridization and structure of XeF_2/ XeF_4/ XeF_6/ XeO_3/ XeO_4/ $XeOF_2$/ $XeOF_4$/ XeO_2F_2.

Group-C

Each question carries 2.5 mark.

1. Explain Thermite process with example.
2. Describe electrolytic Kroll process to extract metals.
3. Describe Van-Arkel de Boer process to purify metal.
4. How do metals occur in nature? Explain with example.
5. What is zone refining? Explain with example.
6. Write note on hydrometallurgy.
7. Give advantages of Ellingham diagram.
8. Give limitations of Ellingham diagram.
9. Give Parke's process of refining lead.
10. What is liquation? Explain.
11. Give three usefulness of Ellingham diagram.
12. Define Bronsted-Lowry concept of acids and bases with examples.
13. Define Lewis concept of acids and bases with examples.
14. Give limitations of Bronsted-Lowry concept of acids and bases.
15. Give limitations Lewis of concept of acids and bases.
16. Give comparison between Bronsted-Lowry and Lewis concepts of acids and bases.

17. What is protolysis? Explain with example.
18. What is hard and soft acids? Give example of each.
19. What is hard and soft bases? Give example of each.
20. Give characteristics of hard acids.
21. Give characteristics of soft acids
22. Give characteristics of hard bases.
23. Give characteristics of soft bases.
24. What is Pearson's HSAB- principle? Explain.
25. Give limitations of Pearson's HSAB- principle.
26. What are covalent hydrides? Give two method of preparation .
27. Although Li^+ small size and high ionization enthalpy, it is strong reducing agent than other alkali metals. Why?
28. Explain why is B^{+3} ion not formed.
29. Why is $SnCl_2$ a solid while $SnCl_4$ is a liquid?
30. What is dry ice? Why is it so called?
31. Why is Al^{+3} ion not exist in solid state but exist in aq . solution?
32. Tl^+ compounds are more stable than Tl^{3+} compounds. Why?
33. Why is CO_2 is a gas while other oxides of group 14 elements are solids?
34. $SnCl_2$ is less stable and better reducing agent than $PbCl_2$. Why?
35. Why is H_2O a liquid while H_2S is a gas?
36. OF_4 does not exist but SF_4 is a strong Lewis acid. Explain.
37. What is inert pair effect? Explain with one example.
38. What is diagonal relationship? Explain.
39. What is allotropy? Explain different allotropic form of carbon with example.
40. Give the anomalous behaviour of Be among its family members.
41. What are nido boranes and orachnoboranes?
42. Why is BH_3 not exist but BF_3 exist?
43. How is orthoboric acid prepared from borax? Give the action of heat on it.
44. How is diborane prepared by Stocks method? Give its action on excess NH_3
45. What are carboranes? Give one preparation of it.

46. What are poly halide ions? Give two examples of poly halides.
47. What are pseudohalogens? Give two examples.
48. Why are the noble gases inert/ do not form diatomic molecules/ mono atomic?
49. Why noble gas compounds involve only O_2 and F_2?
50. Define clathrates. Explain.
51. Explain the structure of XeF_2/ XeF_4/ XeF_6/ $XeOF_2$/ XeO_2F_2 / $XeOF_4$/ XeO_3/. XeO_4 .

Group-D

Each question carries 8 marks.

1. State and explain Ellingham diagram for reduction of metal oxide to metals.
2. Use of Ellingham diagram to explain the reduction of metal oxides with either carbon to carbon monoxide.
3. Describe Mond's process and zone refining method for purification of metals.
4. Explain in details the refining of metals by Hydrometallugy.
5. Describe Bronsted-Lowry concept of acids and bases with suitable examples. How it explains the relative strength of acids and bases ?
6. What are amphiprotic substances in terms of Bronsted-Lowry concept of acids and bases? Explain monoprotonic and polyprotonic acids and bases. Give limitation of this concept.
7. Define Lewis acids and Lewis bases. Describe the effect of substituent's on strength of Lewis acids and Lewis bases.
8. Define hard acids, hard bases, soft acids and soft bases. Give one example in each case. How will you know whether an acid or base is hard or soft?
9. What is HSAB principle? Give its application and limitations.
10. What is inert pair effect? How it explains Bi^{+5} is stronger oxidant than P^{+5} and TiCl is more stable than InCl.
11. Describe the relative stability of different oxidation state of s and p- block element with suitable example.

12.Explain the preparation, properties and structure of beryllium nitrate. Also give the chemistry of ionic hydrides.

13. What are the anomalous behaviour of fluorine. Write three points regarding the anomalies in first and second rows elements.
14. What are hydrides ? How are these classifieds? Give their chemistry.
15. Give preparation, properties and structure of orthoboric acid.
16. Describe the preparation properties and structure of peroxydisulphuric acid.
17. What are polyhalides ? Give their preparation and properties.
18. Give two methods to prepare diborane. How does it react with i) diethyl ether ii) trimethyl boron iii) NH_3 (limited) and excess. Describe its structure also.
19. Name different oxyacids of phosphorous and chlorine. Give preparation of (any two) orthophosphoric acid. Give its acidic nature, its action with ammonia and explain its structure.
20. Name different oxides of nitrogen. Give the preparation (any one), properties(three of any one) and structure of any one of them.
21. Explain the structure,nature of bonding and preparation of a) XeF_2 b) XeF_4 .
22. Describe the shape of noble gas compounds on the basis of VSEPR theory.

a) XeF_6 b)KrF_2 c) XeO_3

23. What are polymers? Explain the classification of inorganic polymersw. Give their general characteristics.
24. Describe different types of silicones with special references to synthesis of silicone rubbers, silicone greases, silicone oils, silicone resins.
25. What are aluminosilicates ? Explain different types of aluminosilicates.

26.What are zeolites and ultramarines ? Give their applications.

27. What are co polymeric resins? Give their structure and uses.

Semester - III

Organic Chemistry

Core – VI

Group-A

Each question carries 1mark.

1. $SN^1/SN^2/SN^i$ stands for ----------.

2. The reactivity order of HX towards alcohol is ------.
3. The reaction of methane with chlorine in diffused sunlight gives ---------.
4. Lucas reagent is ----------.
5. The reactivity order of alcohol to Lucas reagent is ----------.
6. The addition of HX to propene follows ------ rule.
7. The addition of HX to propene in the presence of organic peroxide follows ------ rule.
8. A reaction of ethyl bromide with NaI is --------- reaction.
9. The order of SN^2 reaction is --------.
10. In SN^2 reactions, the nucleophile always attack from -------- side.
11. In SN^1 reactions, the nucleophile always attack from -------- side.
12. The product obtained from SN^2 reaction is named as ---------.
13. The order of reactivity of alkyl halides in SN^2 reaction is ---------.
14. The order of reactivity of alkyl halides in SN^1 reaction is ---------.
15. The order of reactivity of alkyl halides in SN^i reaction is ---------.
16. The reaction of ethyl bromide with KCN gives ----------.
17. The reaction of ethyl bromide with KCN gives ----------.
18. The reaction of methyl iodide with KNO_2gives ----------.
19. The reaction of methyl iodide with $AgNO_2$ gives ----------.
20. Chlorobenzene is o- , p- directing but ----------.
21. Elimination addition mechanism is also called -------- mechanism .
22. The low reactivity of vinyl chloride is due to ----------.
23. Grignard's reagent is ----------.
24. When Grignard's reagent reacts with active hydrogen compounds ---------- is formed.
25. When formaldehyde reacts with methyl magnesium iodide and then on acid hydrolysis forms ----------.
26. The formula of 1- methyl cyclohexanol is ----------.
27. The IUPAC name of p-cresol is ----------.
28. When acetaldehyde is reduced with $LiAlH_4$ -------- is formed.
29. Alcohols are liquids due to ----------.
30. Alcohols are water soluble due to ----------.
31. When ethene is treated with Baeyer's reagent ------- is formed.

32. Between Phenol and ethanol, ---------- is more acidic.

33. Between Phenol and p-nitro phenol ---------- is more acidic.

34. When alcohol is treated with carboxylic acid in presence of dehydrating agent, ---------- is formed. This process is known as ----------.

35. When ester is hydrolysed by alkali, the process is known as ----------.

36. The formation of ether by heating of sodium or potassium alkoxide or phenoxide alkyl halide is known as ---------- reaction.

37. When o- allyl ether of phenol is converted to o- allyl phenol by the action of heat is known as ---------- reaction.

38. Collin's reagent is ---------- and used for preparation of ----------.

39. PCC is ---------- and used as ----------.

40. $C_6H_5CHO + KOH \xrightarrow{\text{----------}}$.

41. $C_6H_5CH{=}CH - CHO \xrightarrow{NaBH_4}$ ----------.

42. $CH_3CH_2CHO \xrightarrow{\text{dil KOH}}$ ----------.

43. $CH_3COCH_3 + 3\ NaIO \longrightarrow$ ----.

44. Chloral is heated with caustic potash to give ---------.

45. Between formic acid and acetic acid -------- is stronger acid.

46. -------- is formed when ammonium acetate is heated.

47. --------- is formed when acetamide is heated with bromine in presence of KOH.

48. --------- is formed when ethyl adipate is treated with sodium ethoxide and then on heating.

49. -------- is formed when cyclohexanone is heated with Zn-Hg /HCl.

50. -------- is formed when benzene is heated with conc. H_2SO_4.

Group-B

Each question carries 1.5 marks.

1. Arrange 1^0, 2^0 and 3^0 alkyl halides in the order of their reactivity towards SN^2 reaction.
2. How is Iodo-benzene produced from benzene diazonium chloride?
3. Arrange CH_3COOH, CH_3OH and C_6H_5OH in the order of their acidic nature.

4. What happens when ethylene glycol is oxidised with lead tetra acetate?
5. What is that oxidising agent used preferably to get an aldehyde from primary alcohol?
6. How does acetone react with alkaline solution of hydrazine?
7. What is active methylene group? Give an example of a compound contacting such group.
8. Arrange the different classes of acid derivatives in orders of their reactivity towards hydrolysis.
9. How can you get trans glycol from ethylene?
10. $(CH_3)\ C - O - CH_3 \xrightarrow{HI}$ ------ + --------
11. What products are obtained when excess of ethyl alcohol is heated with conc. H_2SO_4 to about 140^0C?
12. How can you prepare ethyl thio-alcohol from ethyl alcohol?
13. What do you mean by carbanion ?
14. Arrange the leaving group ability in SN^1 reaction – Ots, -- OH and OAc.
15. Which one of the following is dicarboxylic acid and tricarboxylic acid ?
16. Write down the structure of Benzyne intermediate.
17. Write down structure of diazonium salt.
18. Write down the structureof diazonium salt.
19. Between EtSH and EtOH which one is more nucleophilic towards SN^2 nucleophilic reaction?
20. Between primary and tertiary alcohol which one will have faster rate of SN^1 nucleophilic substitution reaction in polar protic solvent?
21. What do you mean by enolate ?
22. Arrange the following organic compound in ascending order as per the acidic strength: Phenol, Benzoic acid, Ethanol.

23 What do you mean by oxidation in organic chemistry ?

24..Give an example of SN^1 reaction .

25. Give two factors which favours SN^1/ SN^2 reaction.
26. Give one example of Wurtz reaction .
27. Give one example of Wurtz-Fittig reaction . 28. Give one example of Sandmeyer reaction .

29. Give one example of Fittig reaction .
30. Convert chloro benzene to aniline.
31. Convert bromo benzene to iodobenzene.
32. What happens when Cl_2 is passed through boiling toluene?
33. $2\ C_6H_5Br + 2Na \xrightarrow{\text{Dry ether}}$
34. What happens when alcohol reacts with red hot copper?
35. What happens when ethyl alcohol reacts with conc. H_2SO_4 at 140 ^oC ?.
36. How will you convert ethanol into ethane?
37. How is phenol obtained from aniline?
38. Name the primary alcohol which responds iodoform reaction?
39. Give an example of Pinacol- Pinacolone rearrangenment.
40. Give an example of Reimer Tiemann reaction..
41. Give an example of Williamson's reaction..
42. Give an example of Bouvaelt Blanc reduction.
43. Give an example of Claisen Schmidt reaction.
44. Give an example of cannizzaro reaction.
45. Give an example of clemmensen's reduction.
46. Give an example of Hoffmann bromamide reaction
47. Give an example of Wolff Kishner reduction.
48. Give an example of Curtius rearrangenment.
49. Give an example of Reformatsky reaction.
50. Give an example of Claisen condensation reaction.

Group-C

1. Write a note on Pinacol- Pinacolone rearrangenment.
2. Write a note on Reimer Tiemann reaction..
3. Write a note on Williamson's reaction..
4. Write a note on Bouvaelt Blanc reduction.
5. Write a note on Claisen Schmidt reaction.
6. Write a note on cannizzaro reaction.
7. Write a note on clemmensen's reduction.
8. Write a note on Hoffmann bromamide reaction

9. Write a note on Wolff Kishner reduction.
10. Write a note on Curtius rearrangenment.
11. Write a note on Reformatsky reaction.
12. Write a note on Claisen condensation reaction.
13. Write a note on of Wurtz reaction .
14. Write a note on of Wurtz-Fittig reaction .
15. Write a note on Sandmeyer reaction .
16. Write a note on Fittig reaction.
17. Write a note on Lucas test.
18. Write a note on Kolbe –Schmidt reaction.
19. Write a note on Fries rearrangenment.
20. Write a note on Claisen rearrangenment.
21. Write a note on Beckmann rearrangenment.
22. Write a note on Benzil- Benzilic acid rearrangenment.
23. Write a note on Michael
24. Write a note on keto-enol tautomerism.
25. Write a note on Claisen condensation reaction.
26. Give the mechanism of ester formation from alcohol and acid in presence of acid catalyst.
27. Give the mechanism of ester formation from alcohol and acid in presence of base catalyst.
28. Give the mechanism of formation of ethene from ethanol.
29. Give the mechanism of formation of ether from ethanol.
30. Give the mechanism of reduction of aldehyde to alcohol by $LiAlH_4$.
31. Why does allyl chloride give nucleophilic substitution reaction but chlorobenzene is not.
32. Why does ethyl chloride give nucleophilic substitution reaction but chlorobenzene is not.
33. Why does benzyl chloride give nucleophilic substitution reaction but chlorobenzene is not.

34. Why does allyl chloride give nucleophilic substitution reaction but vinyl chloride is not.
35. Why does benzyl chloride give nucleophilic substitution reaction but vinyl chloride is not.
36. Why does benzyl chloride give precipitation reaction with AgCl?
37. Why does chloro benzene not give precipitation reaction with AgCl.
38. Give the mechanism of reaction of ethene with Bayer's reagent.
39. Give the mechanism of reaction of ethene with OsO_4 / O_3 .
40. Give the mechanism of reaction of ethanal with HCN in presence of base.
41. Give the mechanism of reaction of acetone with 2,4 –DNP.
42. Why is chloro benzene ortho and para directing but deactivating?
43. Why is phenol ortho and para directing and activating?
44. Why is benzoic acid meta directing and deactivating?
45. Why is benzaldehyde meta directing and deactivating ?
46. How is Grignard's reagent prepared ? Give example.
47. What are organometallics? Give examples.
48. What is organolithium compound? Give examples.
49. How can you synthesize acetic acid/ ethanol/ acetone/ acetaldehyde/benzene/ ethane/ ethyl amine from Grignard's reagent?
50. How can you synthesize propanoic acid / MEK /acetone /adipic acid / pentane-2, 4- dione/ acetyl chloride from AAE/ Malonic ester?

Group-D

Each question carries 8 marks.

1. (a) Discuss the mechanism of diazotisation. Starting from benzene diazonium chloride,

   How can you prepare.

   (i) Benzene (ii) Phenol
2. (a) Discuss the mechanism of SN^1 reaction with example.

   (b) How can you prepare Acetic Acid and methyl amine from a suitable organo

magnesium compound? .

3. (a) Discuss the mechanism of -

(i) Pinalole-Pinacolone rearrangement (ii) Reimer Tiemann Reaction

(b) How can you prepare phenol from.

(i) Cumene (ii) Chlorobenzene

(c) How does phenol react with – (i) Br_2 water (ii) Dil. HNO_3.

4. (a) Write the mechanism of the following reaction.

(i) Benzil-Benzilic acid rearrangement (ii) Aldol condensation

(b)Starting from diethyl malonate synthesize the following compounds.

(i) Propionic Acid (ii) Acetoacetic Acid

(iii) Cinnamic Acid (iv) Barbituric Acid

5. (a) Write the mechanism of the following reaction.

(i) Claisen condensation (ii) Reformatosky Reaction

6. (a) What happens when .

(i) Tartonic Acid is reduced with HI.

(ii)Lactic Acid is reduced with Fenton's reagent

(iii) Maleic Acid is heated for a prolong period.

(i) Br_2 water (ii) Dil. HNO_3

(b) How does phenol react with –

(i) Br_2 water (ii) Dil. HNO_3

7. (a) What happens when benzene is heated with conc. H_2SO_4 containing SO_3? Discuss with mechanism.

(b) How can you convert ethylene to epoxy ethane?

(c) What happens within diethyl thio-ether is hydrolysed with alkali solution.

8. (a) What happens when Methyl magnesium bromide reacts with ethylene epoxide and the product is hydrolysed.

(b) What happens when epoxy ethane is reduced with $LiAlH_4$?

(c) What happens when anisole reacts with HI at 100^0C.

9. Define and explain SN^1 andSN^2 reaction with stereo chemistry.

10. Explain the Benzyne mechanism of nucleophilic substitution reaction.

11. With suitable mechanism predict the generation of correct product (answer two)

a) Describe Pinacol- Pinacolone rearrangement with an example

b) Discuss Claisen rearrangement with an example.

c) Describe Reimer Tiemann reaction with an example.

12. Write notes on any two with mechanism

a) Discuss Claisen reaction with an example.

b) Describe Benzoin condensation reaction with an example.

c) Explain Michael addition with an example.

13. Discuss the preparation and synthetic reaction application of acid chloride and amide.

14. Discuss and outline the mechanism of acid and alkaline hydrolysis of ester and amide.

15. Write notes on

a) Hofmann- bromamide reaction.

b) Curtius rearrangement.

16. Write notes on any two

a) Effect of solvent on SN^1 andSN^2 reaction

b) Wittig reaction

c) Reformatsky reaction

17. Write notes on

a) Effect of bulky group on SN^1 andSN^2 reaction

b) SN^i reaction

c) Baeyer-Villiger oxidation

18. How can you prepare phenol from a) Benzene diazonium salt b) Cumene . Give the mechanism of Williamson reaction for preparation of ether.

19. How is acetone prepared from a) isopropyl alcohol b) acetyl chloride c) propene. Give the reaction of acetaldehyde with a) HCN b) 2,4-DNP

20. How can you prepare AAE from Claisen condensation reaction. How can you synthesize a) MEK b) Adipic acid c) 1,3- diketone from AAE.

Physical Chemistry Core – VII

Group-A

1. Ice and water consist of ------ phases system.
2. Water – ethanol consists of ------ phases.
3. Benzene and water consist of ------ component system.
4. $CaCO_3$(s), CaO(s) and CO_2 (g) consist of ------ component system.
5. $CaCO_3$(s), CaO(s) and CO_2 (g) consist of ------ phase system.
6. F = C - ---- + 2, complete the equation.
7. When F = 0 called ------ system.
8. At triple point, F= -------.
9. When two components do not form any compound and on solidification they simply form an intimate mixture is known as ----------.
10. When two components form a solid compound up to its melting point is called ---------.
11. When two components form a solid compound which decomposes before attaining its melting point is called ---------.
12. When two components form a solid solution which stable only up to transition temperature is called ---------.
13. The solid solutions are of --------- type.
14. Amorphous solid are also called ---------.
15. ------- phases can't coexist in a one component system.
16. Acetic acid – chloroform – water is a -------- component system.
17. The phase rule for Acetic acid – chloroform – water system is ---------.

18. The mixture of a composition in which vapour pressure maximum and boiling point minimum is called ---------.
19. Mixtures of liquid which boil at constant temperature like a pure liquid such that the distillate has the same composition as that of liquid mixture are called --------.
20. The process of separating mixtures of two or more liquids having close boiling point by repeated distillation and condensation is called -------.
21. Nernst's distribution law represents K_D = --------.
22. The change in distribution co-efficient for 1^0C rise in temperature is called ---------.
23. The unit of rate of the reaction is ---------.
24. The unit of rate constant of the zero order reaction is ---------.
25. The unit of rate constant of the first order reaction is ---------.
26. The unit of rate constant of the second order reaction is ---------.
27. Decomposition of N_2O_5 is ------ order reaction.
28. Combination H_2 and I_2 is ------- order reaction.
29. Decomposition of NH_3 in the presence of Pt is a ------- order reaction.
30. Hydrolysis of ester in acid catalyst is a ---------- order reaction.
31. Half life of first order reaction is ----------.
32. Half life of zero order reaction is ----------.
33. Half life of second order reaction is ----------.
34. The minimum energy required to the reactant to be able to react chemically is called --------.
35. The total energy required to the reactant to be able to react chemically is called --------.
36. $E_a = E_{th}$ - ------.
37. k= A --------.
38. Collision theory of reaction rate is given by ------.

39. A catalyst is a substance that -------- the rate of chemical reaction without itself being used of in the chemical reaction.
40. The catalyst is ------ chemically at the end of the reaction.
41. The catalyst does not alter the position of ------- in a reversible reaction.
42. The catalyst does not ------ the reaction.
43. The activity of catalyst is enhanced by the presence of a substance called ---- -------.
44. The catalyst is --------- in its action.
45. The substance which adsorbs the gases is called -------.
46. Amylase is a ------- catalyst.
47. Pepsin catalyses protein to --------.
48. Chemiadsorption is also known as -------.
49. Adsorption isotherm is a plot between ------- and -------- of a gas at constant temperature.
50. The force acting in physical adsorption is called -------.

Group-B

Each question carries 1.5 marks.

1. How many components are present in the following systems?
   $H_2O\ (l) \rightleftharpoons H_2O\ (g) + H_2O\ (s)$
2. What do you mean by degrees of freedom?
3. What is the molecularity of the following reaction?
   $CH_3COOC_2H_5 + H_2O \rightleftharpoons CH_3COOH + C_2H_5OH$
4. What is the unit of second order rate constant?
5. Define threshold energy. What is the relationship between kinetic energy, threshold and activation energy?
6. Define physical adsorption.
7. What is the force existed in physical adsorption?
8. Define phase rule.

9. Define pseudo uni-molecular reaction.
10. Give example of a two component system.
11. What are the important characteristics of a catalyst?
12. Give example of a zero order reaction.
13. Give example of a 1st order reaction.
14. Give example of a 2nd order reaction.
15. Give example of an uni-molecular reaction.
16. Define 1st order reaction with an example.
17 Define zero order reaction with an example.
18. Define 2ndt order reaction with an example.
19.Decomposition of PCl_5 is which order reaction?
20. What is an ideal solution?
21. What is a non ideal solution?
22. What is a miscible liquid?
23. What is CST?
24. What is a binary solution?
25. What is azeotropes?
26. Define rate law with an example.
27. Define activation energy. 28. Give Arrhenius equation.
29. Define Nernst distribution law.
30. Give unit of zero order reaction.
31. Give unit of 1st order reaction.
32. Give unit of 2nd order reaction.
33. Give unit of rate of the reaction.
34. What is a eutectic point?
35. What is an adsorption?
36. What is absorption?
37. What is an adsorption isotherm?
38. What is an adsorbate and adsorbent? Give one example of each.
39. What is a catalyst? Give one example.
40. What is specificity of a catalyst?
41. What is selectivity of a catalyst?
42. What is enzyme catalysis? Give one example.

43. What is the enzyme catalyst used for fermentation of glucose?
44. What is acid-base catalysis? Give one example.
45. What is chemiadsorption?
46. What is physicaladsorption? Give one example.
47. What is metastable equilibrium?
48. Give Clausius –Clapeyron equation.
49. Give one example of three component system.
50. What is collision theory of reaction rate ?

Group-C

Each question carries 2.5 marks.

1. What do you understand by triple point in water system?
2. What do you understand by triple point in sulphur system?
3. Define phase. Explain with example.
4. Define component. Explain with example.
5. Define degree of freedom. Explain with example.
6. Define phase rule. Give the number of phases for boiling water.
7. Predict the number of components, phases and degrees of freedom. For the reaction $CaCO_3$ (s) $\rightleftharpoons$ CaO(s) +CO_2 (g).
8. Define and explain eutectic point.
9. Define and explain congruent melting point.
10. Define and explain incongruent melting point.
11. What is a freezing mixture? What is the condition s of a good freezing mixture?
12. Define and explain invariant.
13. Justify why the fusion curve in the phase diagram of water has a negative slope?
14. Why is triple point of water is not identical with its freezing point.
15. Why is three phases cannot coexist in a one component system.

16. Define and explain Raoult's law.
17. What is azeotropic mixture? Explain.
18. Can we separate azeotropic mixture by distillation? Why do we call it a mixture?
19. What is CST? Explain.
20. What is UCST? Explain.
21. What is LCST? Explain.

22. State and explain ideal solution.

23. State and explain non-ideal solution.

24. Write a note on minimum boiling azeotrope.

25. State Nernst distribution law with equation.

26. What are the essential conditions for the validity of distribution law?

27. Explain distribution equation for the solute associates in one of the solvents.

\28. Explain distribution equation for the solute dissociates in one of the solvents.

29. Explain distribution equation for the solute enters into chemical combination with one of the solvents.

30. What are the applications of distribution law?

31. What is solvent extraction? Explain.

32. What do you mean by rate law and rate equation? Explain.

33. What is zero order reaction ?Give one example and the unit of rate constant of it.

34. What is first order reaction ? Give one example and the unit of rate constant of it.

35. What is second order reaction ? Give one example and the unit of rate constant of it.

36. Derive rate constant of zero order reaction.

37. What is activation energy? Explain.

38. What is Arrhenius equation? Explain.

39. How can you determine order of a reaction by method of half change?

40. How can you determine order of a reaction by method of differential method?

41. How can you determine order of a reaction by method of isolation method?

42 . How can you determine order of a reaction by method of method of trial?

43. Define catalysis. Give example of each of homo and heterogeneous catalyst.

44. Give the general character of catalyst.

45. What is specificity and selectivity of a catalyst? Explain with example.

46. Give the difference between adsorption and absorption.

47. Define physical adsorption. What are the factors affecting it?

48. Define chemical adsorption. What are the factors affecting it?

49. What is adsorption isotherm? Explain.

50. Why is physical adsorption multimolecular where as chemical adsorption .are unimolecular?

Group-D

Each question carries 8marks.

1. State and derive Nernst distribution law. What are its important applications?

2. Explain the following terms :-

(a) Azeotrope

(b) Triple point

(c) Eutectic mixture

3. (a) Describe KI - H_2O system on the basis of phase rule.

(b) Explain critical solution temperature. 4.

Discuss in brief:-

(a) NH_4Cl in equilibrium with its dissociation product is an one component system.

(b) Sulphur system ay any of its triple point is a non-variant system.

5. Derive mathematical expression for the rate constant of a reaction, A+B → Product, following second order kinetics.

6. What is a consecutive reaction? What down the differential rate expression, for the reaction A → B → C, Draw the concentration and time plot.

7. Explain Arrhenius equation. Discuss Arrhenius concept of activation energy. Write graphical representation of activation energy diagram.

8. Describe Lindemann mechanism of unimolecular reaction with a suitable example.

9. Derive an expression for the kinetics of enzyme catalysis expressed by MIchaelis – Menten equation.

10. Derive Langmuir absorption isotherm equation. Show the conditions under which it becomes identical with Freundlich adsorption isotherm equation.

11. State phase rule. Explain the various term used in it. Discuss the derivation of phase rule from thermodynamic consideration.

12. Explain the terms giving one example of each. I)Degree of freedom ii) Metastable equilibrium iii) Eutectic point iv) Triple point

13. How does the phase diagram of KI- H_2O and Pb-Ag system differ from each other.

14. Describe Clausius –Clapeyron equation for the equilibrium liquid ⟷ vapour. How will you obtained the heat of vaporisation using this equation.
15. Write notes on (a) three component system: water-chloroform-acetic acid (b) CST.
16. Discuss the distillation under a constant pressure of a complete miscible binary liquid mixture having a boiling point maximum and a boiling point minimum.
17. Define ideal solution and deduce expression ΔG_{mix}, ΔS_{mix} and ΔH_{mix} for solution of liquids with almost similar nature.
18. Define activation energy and activated complex. Draw diagram to explain i) Exothermic reaction ii) Reversible reaction.
19. Write notes on

i) Opposing reaction

ii) Parallel reaction iii)

Chain reaction

20. Write notes on i) Freundlich isotherm ii) Langmuir adsorption isotherm iii)

Gibb's adsorption isotherm

Semester – IV

Inorganic Chemistry

Core – VIII

Group-A

Each question carries 1 mark.

1. Write the IUPAC name of $K_2[HgI_4]$.
2. Give one example of outer orbital complex.

3. Write the formula of hexanitrito-o-cobaltale-(III) ion.
4. Cu^{+} is colourless but Cu^{2+} is blue coloured. Explain.
5. In octahedral strong field the no. of unpaired electrons in Co^{3+} is _____.
6. Ni^{4+} compounds are less stable than Pt^{4+} compounds. Why?
7. Give one reaction in which $TiCl_4$ acts as an oxidant.
8. Why Eu exhibits +2 oxidation state but La does not ?
9. What is lanthanide contraction?
10. Why blood is red in Colour?
11. What do you mean by labile complex?
12. Anhydrous $CuSO_4$ is colourless but $CuSO_4 . 5 H_2O$ is blue in colour. Why?
13. Why Cu(I) is diamagnetic while Cu(II) is paramagnetic ?
14. What are lanthanides?
15. Give two example of bidentate ligand.
16. What is Heme?
17. What is effect of C_v and C_p when these are deficient in biological system.
18. Write IUPAC name of $Na_3 [Co (CO)_4]$.
19. What are low spin and high spin complexes?
20. What is chelating ligand?
21. What is actinide contraction?
22. Give general electronic configuration of lanthanides.
23. Give general electronic configuration of actinides.
24. What are essential trace elements?
25. Why transition elements are coloured?
26. What are labile and inert complexes?
27. Give one example of labile complex and inert complex.
28. What is electro neutrality principle?
29. Write structure of a complex (C.N =4) which show geometrical isomerism.
30. Write structure of a complex (C.N =6) which show geometrical isomerism.
31. Explain generally there is an increase in density of elements from titanium (Z = 22) to copper (Z = 29) in the first series of transition elements.
32. Why transition elements and their compounds are generally found to be good catalysts in chemical reactions?

33. Why zinc is not regarded as a transition element?
34. Explain Copper (I) ion is not known in aqueous solution.
35. Why Manganese exhibits the highest oxidation state of +7 among the 3d series of transition elements.
36. Why Cr^{2+} is reducing in nature while with the same d-orbital configuration (d^4) Mn^{3+} is an oxidising agent.
37. Complete

$Cr_2O_7^{2-}$ (aq) + Fe^{2+} (aq) + H^+ (aq) →

38. Why transition metals and their compounds generally exhibit a paramagnetic behaviour?
39. Explain why the enthalpies of atomization of transition metals are quite high.
40. Which metal in the first transition series (3d series) exhibits +1 oxidation state most frequency?
41. Which of the following cations are coloured in aqueous solutions and why?

Sc^{3+}, V^{3+}, Ti^{4+}, Mn^{2+}.

42. Write two consequences lanthanide contraction.
43. Why the highest oxidation state of a transition metal is usually exhibited in its oxide.
44. Why Co^{2+}. is easily oxidised in the presence of a strong ligand ?
45. What are the transition elements? Write two characteristics of the transition elements.
46. What is meant by 'disproportionation'? Give an example of a disproportionate reaction in aqueous solution.
47. Write the equation of preparation of potassium permanganate.
48. Write one chelating agent used in medicine.
49. What is the medicinal use of cis- platin.
50. Which vitamin is cyanocobalamine.

Group-B

Each question carries 8 marks.

1. What are the postulates of Werner's Co-ordination theory? Give its drawbacks.

2. Explain Crystal Field Splitting in an Octahedral Complex. What is crystal field stabilization energy?

3. What are transition elements? Discuss the following properties of transition element

   (3^{rd} Series) :

   (a) Colour

   (b) Oxidation states

   (c) Magnetic Properties

4. What are Latimer diagrams? Give their applications.

5. Describe the chemistry of complexes of +III state of iron.

6. Discuss the chemistry of CrO_3 & TiO_2.
7. Discuss the causes and effects of Lanthanide contraction.
8. What are actinides? Discuss their oxidation states and colours.

9. Describe the function of haemoglobin in transport of oxygen.

10. Describe the toxicity of Cd and Pb. Give reasons for their toxicity
11. What are salient features of CFT? How do d – orbital energy level split? When a transition metal ion is placed in an octahedral field of ligands.
12. Describe effect of John-Teller effect in octahedral complexes. Explain $[NiCl_4]^{2-}$ but $[Ni(CO)_4]$ is diamagnetic though both are tetrahedral.
13. What are transition elements? Discuss the magnetic character, colour and complex forming tendency of first row transition elements.
14. Explain catalytic property of transition metals. Also explain salts of Zinc, cadmium and Mercury are white.
15. Explain the stability of various oxidation states of transition metals in term of their emf value.
16. Discuss the chemistry of complexes of +3 state of iron. How Fe(II) and Fe(III) states are stabilised.
17. a) Give the chemistry of +3 and +4 oxidation state of Titanium.

b) Why Mn(II) states have pale pink or white colour.

c) Describe the chemistry of Co (+1) and Co (-1) complexes.

18. What is lanthanide contraction? Describe the cause and consequences of lanthanide contraction.
19. What are actinides? Give their electronic configuration. Explain why actinides show wide range of oxidation states than the lanthanides.
20. Discuss the structure of Haemoglobin and its role in oxygen transport.
21. What do you mean by the term Taxicity ? In what way mercury, lead and cadmium act as toxic elements.

Organic Chemistry

Core-IX

Group-A

Each question carries 1 mark.

1. Which position of Anthracene is most reactive towards electrophilic substitution reaction?
2. Arrange Aniline, diphenyl amine and benzyl amine in increasing order of their basic nature.
3. What is the product obtained by the reaction of dimethyl amine with nitrous acid.
4. Among pyridine, pyrrole and pyperidine which in most basic.
5. Write any one medical importance of cocaine.
6. What product is obtained by the reaction of alkyl halide with KNO_2?
7. $CH_3Br \xrightarrow{KCN} A \xrightarrow{H_3O^+} B$ (Identify A & B)
8. What is the hybrid state of the sulphur atom of thiopene?
9. Write the structure of Nicotine.
10. What is Neral?
11. Give one test to distinguish 1^0, 2^0 and 3^0 amines.
12. Why is aniline a weak base?
13. What is a diazonium salt? Give one example.
14. What happens when BDC is heated with CuCl? Give the reaction.
15. Give one method of preparation of anthracene.

16. Why is pyridine susceptible for nucleophilic substitution reaction?
17. Why is indole aromatic?
18. Though morphine is analgesic, but not used as medicine. Explain.
19. What is Hoffman's exhaustive methylation? Give the reaction.
20.  CHO $\xrightarrow{\text{alk. KMnO4}}$ A $\longrightarrow$ B Identify A & B.
21. Arrange aniline, O-nitroaniline and 2,4,6 – trinitro aniline in the order of their basic nature.
22. What is the product obtained by the reduction of nitrobenzene in neutral medium?
23. $C_6H_5NH_2 \xrightarrow{NaNO_2 / HCL} \xrightarrow{KI}$ A B (Identify A and B)
24. Arrange benzene, naphthalene and anthracene in the order of their aromatic nature.
25. In between pyrrole and pyridine, which is more basic in nature?
26. Which position of 5-membered heterocyclic compounds in most reactive towards electrophilic substitution?
27. What are alkaloids?
28. Write any medicinal importance of nicotine.
29. Define isoprene rule.
30. Write any two sources of terpenes, Haemoglobin and chlorophyll?
31. What happens when nitrobenzene is heated with Sn and conc HCl?
32. Which one is most basic out of aniline and p- Nitro aniline?
33. How will you convert benzenediazonium chloride to phenol?
34. What is carbylamine reaction?
35. What happens when primary amine react with nitrous acid?
36. What are polynuclear hydrocarbon? Give two examples.
37. How will you convert furan into furoic acid.
38. Write the structure of Nicotine and Hygrine.
39. Write two importance of morphine .
40. Give commercial method of isolation of alkaloids
41. Why is aniline less basic than ethyl amine>
42. How can you convert benzene diazonium chloride to benzene?

43. How can you convert benzene diazonium bromide to bromo benzene?
44. How can you convert benzene diazonium fluroborate to flurobenzene?
45. How can you convert benzene diazonium chloride to benzonitrile?
46. What happens when benzene diazonium chloride reacts with phenol in basic medium?
47. What is coupling reaction ? Give one example.
48. What is Balz- Schiemann reaction?
49. How can you convert benzene diazonium chloride to benzoic acid?
50. What is Hinsberg reagent?

Group-B

Each question carries 8 mark.

1. (a) Write notes on Mannich Reaction

(b) How do Primary, secondary and tertiary amine react with HNO_2.

2. (a) What happens when nitrobenzene is reduced in different media?

(b) How can you convert benzene to 1,3,5- trinitrobenzene.

3. (a) Starting from benzene diazonium chloride, How can you synthesize the following compounds.

(i) Flurobenzene (ii) Benzene (iii) Benzoic acid (iv) P-hydroxy azobenzene

4. (a) Elucidate the structure of Anthracene with synthetic evidence.

(b) How can you convert Napthalene to β- Napthol .

5. (a) Elucidate the structure of Quinoline and give its synthetic evidence.

(b) Discuss the amphoteric nature of pyrrole.

6. (a) Why does pyridine undergo nucleophilic substitution? And which position of pyridine is more reactive for this and Why?

(b) Give a chemical test to distinguish between quinoline and isoquinoline

.

7. Writes notes on alkaloids as regard to their occurrence. Structural features, isolation and physiological action.

8. Write Notes on :-

(i) Emde's modification

(ii) Medicinal importance of Nicotine and Hygrine.

9. Elucidate the structure of α- terpinol and write its synthetic evidence.

10. Write Notes on :-

(i) Isoprene rule

(ii) Citral

11. (a) Define the following terms. In what units are these expressed?

(i) Conductance (ii) Specific resistance (iii) Cell constant

(b) How is the conductance of a solution of an electrolyte is determined? Establish a relation between specific conductance, Equivalent conductance and molar conductance.

12. (a) The molar conductance of a solution of Aluminium Chloride is found to be 130 S cm^2 mol^{-1} at 298K. What would be its equivalent conductance at the same temperature?

(b) Give an account of the Debye-Huckel theory of strong electrolyte.

13. (a) Write a note on Debye-Falkenhagen effect.

(b) The electrolyte conductivity of a 0.1 N acetic acid solution at 291K is 0.000471 S cm^{-1} and that of a 0.001 N Sodium acetate solution is 0.000781 S cm^{-1}.

What are the equivalent conductivities of acetic acid and sodium acetate?

14. (a) What is meant by the term ionic mobility? Describe as experiment to show that different ions have different ionic mobility.

(b) Write notes on :

(i) Transport number of ions.

(ii) Application of conductance to hydrolysis of salts. **15**. (a) What do you mean by the term migration of ions? Write a detailed note on the discharge of ions on electrolysis.

(b) Discuss various applications of conductance measurement with special reference to weak electrolyte.

(c) The ratio of ionic mobility of Ag^+ and NO_3^- being 0.9. The transport number of Ag^+ will be less than 0.5. Justify your answer.

16. (a) Discuss the applications of emf measurement in chemistry.
(b) Describe quinine-hydro quinine electrode. How does its potential vary with pH
(c) Write the electrode relations for the following electrodes:
    (i) Pt, H_2 (1 atm) I HCl
    (ii) Cd I Cd^{2+} (a = 1
    (iii) Zn I $ZnCl_2$ (a = 0.5)

17. (a) What is meant by standard electrode and standard electrode potential? How will you determine H+ ion concentration of a solution using normal hydrogen electrode.
(b) What is a reference electrode? Give their significance. Describe the working of an Ag I Ag^+ electrode. What are its merits relative to NHE?

18. (a) Explain the working principles of concentrations cells with and without transference.
(b) Why are potassium or ammonium nitrate or potassium chloride preferred to make salt bridges.
(c) How are emf of a cell and entropy of the cell reaction related?

19. (a) Explain the principles involved in the redox and precipitation titrations by potentiometric method.

    (b) Explain any three applications of the concentration cells.
    (c) Calculate the emf of the cell

Zn / $ZnSO_4$ (0.01m) II $CdSO_4$ (0.001m)/Cd

(The standard potential of Zn and Cd electrodes at 298K are -0.76 v and -0.4v
respectively)

20. (a) Give two methods of preparation of nitro benzene.

(b) Give reduction of nitrobenzene in acidic medium with mechanism.

21. (a) How is amine prepared from :

(i) Gabriel phthalimide synthesis.

(ii) Hoffmann's bromamide reaction.

(b) Write Notes on :-

(i) Mannich reaction.

(ii) Hoffmann's exhaustive methylation.

22. (a) Elucidate the structure of anthracene with one synthetic evidence.

(b) How is benzene prepared from benzene diazonium chloride? Give the reaction.

23. (a) Elucidate the structure of phenanthrene with one synthesis.

(b) How is Iodobenzene prepared from benzene diazonium chloride? Give the mechanism of the reaction.

24. (a) How is pyrole prepared from :-

(i) Paal-Knorr synthesis.

(ii) Hantzsch synthesis.

(b) Why is electrophilic substitution in pyridine preferably at C_3 position? Explain.

25. (a) Elucidate the structure of quinoline with one of its synthesis.

(b) Elucidate the structure of Nicotine with one of its synthesis.

26. Write Notes on :-

(a) Emde's modification.

(b) Medicinal property of quinine.

27. (a) Elucidate the structure of -terpineol with synthetic evidence.

(b) Elucidate the structure of Neral with synthetic evidence.

28. (a) Distinguish between 1^0, 2^0 and 3^0 amines by Hinsberg method.

(b) Arrange Aniline methylamine and ammonia in the order of their basic nature with reason.

29 (a) Write Notes on :-

(i) Carbylamine reaction.

(ii) Gabriel-phthalimide synthesis.

(b) What is Hoffman-elimination reaction? Discuss with examples. 30.

(a) What is diazotisation? Discuss with mechanism.

(b) Starting from benzene diazonium chloride, how can you synthesis the following compounds.

(i) Benzoic acid (ii) Phenol

31. (a) Elucidate the structure of naphthalene with synthetic evidence.

(b) How can you prepare B-naphthol from naphthalene?

32. (a) Discuss the M.O. structure of pyridine.

(b) What happens when pyridine reacts with n-C_4H_9Li? Discuss the mechanism.

33. (a) Write notes on Fischer-Indole synthesis.

(b) Why does furan undergo electrophilic substitution at C_2 position.

34. (a) Elucidate the structure of hygrine with its synthetic evidence.

(b) Give a general method of extraction of alkaloids.

35. (a) Elucidate the structure of Nicotine.

(b) Elucidate the structure of Citral with its synthetic evidence.

36. Write Notes on :-

(i) Neral

(ii) α- terpeineol

Physical Chemistry

Core – X

Group-A

Each question carries 1 mark.

1. What is effect of dilution on conductance and equivalent conductance?
2. Define equivalent conductance with unit.
3. Define Kohlrausch law.
4. What is transport number? Give the relation.
5. What is ionic product of water? Water is its value of 25^0C?
6. Define solubility product.
7. What do you mean by conductometric titration?
8. Give Nernst equation for electrode political.
9. What is liquid junction potential? What is its value?
10. What is the condition of a substance to be paramagnetic in character?
11. Define law of independent mobility.
12. Write the unit of equivalent conductance.
13. What is the effect of dilution on molar conductance.
14. Define ionic product of water.

15. What is the standard electrode potential of hydrogen electrode?
16. Represent glass electrode with definition.
17. What are reversible cells? Give one examples.
18. What is magnetic susceptibility?
19. What is liquid junction potential?
20. Define transference number?
21. What are strong electrolytes?
22. Write one application of electrolytes?
23. Define molar conductance.
24. Explain the term ionic mobility.
25. Define Fareday's 1^{st} law of electrolysis.
26. What do you mean by redox reaction?
27. Define pH.
28. Represent quinine-hydroquinone electrode.
29. Define solubility.
30. What do you mean by diamagnetism?
31. How are equivalent conductivity and molar conductivity of an electrolyte related?
32. Write the expression for the Debye-Huckel-Onsager conductance equation and define the terms involved terein.
33. What are transference numbers and how they are related to the ionic mobilites?
34. Ionic conductance's of Na^+ and Cl^- ions at infinite dilution are 50.11 and 76.32 Scm^2 $equiv.^{-1}$, respectively. Find out the transport numbers of Na^+ and Cl^- ions.
35. Write the Nernst equation for the following reduction reaction:
    M^{n+} (aq) + ne^- $\rightleftharpoons$ M (s)
36. The potential of a hydrogen electrode in a solution of unknown concentration is 0.29V at 291 K, as measured against normal hydrogen electrode, calculate the pH of the solution.
37. Give one example each of concentration cells with and without transference.
38. Write the overall cell reaction for the foolowing:
    Zn (s) I Zn^{2+} (aq) II Cl^- (satd), Hg_2Cl_2 (s) I Hg (l)
39. Write the Lorenz-Lorentz equation and define each term involved therein.
40. Discuss the nature of the potentiometric precipitation titration curve.
41. What is conductance?

42.Define specific resistance and write its unit.

43. Define cell constant how it is related to specific conductance.

44. How specific conductance is related to equivalent conductance?

45. How specific conductance is related to molar conductance?

46.What is reference of electrode?

47. What is standard electrode potential?

48. How are the emf of a cell related entropy.

49.What standard electrode potential of hydrogen electrode ?

50. What is the unit of specific conductance/ molar conductance in SI unit?

Group-B

Each question carries 8 marks.

1. (a) Write Notes on:-

(i) Molar conductance & effect of dilution

(ii) Walden's rule

2. (a) Write Notes on :-

(i) Kohlrausch law

(ii) Wien effect

3. (a) What is ionic mobilities? How can you determine ionic mobilities?

(b) How can you determine -

(i) Degree of dissociation of weak electrolyte and

(ii) Solubility product of sparingly soluble salts by conductance measurements.

4. (a) State and explain Faraday's laws of electrolysis. What are its applications.

(b) What is conductometric? How can you determine the end points of (i) titration of strong acids and weak bases.

(ii) strong acids, weak acids and strong bases.

5. (a) What are reversible and irreversible cells? Give examples. Derive Nernst equation for a half cell.

(b) Determine -

(i) equilibrium constants

(ii) pH value of Hydrogen electrode by e.m.f measurements.

6. (a) Determine emf of concentration cell without transference.

(b) What is potentiometric titration? How can it use to-

(i) titration of acid and base.

(ii) precipitation reaction of $AgNO_3$ and NaCl.

7. (a) Define specific and equivalent conductance. How are they related? How do they vary with dilution of electrolyte? .

(b) Discuss Debye-Huckel-Onsagar theory of strong electrolytes.

8. (a) What is conductometric titration? Explain the conductometric titration curves of -

(i) strong acid versus weak base and

(ii) mixture of strong and weak acids with a strong base.

9. How does conductance measurement help to determine-

(a) Ionic product of water and

(b) Solubility of sparingly soluble salt?

10. (a) State and Explain Faraday's laws of electrolysis. Find out the mass of Aluminum deposited by passing 10amp. Of current for 0.5hrs. through fused alumina.

(b) Discuss the application of electrolysis in

(i) Metal extraction

(ii) Electroplating soluble salt?

11. (a) What is electro-chemical cell? Give the construction, function and application of Galvanic cell.

(b) Explain the determination of pH -

(i) by using hydrogen electrode.

(ii) quinine hydroquinone electrode.

12. (a) Explain how will you determine activity coefficient and Transport number from EMF measurement?

(b) What is magnetic susceptibility? Explain how is it measured by Gouy's method.

13. (a) Discuss Arrhenius theory of electrolyte dissociation.

(c) Define equivalent conductance. How it vary with dilution for strong electrolytes?

14. (a) State and explain Kohlrausch's law.

(b) Calculate equivalent conductance of NH_4OH at infinite dilution from following data.

Equivalent conductance of NH_4Cl, NaOH and NaCl at infinite dilution are 149, 247

and 126 ohm^{-1} cm^2 gm. Eq^{-1} respectively.

15. (a) Derive Deby-Huckel-Onsagara equation. Suggest the conditions for the validity of the equation.

(b) Define transport number. Describe one method for its determination.

16. (a) Define EMF of a Cell. How can it be measured experimentally?

(b) Derive Nernst's equation.

17. (a) What are reversible and irreversible cells? Explain them with suitable examples.

(b) Derive relationship between emf$\Delta H, \Delta G \; and \; \Delta S$of a cell reaction.

18. (a) What are concentration cells? Derive the expression for the emf of a concentration cell without transference.

(b) What is liquid junction potential? Derive the expression for liquid junction potential.

19. (a) Define electrode potential. Determine the e.m.f. of the cell Zn/Zn^{++} I I Cu^{++} I Cu from the following data:

$E^0_{Zn^{++}|Zn} = -0.76$ V $E^0_{Cu^{++}|Cu} = +0.34$V.

(b) What do you mean by potentiometric titration? Discuss it involving an acid base reaction.

20. (a) Write notes on Debye-Falkanhagen effect and Wein effect.

(b) Why do you mean by conductance titration? Explain it involving weak acid and strong base.

21. (a) What are the evidences which favour the Arrhenius theory of electrolytic dissociation?

(b) The electrolytic conductivity of water at 298K is 0.58×10^{-7} Scm^{-1}. Calculate the degree of Dissociation of water at 298K is $548.6 Scm^2$ $eq.^{-1}$ and density of water = $0.997 gm^{-3}$

22. Derive Debye-Huckel-Onsager equation as applicable to strong electrolytes. Discuss its significance.

23. Describe Hittorff's method for determining the transport number of an ion.

(i) Hoffman bromamide reaction.

24. (a) Derive the following reaction relation for a salt of weak acid and strong base, $pH=-\log (K_w\, c/K_a)^{1/2}$ Debye-Huckel-Onsager equation as applicable to strong electrolytes.

(b) Calculate the pH value of a solution obtained by mixing 0.083 moles of acetic acid and 0.091 moles of sodium acetate and making the volume 500mL, K_a for acetic acid is 1.7×10^{-5}

25. (a) Describe the principles for the determination of pH of a solution using quinhydrone electrode and indicate the limitations (if any) of using this electrode.

(b) Give the cell reaction for the following cell:

Pt I H_2 (g) I HCl (aq) I Hg_2Cl_2 (s) I Hg (l)

The emf of the above cell is 0.2669 V at 303K and 0.2699 V at 293 K. Δ Calculate ΔG, $\triangle H$ and ΔS of the cell reaction at 293 K.

26. Write notes on the following:

(a) Application of electrolysis in industry and metallurgy.

(b) Reversible and irreversible chemical cells.

27. (a) Construct the galvanic cell for each of the following reactions and write the corresponding equations for the cell potential.

(i) $Zn\ (s) + H_2SO_4\ (aq) \rightleftharpoons ZnSO_4\ (aq) + H_2\ (g)$

(ii) $Ag\ (s) + \frac{1}{2}Br_2(l) \rightleftharpoons AgBr\ (s)$

(b) How will you determine pH of a solution using glass electrode?

28. (a) What is induced polarization?

(b) What are polar molecules? Illustrate with examples.

(c) Dipole moment for HCl molecule is 1.03D and the internuclear separation is $1.275A^0$.

Calculate the % ionic character of HCl.

29. Write notes on the following:

(a) Kohlrausch's law of independent migration of ions.

(b) Rules of oxidation / reduction of ions based on half-cell potential.

30. Explain molecular polarizabilites. Describe the method of measurement of molecular polarizabilites.

DEPARTMENT OF CHEMISTRY
Derabis College , Derabis Kendrapara

QUESTION BANK (Hons.)

+3 3rd Year Science

Semester - V

Organic Chemistry — Core - XI

Group-A

Each question carries 1 mark.

1. Define nucleic acid.
2. what is a nucleotide? Give one example.
3. what is a nucleoside? Give one example.
4. what is a DNA? Give one example.
5 What is a RNA? Give one example.
6. What is purine? Give its structure.
7. What is pyrimidine? Give its structure.
8. Give two examples of purine bases used in nucleic acid.
9. Give two examples of pyrimidine bases used in nucleic acid.
10. What is an enzyme? Give one example. 11. What is an inhibitor? Give one example.
12. Give two uses of enzymes.
13. Give two characteristics of enzymes
14. Give two factors of enzymes.
15. What is an aminoacid? Give one example.
16. What is an alpha-aminoacid? Give one example.
17. What is a peptide ? Give one example.
18. What is a protein? Give one example.
19. Name one fibrous and globular proteins.
20. What is a prosthetic group?
21. What is denaturation? Give one example denatured protein.

22.What kind of bonding is responsible for the tertiary structureof proteins?

23. What is renaturation? Give one example.
24. Define isoelectric point?
25. What is an oil? Give one example with structure.
26. What is a fat? Give one example.
27. What is different type of lipids? Give example of each.
28. What is a lipid? Give one example.
29. What are different types of compound lipids? Name them.
30. What is rancidity?
31. What are different types of rancidity?
32. What is acid value?
33. What is saponification value?
34. Define soap with one example.
35. What is iodine value?
36. Give two uses of oils and fats.
37. Define calorific value of food.
38. What is catabolism?
39. What is anabolism?
40. What is a natural drug? Give one example.
41. What is a synthetic drug? Give one example.
42. What is an antipyretic drug? Give one example.
43. What is an analgesic ? Give one example.
44. What is the difference between narcotics and non-narcotics?
45. Give the structure of Ibuprofen/ Aspirin.
46. What is an antimalerial drug? Give one example.
47. Name the antimalerial drug used for prevention of COVID 19 .
48. What is an antibiotics? Give one example.
49. What is an antacid? What is its use?
50. Give names of two natural drugs used as antibiotics.

Group-B

Each question carries 8 marks.

1. Define the term enzyme. Give an account of characteristic feature of enzymes.
2. Write notes on a) active sites and specificity b) Fischer's lock and key model.
3. Briefly describe Michaelis and Menten's theory and also the assumption upon which this theory is based.
4. Explain enzyme kinetics and also explain the factors which affect the rate of enzymatic reaction.
5. Give the detailed account competitive and non competitive inhibitions in enzymes.
6. Give an account of a) isoelectric point b) peptide linkage c) biological importance of protein d) Zwitter ion structure of amino acid.
7. Give three methods of preparation of alpha amino acid.
8. Write notes on a) Strecker synthesis b) Gabriel synthesis c) Azlacton synthesis d) Darapsky synthesis
9. How can you determine the structure of a poly peptides/proteins.
10. What is solid phase synthesis? Explain.
11. How can you determine C- terminal and N-terminal ends of poly-peptides/proteins.
12. What are peptides? Discuss carboxy-benzoyloxy method for their synthesis.
13. What are lipids? How are they classifieds?
14. Write notes on a) Hydrogenation of oils b) Saponification.
15. Define and explain the terms oils and fats. How do you differentiate between them?
16. Explain Iodine value. What is meant by rancidity of oils?
17. Write notes on a) Saponification value b) Acid value c) Iodine number d) Reversion e) Rancidity.
18. Write notes on a) Oxidation of food stuff b) Catabolism c) Anabolism.
19. Write an explanatory notes on metabolic pathways of carbohydrates.
20. Give a detail description on catabolic pathways of the fats.
21. Explain metabolism in protein.
22. Write brief accounts of catabolism and anabolism.

23. How will you say that cells obtain energy by the oxidation of food stuff.
24. Describe the synthesis of a) chloroquine b) pamaquine c) chloramphenicol d) Ibuprofen.
25. Write notes on a) analgesics b) antipyretics c) antibiotics d) antimalerials.
26. Briefly explain the medicinal value of a) Curcumin b) Azadirachtin c) Vitamin C b) Antacid.
27. Briefly explain antimalerials, antibiotics and antipyretics with examples.

Physical Chemistry

Core – XII

Group-A

Each question carries 1 mark.

1. What is zero point energy?
2. What is formula for determination of no. of nodes in p-orbitals?
3. What is the Schrodinger wave equation for 'He' atom?
4. What is the bond order and magnetic behaviour of O_2 molecule?
5. What is Morse potential?
6. Define rule of mutual exclusion.
7. Define phosphorescence.
8. Define quantum yield with relation.
9. Define Franck-Condon principle.
10. Define Lambert-Beer's law.
11. If two operators, A and B commute then they have some set of _____.
12. The minimum vibrational energy is _____.
13. The Eigen values of a _____operator are real.
14. A particle moving in a three dimensional box cube has a total energy of $\frac{14h^2}{8ml^2}$. The energy level has fold g ml^2 degenerate.
15. Between CO and CO_2, which is microwave active?

16. Among fundamental,, overtone and combination bands, which is most intense?
17. Vibrational degrees of freedom of CO_2 is _____.
18. The selection rule for pure rotational Raman Spectra of a diatomic molecule is_____.
19. In photo chemistry, benzophenone and SO_2 are use as _____.
20. _____ and _____ are example of radiation less transitions.
21. What is normalized wave function?
22. What is orthogonal wave function?
23. Draw MO diagram of H_2 .
24. What is bond order of H_2^+.
25. What is selection rules of molecular spectroscopy /
26. Write then formula of force constant.
27. Define anharmonicity.
28. What is Morse potential?
29. What is a hot band?
30. Calculate degree of freedom of CO_2 molecule.
31. What is stokes line?
32. What is anti stokes line?
33. What is difference between singlet and triplet state?
34. What is fluorescence ?
35. Define phosphorescence.
36. Write two differences between Phosphorescence and fluorescence.
37. What is Beer Lamberts law.
38. What is chemiluminescence?
39. What is quantum yield of reaction of H_2 with Br_2?
40. What is quantum yield of decomposition of HI?
41. What is quenching?
42. What is electromagnetic radiation?
42. What is actinometry?
43. Give one example of reaction of low quantum yield.
44. Give one example of reaction of high quantum yield.
45. What is meant by photochemical reaction?
46. Give law of photochemistry.
47. Give one example of photosensitized reaction.

48. What is the wavelength of UV radiation?

49.. What is degree of freedom of water molecule ?

50. What is degree of freedom of NH_3 molecule?

Group-B

Each question carries 8 marks.

1. State and explain Schrodinger wave equation with its application to free particle.

2. Explain the qualitative treatment of simple harmonic Oscillator model of vibrational motion.
3. What are commutation rules? Explain the quantization of square of total angular momentum.

4. Define particle in one dimensional box. Find out the energy equation of wave function of simple harmonic oscillator.
5. Explain the valence bond approach of diatonic molecule.
6. Give the molecular orbital diagrams electronic configurations, magnetic characters and bond orders of N_2 and HF molecules.
7. (a) What is rotational spectroscopy? To which this spectroscopy concerned?

(b) Determine bond length of linear triatomic molecule by rotational spectroscopy.

8. Write Notes on:-
   (a) Overtones
   (b) Degrees of freedom for polyatomic molecules.
9. Give the qualitative treatment of Rotational and vibrational Raman Spectra.

10. Explain Fluorescence and Phosphorescence on the basis of electronic transition.
11. (a) Derive the expression for Eigen functions of both the operators of a rigid rotator and show that they are same.

(b) Differentiate between Hermitian and Unitary operator giving expressions for each.

12. (a) Derive the expression for energy of an electron in a cube and show what happens when there is a distortion.

(b) Differentiate between normalised and orthogonal wave functions.

13. (a) Discuss the LCMO approach of H_2^+. Show the overlap of atomic orbitals of same and different symmetry.

(b) Give a comparison of MO and VB theory with respect to H_2. Show that both given nearly the same picture of covalent bonding.

14. (a) Give the Hitler-London approach of H_2. Calculate the integrals H_{11} and H_{12}.
(b) Give the correlation diagram of a homo nuclear diatomic molecule like H_2 and hetero nuclear molecule like LiH with justification.

15. (a) Derive the expression for rotational energy, frequencies and wave number of a rigid rotator.
(b) Define degree of freedom of a molecule and discuss the various degrees of freedom of diatomic and triatomic molecules.

16. (a) Define Raman spectra. Give the selection rules to explain strokes line Rayleigh line and Anti-strokes lines.

(b) Give the rotational vibrational Raman spectra of a diatomic molecule.

17. (a) Give Born-Openheimier approximation for electronic spectra and explain the different types of electronic transition.

(b) Explain Franck-Condon principle with suitable diagram of a diatomic molecule.

18. (a) Explain Lambert-Beers law of photo chemistry and derive expressions for extinction coefficient.

(b) Explain chemiluminescence, fluorescence and phosphorescence with example.
19. (a) Maintain the postulates of quantum mechanics.

(b) Normalize the wave function.

$\Psi(x) = A \sin \frac{2\pi x}{\pi}$, x varies between 0 to L.

20. (a) Show that the most probable distance of finding an electron in H-atom is q_0.

(b) Zero point energy is as per uncertainty principle.

21. Discuss the LCAO-MO treatment of H_2^+-ion. Obtain normalised binding and anti binding M.O.S.

22. Discuss valence bond treatment of H_2 molecule. Mention the limitations of valence bond treatments.

23. (a) Discuss Born-Oppenheimer approximation.

(b) What are the factors, that spectral intensity depends on, discuss.

(c) What is the selection rule for pure rotational transitions?

24. (a) Determine the separation between first two anti-stokes lines in Rotational Raman spectra.

(b) Describe the origin of P, Q and R lines in rotation-vibrational spectra.

25. (a) Discuss briefly:-

    (i) Franck-Cordon Principle

    (ii) Beer-Lambert's law. What is the selection rule for pure rotational transitions?

26. (a) Define quantum field.

(b) Discuss briefly :-

(i) Photosinthesizers

(ii) Phosphoresnence

(c) Why triplet state is more stable than singlet state? Explain.

Polymer Chemistry

DSE – I

Group-A

Each question carries 1 mark.

1. Give four examples of polymer that are obtained from nature.
2. Define degree of polymerization.
3. Write the name of the techniques only used to measure the degree of crystallinity of polymer.
4. Write the relationship between T_g and T_m.
5. What are the chemical bonding present in nylon 6,6?
6. Write the Williams-Landel-Ferry equation for polymer melting.
7. Define polydispersity index (PDI). What is its value for uniform chain length?
8. Write the name of the factors only that affect the solubility of a polymer?
9. Write the structure and two uses of Teflon.
10. What are the monomers and structure of Novalac resin?
11. What is homo polymer ? Give an example.
12. What is copolymer ? Give an example.
13. What is addition polymer ? Give an example.
14. What is condensation polymer ? Give an example.
15. What is thermosetting polymer? Give an example.
16. What is thermoplastic polymer? Give an example.
17. What is an elastomer ? Give an example.
18 Write the IUPAC name PVC/ nylon -6,6/ neoprene/Teflon/PET.
19. What is monomers of nylon -6/ nylon -6,6/ Bakelite/ PAN.
20. What is functionality ? Give an example.
21. What is the repeating structural unit of polymer polythene/ polyisoprene/ PVC/ polyepoxide/ nylon -6,6/ PVA
22. What is monofunctional polymer? Give an example.
23. What is bifunctional polymer? Give an example.
24. What is trifunctional polymer? Give an example.
25. Find the functionality benzene / phenol.
26. What radical polymerization? Give an example.
27. What redox polymerization? Give an example.
28. What is linear termination?

29. What is gel point?
30. What is auto acceleration?
31. What is leaving polymerization?
32. What is first order transition in polymer?
33. What is second order transition in polymer?
34. What is DSC?
35. Give two factors affecting crystalinity of the polymer?
36. Write the different morphology of different polymer?
37. What is glass transition temperature ?
38. Define cohesive energy density.
39. What is solubility parameter?
40. What is viral coefficient?
41. What is vulcanization?
42. Give two uses of styrene rubber/ butyl rubber .
43. Give two properties of styrene rubber/ butyl rubber .
44. What are resins?
45. What is Bakelite?
46. What is PTFE ?
47. What is latex?
48. Give one difference between HDPE and LDPE.
49. What is silicone?
50. Give one method of preparation of polystyrene/ PVC/ Buna-S.

Group-B

Each question carries 8 marks.

1. Classify polymers based on source, heat response, use and structure with appropriate examples.
2. Define polymerization process. Differentiate between homo-polymer and copolymer.
3. Explain the Chain Growth Polymerization (CGP) process. What are the initiators and inhibitors used for CGP process? How can you synthesize poly (ethylene) by this process?
4. What are the different types of crystal morphology? Draw and explain one type of such crystal morphology of a polymer.

5. Write the Mark-Houwink equation for determining the viscosity molecular weight. Explain the viscometry method in detail for the determination of molecular weight of polymer.
6. How chain topology, molecular weight, diluents and chemical structure influence Tg of the polymer, explain with example?

7. Explain entropy, enthalpy and free energy change of mixing of polymer solution.

8. Write the short note on criteria of polymer solubility and explain one method to determine the solubility parameter.

9. Draw the Structural formula, properties and commercial applications of the following polymers (i) Nylon 6, (ii) Poly (vinyl chloride (iii) Poly (ethylene) (iv) Poly
(aniline) (v) Poly (siloxane) (vi) Poly (carbonate)
10. Give classification of polymers on basis of composition, origin, combination and heat treatment with examples.
11. What are the polymerization techniques? Discuss about emulsion polymerization process.
12. Write notes on a) bulk polymerization b) solution polymerization c) suspension polymerization d) emulsion polymerization
13. Briefly discuss about the interfacial polymerization by giving suitable example.
14. Derive the steady state kinetics of vinyl or free radical polymerization.
15. Discuss the kinetics of linear step growth polymerization.
16. What is anionic polymerization? Discuss its mechanism and kinetics.
17. What is cationic polymerization? Discuss its mechanism and kinetics.
18. Give an account of methods of determining the number average and weight average molecular weight.
19. Give an account of principles of technique involved in end group analysis.
20. Discuss osmometry method for the determination of molecular weight of high polymers.

Green Chemistry DSE – II

Group-A

Each question carries 1 mark.

1. Give an example ionic liquid.
2. Define the term Atom Economy.
3. Give an example of biocatalyst.
4. What are green solvents?
5. Give examples of protection and deportation of functional group in organic synthesis.
6. Which was gas responsible in Bhopal gas tragedy?
7. Give an example of CO_2 surfactant.
8. Write an example of the reaction using super critical CO_2.
9. Give an example of toxic inorganic pigment.
10. What is biomemetric approach to Green chemistry?
11. Give two principles of Green Chemistry.
12. Write the structure of adipic acid.
13. What is biodegradation?
14. What is biomimetic?
15. Give examples of renewable and non-renewable resources.
16. What is the need for Green Chemistry?
17. Which solvents are called “Green solvents” and why?
18. Give examples of microwave assisted reaction.
19. How Cannizzaro’s reaction is carried out by green method?
20. How catalytic reagents are superior to stoichiometric ones?
21. How are nitriles obtained from aldehydes by Green method?
22. How can you bring out esterfication by ultrasound assisted reaction?
23. What is green chemistry?
24. Define atom economy.
25. Define super critical CO_2.

26. Define super critical water.
27. Define super critical fluid.
28. What is a phase transfer catalyst? Give two advantages of it.
29. Give one important principle of green chemistry.
30. What is a biocatalyst give one example?
31. Give two strategies of ISD.
32. What is photo catalyst give one example.
33. Give one example of bio catalytic reducing agent.
34. Give two advantages of homo and heterogeneous catalyst.
35. Give two disadvantages of homo and heterogeneous catalyst.
36. What is an antifoulant ? Give one example.
37. Give microwave assisted Diels – Alder reaction.
38. Give microwave assisted Hoffmann elimination reaction.
39. Give the formula of % of atom economy.
40. What is the % of atom economy of the reaction

Cyclohexene + Br_2 ⟶ 1,2- dibromohexane

41. What is Chernobyl disaster? 42. What is Miniamata disease?

43. What is 4 R's?
44. What is photochemical smog?
45. What is London smog ?
46. What is love canal incident?
47. What is Bhopal disaster?
48. What is Agent Orange tragedy?
49. What is CFC?
50. What is Global warming?

Group-B

Each question carries 8 marks.

1. (a) Discuss twelve principles of green chemistry. 2. (a) Calculate the percentage of atom economy of reaction between 2-methyl propane and HBr.

(b) Write a short note on effect of hazardous solvents in environment.

3.(a) What are the benefits of using microwave as energy source?

(b) Write the principles of sonochemistry in organic synthesis.

4. (a) What are biocatalysts? What are the advantages of use of biocatalyst over conventional catalysts?

5. (a) Describe green synthesis of adipic acid from D-glucose.

6. (a) Describe ultra sound assisted Simmon-Smith reaction.
(b) What are super critical fluids? Take CO_2 as example and explain in detail.

7. (a) What are the limitations of conventional methods of synthesis of catechol. Propose a green procedure for the synthesis of catechol.

8. Describe the following microwave assisted reactions in water.
(a) Hoffmann elimination
(b) Methyl benzoate to benzoic acid

9. (a) Write note on green chemistry in sustainable development.

(b) Describe green synthesis of biodegradable polylactic acid from corn.

10. What is Green Chemistry? Discuss the principles of Green Chemistry.

11. (a) Describe how you can minimize hazardous products by Green Chemistry.

(b) How atom economy is useful in Green Chemistry?

12. How can you synthesize the following by green method and how it is superior to the traditional method?

(a) Furfural (b) Acetaldehyde

13. Schematically show the synthesis of

(a) Catechol

(b) Disodium iminodiacetate by green method and how it is superior to the traditional method.

14. Explain how the following reactions can be carried out by microwave.

(a) Fries rearrangement

(b) Claisen rearrangement

(c) Diels – Alder reaction

15. How can the followings be carried out by ultrasonic waves:

(a) Strecker synthesis

(b) Reformatsky reaction

(c) Substitutional reactions.

16. (a) Draw the structure of diphenyl carbonate?
How it is used in the polymerization of amorphous polymers? Give examples.

(b) What is active methylene group? How can it be methylated by dimethyl carbonate? Give examples.

17. Write notes on any three :-

(a) Non-metallic oxidative reagent

(b) Free radical bromination

(c) Role of Tellurium is organic synthesis.

18. (a) What do you mean by multifunctional reagents. How it is useful in green synthesis? Give examples.

(b) What is combinatorial green chemistry? Illustrate giving an example.

19. (a) Discuss with examples how Green chemistry can be applied to sustainable development.

(b) Why solvent less reaction are preferred in green synthesis? Give examples to justify your answer.

20. Give a green synthesis of the following

a) Methyl Methacrylate b)Furfural c) disodium iminodiacitate d) catechol

21.Write notes on a) noncovalent derivetaisation b) multifunctional reagent c) sustainable development

Inorganic Chemistry

Core – XIII

Each question carries 1mark.

Group-A

1. Define common ion effect.

2. Define solubility product.
3. Define solubility.
4. Give the relationship between solubility and solubility product.
5. The solubility Ag_2CrO_4 at 85 ^oC is 8.0×10^{-5} M L^{-1} find its solubility product.
6. What is the group reagent of group I/ group II/ group IIIA/ group IIIB/ group IV cations?
7. What is the role of common ion effect in the separation of group II/ group IIIA/ group IIIB/ group IV cations.
8. How can you recover pure NaCl from sea water?
9. How can you recover pure soap by salting out process?
10. What is the function of NH_4OH in group V cations?
11. What is Wilkinson's catalyst?
12. What do you understand by Tolman catalytic loops?
13. What is Hydroformylation?
14. What is Wacker process?
15. What is asymmetric hydroformylation?
16. What is Fischer-Tropesch reaction?
17. What is syn gas?
18. What is Exxon process?
19. What is Shell process?
20. What is organometalic compound? Give one example.
21. What is meant by heptocity?
22. What is 18-electron rule give one example/ Give an example.
23. What is EAN rule?
24. What is Zeise salt ?
25. How many types of bonding are present in crystalline structure of Co (CO)$_8$.
26. What is Ziegler Natta catalyst?
27. What is ferrocene ? Give its structure.
28. What is Shlenk equilibrium?

29. Give the structure of methyl lithium/trialkyl aluminium.
30. Give laboratory preparation of ferrocene.
31. What is inert complex?
32. What is labile complex?
33. What is kinetic stability?
34. What is Thumb's rule?
35. What is meant by aquation in octahedral complex?
36. Give the decreasing order of trans effect of the ligands Cl^-, NH_3, NO_2^-.
37. What is trans effect?
38. Give two applications of trans effect.
39. Give two factors affecting rate of substitution in metal complexes.
40. Give two factors affecting formation of complexes.
41. What is π bonding?
42. Explain EAN rule in $Cr(CO)_6$.
43. Write the structure of decacarbonyl di manganese (o)/ tetra carbonyl cobaltate(I)/ hexacarbonyl(ethyl mecurio) tantalum.

45. What is the name of $(C_2H_5)_4Pb$/ $Fe_2(CO)_9$/ $K_3[Fe(CN)_5CO]$/ $[Fe(C_5H_5)_2]$
46. Give confirmatory test of Cl^-.
47. Give confirmatory test of PO_4^{3-}.
48. Give confirmatory test of Fe^{+3} /K^+.
49. Give all the cations of group III.
50. How can you separate S^{-2} from CO_3^{2-}.

Group-B

Each question carries 8 marks.

1. How are organometallic compounds classified on basis of their bond type? Explain with example.

2. Explain hapticity of organic ligands. Give at least four examples to explain it.

3. Explain 18 electron rule and effective atomic number rule with suitable example. Also calculate the EAN of Fe (π-C_5H_5) (σ- C_5H_5) $(CO)_2$ and (C_6H_6) Cr $(CO)_4$.

4. Give preparation, structure and evidence of synergic effect of Zeise salt. Also compare the synergic effect with that in carbonyls.
5. Describe various factors that influence the formation of complexes.
6. Explain kinetic and thermodynamic stabilities and explain their difference with example.
7. Give the mechanism of nucleophilic substitution in square planar complexes.
8. Describe ligand field effects and reaction rates in octahedral complexes.
9. Describe in details the substitution reaction of square planar metal complexes.
10. How will you explain the π – acceptor behaviour of CO with help of MO concept?
11. How will you explain the structure of trialkyl aluminium?
12. Explain the concept of multicenter bonding in methyl lithium and trialkyl aluminium.
13. Describe the role of triethyl aluminium in polymerisation of ether by Ziegler Natta catalyst.
14. Describe any two method of preparation of ferrocene. How does it give acylation reaction?
15. Give laboratory preparation of ferrocene. Give the comparison of aromaticity and reactivity with that of benzerne.
16. Give the principle involving separation of cation into groups according to the choice of group reagent.
17. How are solubility product and common ion effect involved in the separation of group II, group IIIA and group IV captions?

18. What is Wilkinson's catalyst? Give the mechanism of alkene hydrogenation with the help of this catalyst.
19. What is Wacker process? Give the mechanism for the reaction taking place in this process.
20. What is Fischer-Tropesch reaction? How is it used for the manufacture of synthetic gasoline?
21. What are interfering radicals? How can you identify Cl^- , Br^- and I^- in presence of each other.

Organic Chemistry

Core – XIV

Group-A

Each question carries 1 mark.

1. Explain chromophore with an example.
2. Define the term Absorbance?
3. What is the effect of hydrogen bonding on ultra violet absorption?
4. Why Methanol is a good solvent for U.V not for I.R.?
5. Define coupling constant?
6. What do you mean by base peak?
7. Define the term precessional frequency?
8. Explain mutarotation in glucose?
9. Explain Reducing and non-reducing sugar with example.
10. What is Mordant dye? Give one example.
11. What is Buna-S?
12. Write the name of monomers for Nylon 6.6.
13. What is the wave no. of a wave having wave length 2000 A^0?

14. What is an auxochrome? Give one example.

15. What is Bathochromic shift?

16. What are the no. of molecular vibrations for H_2O and CO_2 molecules?

17. What is fingerprint region?

18.What do you mean by NMR spectroscopy?

19. What is molecular ion peak?

20. What is an epimer? Give one example.

21. What is polysaccharide? Give one example.

22. What is degree of polymerisation?

23. What is Ziegler-Natta catalyst?

24. Give two examples of conducting polymers.

25. Explain chromophore with an example.

26. Define the term Absorbance?

27. What is the effect of hydrogen bonding on ultra violet absorption?

28. Why Methanol is a good solvent for U.V not for I.R.?

29. Define coupling constant?

30. What do you mean by base peak?

31. Define the term precessional frequency?

32. Explain muta rotation in glucose?

33. Explain Reducing and non-reducing sugar with example.

34. What is Mordant dye? Give one example.

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44. What is an epimer? Give one example.

45. What is polysaccharide? Give one example.

46. What is degree of polymerisation?

47. What is Ziegler-Natta catalyst?

48. Give two examples of conducting polymers.

49. What is the use of Ziegler-Natta catalyst?

50. Give one example of mono, oligo and poly saccharide.

Group-B

Each question carries 8 marks.

1. Describe the various types of transitions involved in U.V. spectroscopy with one example in each case?
2. Write a note on the modes of vibration in diatomic and polyatomic molecules?
3. What is meant by the term chemical shift? Explain the factors affecting chemical shift with examples.

4. Write the basic principle of Mass Spectrometry? Describe the importance of metastable peaks.
5. Discuss the configuration of D(+) Glucose?
   Discuss the pyranose structure of D-Glucose? Describe Killiani-Fischer synthesis.
6. Give the synthesis and applications of following dyes.

(i) Methyl orange
(ii) Crystal violet
(iii) Phenolphthalein

7. Give the structural elucidation and synthesis of Alization.
8. Explain step-growth polymerization reaction with example and kinetics?
9. Give the synthesis and uses of -

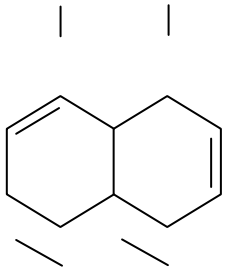
(i) Phenol-formaldehyde resin
(ii) Poly Urethanes
(iii) Poly Vinyl Chloride

10. (a) Write the basic principles of UV spectroscopy with potential energy diagram.

(b) What are chromophores? What are the conditions of a group to be act as chromophore?

11. (a) Write the Woodward empirical rules for calculation of λ_{max} values of conjugated dienes.

    (b) Calculate the λ_{max} value of the following compound.



12. Write the basic principle of NMR spectroscopy.

13. Give the instrumentation in detail with schematic diagram of mass spectroscopy.

14. Give the detail description of determination of ring size of glucose.

15. Write notes on (any two) :-

    (a) Mutarotation
    (b) Coversion of Glucose to Fructose (c) Killiani-Fischer synthesis.

16. Elucidate the structure of Indigotin with synthesis.
17. Write notes on (any two) :-

    (a) Congo Red
    (b) Malachite green
    (c) Fluorescein

18. What are free radical and amionic polymerisation? Explain with mechanism.

19. Write notes on (any two):-

    (a) Classification of polymer.
    (b) Natural and synthetic polymers with example.

(c) Biodegradable polymers.

20. (a) Describe Woodward-Fiesher rule for calculating absorption maximum for a simple conjugated diene.

(b) Calculate the frequency and energy associated with 1 mole of photon with wavelength 480nm.

(c) Define the term auxochrome and chromophores.

21. (a) Discuss n $\rightarrow$ π* and π $\rightarrow$ π* electronic transitions involved in UV spectroscopy. Which class of compound exhibit these types of transitions.

(b) Distinguish between red and blue shifts in UV spectroscopy.

(c) What is the effect of hydrogen bonding on UV absorption?

22. (a) What are fundamental vibrations? Explain various types of fundamental vibrations in water molecule.

(b) How can you distinguish between primary and secondary amines by I-R spectra? Explain with example.

(c) Using IR technique, how will you show that a compound under investigation is aromatic.

23. (a) Briefly describe the instrumentation and functioning of IR spectrometer.

(b) How can you distinguish between phenol and cyclohexanol using IR spectroscopy?

24. (a) Discuss the basic principle of NMR spectroscopy.

(b) What do you mean by diamagnetic and paramagnetic effects in NMR spectroscopy?

Explain with a suitable example.

25. (a) What is NMR spectroscopy? Discuss briefly what information can be obtained from NMR spectrum?

(b) Describe briefly shielding and deshielding effect involved in NMR spectroscopy.

26. (a) Determine the structure of organic compound whose mass spectrum shows m/e values as 114, 85, 72 (MR ion), 57, 41, 29.

(b) Discuss the important features of mass spectra of amines.

(c) Draw and explain the mass spectra of 2, 2- dimethyl butane.

27. (a) Write Notes on metastable ions.

(b) Discuss the process involved in identification of an organic compound by mass spectra.

28. (a) What is chromatography? Describe how it can be used to separate the components from a mixture.

(b) Write notes on Gas-liquid chromatography.

29. (a) Write a note on HPLC.

(b) What is paper chromatography?

Define the parameters R_f, R_M and R_x in paper chromatography.

30. (a) What is meant by electromagnetic radiations?

Discuss important characteristics of electromagnetic radiation.

(b) Arrange the following radiations in the order of their increasing wave number.

UV, X-rays, visible light, microwaves, cosmic ray.

(i) CMC (ii) Micelles

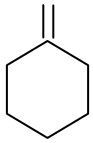
(c) The wavelength associated with an U.V. radiation is 280nm. Determine the energy associated with it in K.Cal.

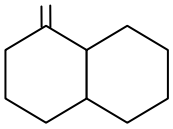
31. (a) Calculate the values of absorption maxima for the following compounds.

O

$CH - CH - CH_2$

(i)





(ii)

(b) Write Notes on :

(i) Bathochromic shift. (ii) Hypochromic shift.

32. (a) Discuss the basic principles of Infra-red spectroscopy.

(b) Discuss the effect of intermolecular and intramolecular hydrogen bonding on the absorption frequency of a compound with example.

33. (a) Distinguish between the following pairs of compounds with the help of infrared technique.

(i) Propanol and Propane (ii) Ethanol and Ethyl amine.

(b) Discuss the inductive and mesomeric effect influencing the Carbonyl absorption frequency with example.

34. (a) State and explain the term Chemical Shift and describe the factors affecting it.

(b) Write notes on spin-spin coupling.

35. (a) Discuss notes on spin-spin spectrum of

(i) 1, 3-dichloropropane (ii) Ethyl alcohol

(b) Write Notes on Coupling Constant.

(c) Explain why NMR spectrum of benzene is observed at a lower field strength than acetylene.

36. (a) Discuss the basic principles of mass spectrometry.

(b) Write Notes on mass spectra of alkanes and alkenes

37. (a) Write notes on Mc-Lafferty Rearrangement.

(b) Give some important features of the mass spectrum of primary, secondary and tertiary alcohol.

38. (a) Write Notes on thin layer chromatography.

(b) Discuss ascending paper chromatography and write the various solvent systems used in paper chromatography.

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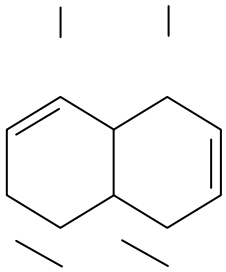

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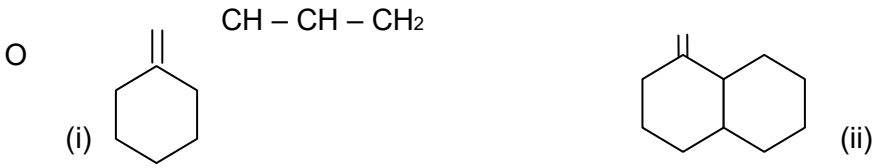

(i) (ii)

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78. (a) Write the principles of Chromatography.

(b) How will you proceed to separate a mixture of amino acids.

Industrial Chemistry

DSE – III

Group-A

Each question carries 1 mark.

1. Give two uses of acetylene.
2. Write the formula and application of borox.
3. What is Smog? What are the constituents?
4. Point out the major sources of air pollution?
5. What are the major sources of ground water pollution?
6. What are industrial effluents?
7. What is reverse osmosis?
8. How ion exchange is used for purification of water?
9. What is tidal energy?
10. Give the significance of geothermal energy.
11. What are LPG and LNG.
12. What happens when potassium chlorate is heated?
13. What are the uses of oxygen?
14. Write the uses of helium.
15. What is molecular shiver?
16. What is synthetic gas?
17. Write two uses of Chlorine.
18. How potash alum is prepared?
19. Describe different types of cast iron.
20. What is smelting?
21. What is roasting?
22. What are calcinations?
23. What is intrinsic semiconductor?
24. What is extrinsic semiconductor?
25. Define ecosystem.

26. What are the components of ecosystem?
27. What is smog?
28. Write the major regions of atmosphere.
29. What is ozone hole?
30. What is hydrological cycle?
31. Describe pond ecosystem.
32. What is thermal pollution?
33. What is COD?
34. What is BOD?
35. What is dechlorination?
36. How sterilisation of water takes place by UV rays?
37. Write two methods of sludge disposal.
38. What do you mean by land treatment?
39. What is synfuel?
40. What is Shale oil?
41. What is natural gas?
42. What is kerogen?
43. Give an example of fission reaction.
44. Give an example of fusion reaction.
45. What is chain reaction?
46.What is saline polar pond?
47. What is biocatalyst?
48. What is non aqueous biocatalyst?
49. What is uncontrolled chain reaction?
50. What is biodiversity?

Group-B

Each question carries 8 marks.

1. Give a brief account of production, uses, storage and hazards in handling of the following gases:-

(a) Nitrogen (b) Chlorine

2. Briefly describe the manufacture, application and hazards of the following chemicals:-

(a) Hydrochloric acid (b) Caustic soda

3. (a) What are the major types of air pollutants its sources and how can it be minimized?

(b) Describe the role played by ozone in maintaining the environmental balance and what are the causes of its depletion.

4. Write Short Notes on:-

(a) Green house effect

(b) Carbon cycle

(c) Major region of atmosphere

5. What are the major sources of water pollution and how can it be minimised.

6. Write Short Notes on:-

(a) Hydrological cycle

(b) Effluent treatment plants

(c) Water resources

7. Write Notes on:-

(a) Reverse Osmosis

(b) Electro dialysis

(c) Ion exchange

8. Discuss the water quality parameters for different types of water and what steps can be taken to maintain it? 9. Write Notes on:-

(a) Solar energy

(b) Geothermal energy

(c) Hydel energy

10. (a) What is nuclear pollution? Suggest different methods by which it can be minimised.

(b) What are biocatalysts? How it is relevant to chemical industry?

11. Give a brief account of production, uses, storage and hazards in handling of the following gases:-

(a) Carbon monoxide (b) sulphur dioxide

12. Briefly describe the manufacture, application and hazards of the following chemicals:-

(a) bleaching powder (b) sodium thisulphate

13. How K_2MnO_4 is industrially prepared? What are uses and hazards of it .
14. How cast iron is prepared in the blast furnace?
15. What is semiconductor? Give its classification. How n-type and p-type semiconductor are prepared.
16. What is smog? What is photochemical smog and London smog? Write the difference between the two?
17. Write Notes on:- a) Global warming b) Ozone layer depletion c) CFC
18. Discuss the source and nature of water pollution.
19. Write Notes on: - a) sludge disposal b) Industrial waste management.
20. What is nuclear fusion process? Also write how this reaction is used for making atom bomb and nuclear reactor.
21. Describe Bosch process for preparation of hydrogen. What are the hazards of handling H_2-gas?