## SOME BASIC CONCEPTS OF CHEMISTRY

1. **What is a homogeneous mixture?**
2. 4g of NaOH are dissolved in 500ml of water. Calculate the molarity of the solution.
3. An Organic compound contains 26.66% carbon, 2.22% hydrogen and 71.12% oxygen. The molecularmass of the compound is 90. Find its empirical formula and molecular formula.
4. Define Mole
5. Calculate the mass percentage of carbon in methane. (The molecular mass of $CH_4$ is 16)
6. **What is limiting reagent? How many significant figures are in 0.4500g**?
7. Calculate the molecular mass of $HNO_3$?
8. Define empirical formula. Give an example of compound whose empirical formula and molecularformula are same.
9. Write any three basic physical quantities along with SI units.
10. State law of definite proportions?
11. What is SI unit of density?
12. **Define Molarity of solution?**
13. Name the SI unit of amount of substance.
14. Calculate the molar mass of i) Butane ($C_4H_{10}$) ii) Glucose ($C_6H_{12}O_6$)
15. Define the empirical formula and molecular formula.
16. Calculate the Molarity of NaOH in the solution prepared by dissolving in 4gm in enough water to form250mL of the solution.
17. **Define Mole fraction.**
18. **State law of definite proportion.**
19. **A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molar mass is 98.96. What are its empirical formula and molecular formula (Atomic mass of C=12, H=1.008 and Cl=35.453)**
20. Define law of definite proportion
21. Calculate the number of grams of oxygen in 0.1mol of $Na_2CO_3.10H_2O$
22. A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molar mass is 98.96.What are its empirical formula and molecular formula?
23. Name the SI unit of density.
24. Write the any three postulates of Dalton's atomic theory
25. State the law of Multiple proportions.
26. Mention any two basic physical quantities?
    a) Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and $CO_2$ according to the equation.$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$
27. What mass of $CaCO_3$ is required to react completely with 25ml of 0.75M HCl?
28. b) Mention any two postulates of Dalton's atomic theory.
29. Define atomic mass unit
30. Calculate the number of grams of methane required to produce 9gm of water
31. **Give any three postulates of Dalton's atomic theory**
32. Calculate the Molarity of $Na_2CO_3$ solution prepared by dissolving 5.2gm in enough water to make500mL solution (Molecular mass of $Na_2CO_3$ = 106 $gmol^{-1}$)
33. How many significant figures is present in 3 .0667g?
34. A solution is prepared by adding 4g of a substance „A" to 36g of water. Calculate the mass percent ofsolute
35. Calculate the number of moles in 3.01 X $10^{22}$ molecules of $CO_2$
36. A solution is prepared by adding 2g of a substance „A" to 18g of water. Calculate the Mass percentageof solute
37. Calculate the molarity of NaOH in the solution prepared by dissolving its 4g in enough water to form250mL of solution.
38. State law of proportions. How many significant figures are in 405?
39. What is the value of Avogadro number?
40. Calculate the molecular mass of $CO_2$
41. What is mass number of Tritium?
42. Calculate the molarity of NaOH in the solution, prepared by dissolving 10g in enough water to form500mL of the solution.( Molar mass of NaOH is 40 $gmol^{-1}$)
43. **The percentage composition of an organic compound found to contain 39.9% carbon, 6.7 % hydrogenand the rest is oxygen. If the molecular mass of the compound is 60$gmol^{-1}$. Determine the molecular formula of the compound**

44. State Avogadro law.
**45.** Define mole?
46. State law of definite proportions
47. A sample of a compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molecularmass is 98.96g. What is its empirical and molecular formula? (Given At. Mass of C =12,H =1,Cl= 35.5)
**48.** Write the number of significant figures in the value $6.022 \times 10^{23}$
49. What is meant by limiting reagent? In a reaction $A + B_2 \rightarrow AB_2$, identify the limiting reagent in themixture of 2 moles of A and 3 moles of $B_2$.
50. Give an example each for physical property and chemical property of matter.

## STRUCTURE OF ATOM

**1.** Write the electronic configuration of Al (Z=13)
2. Mention any two properties of cathode rays?
3. Give two properties of electromagnetic radiations?
4. Write all possible values of l, m and s ,when n=3 in an atom.
5. State Aufbau principle ?
6. The electron in a hydrogen atom moves with a velocity of $2.2 \times 10^6$ $ms^{-1}$. Calculate wave length of theelectron. (Given: Mass of electron = $9.1 \times 10^{-31}$ kg , Planck‟s constant = $6.62 \times 10^{-34}$ JS)
**7. Give two limitations of Bohr's model of an atom?**
**8.** Between 4s and 3d orbital which has lowest energy?
**9. State Heisenberg's uncertainty principle?**
**10. Explain the one significance of each of four quantum numbers?**
11. Atomic number (z) and Mass number (A) of element are 29 and 64. How many protons and neutronsare present in it?
12. Calculate the number of protons, neutrons and electrons in $^{80}Br_{35}$.
13. Give the electronic configuration of an element having atomic number i) 24 ii) 30
**14. Write the four postulates of Bohr's model of hydrogen atom.**
15. What are isotopes?
16. For an element with atomic number Z=29 i) Write its electronic configuration
17. ii) How many unpaired electrons are present in it? iii) Calculate (n+l) value for 3d orbital.
18. **State Pauli‟s exclusion principle**.
**19.** Write any three observations of Rutherford nuclear model of an atom.
20. Give the electronic configuration of copper (Z=29).
21. Calculate the wave number of first line in Balmer series of hydrogen spectrum. ( R =$1.09677 \times 10^7 m^{-1}$)
    **a)** For the element atomic number 24 i) write the electronic configuration
    ii) How many unpaired electrons present in it? iii) Belongs which block in the periodic table?
    b) i) Between 3d and 4s orbital, which has lower energy?
22. Between 3p and 3s orbital, which has lower energy?
**23. Write de-Broglie equation.**
**24.** What are the observations made in Rutherford's α-particle scattering experiment.
25. Using s,p,d notations, describe the orbital with the following quantum numbersi) n=1, l=0 ii) n=3, l=1 iii) n=4, l=2
26. Explain Hund‟s rule of maximum multiplicity?
**27.** Using s,p,d and f notations, mention the orbital with the following quantum numbers
28. a) n=2, l=1 b) n=4, l=0 c) n=5, l=3 d) n=3, l=2
29. Write Rydberg's equation
30. Calculate the energy of one mole of photon of radiation whose frequency is $5 \times 10^{14}$ Hz.
31. State Hund's rule of maximum multiplicity.
32. Write Rydberg's equation? Explain the terms.
33. For the element with atomic number Z=29 i) Write the electronic configuration
34. Write the value of „n‟ and „l‟ for its electrons in the valence shell
35. Give any two the difference between orbit and orbital
**36.** Write the characteristics of anode rays (canal rays)
**37. What are Isotopes? Give an example.**
38. State Hund's rule of Maximum multiplicity
39. What is wavelength of light emitted when the electron in a hydrogen atom undergoes transition from anenergy level with n=4 to an energy level with n=2 ( Given R =$1.09677 \times 10^7 m^{-1}$)
**40.** Give any three postulate of Bohr's theory of atomic model
41. State Hund's rule of maximum multiplicity.

42. What is node?
43. Give de-Broglie equation.
44. Name the orbital when n=3 and l=2
45. State Pauli‟s exclusion principle.
**46.** Write any three postulates of Rutherford's nuclear model of atom.
**47. Calculate the energy of one mole of photon of radiation whose frequency is 5 x $10^{-34}$ Hz.( Given : h = 6.626 x $10^{-34}$JS & $N_A$ = 6.022 x $10^{23}$ $mol^{-1}$)**
**48. For an element with atomic number Z=29, i) Write its electronic configuration How many unpaired electrons are present in it? iii) Calculate (n+l) value for 3d orbital in it.**
**49. State Pauli‟s exclusion principle.**

## CLASSIFICATION OF ELEMENTS ANDPERIODICITY IN PROPERTIES

**1.** Write the IUPAC name of an element with Z=108.
2. State the law of triads. Give an example of a triad?
**3. Define atomic radius. How does it vary along a period and down a group?**
**4. State Modern periodic law.**
**5. Define ionization enthalpy? What is the variation of ionic radius on going down the group?**
6. What are isoelectronic species? Select isoelectronic pair among the following. $Na^+$, $Cl^+$, $F^-$ , $Li^+$
**7.** Name the element having highest value of electronegativity in the halogen.
8. Give the general electronic configuration of S-block elements.
9. Size of $Na^+$ ion is smaller than Na. Give reason.
10. What are isoelectronic species?
**11.** State Modern periodic law.
12. Define ionization enthalpy. How it varies down the group in the periodic table.
13. Give the IUPAC name of an element with atomic number 112.
**14.** How do you differ isoelectronic ions from simple ions?
15. Define atomic radius. Give the variation of covalent radius along the period and down a group.
**16.** In which period does the Lanthanides appear?
17. State modern periodic law. Why the size of anion is always greater than the parent ion ?
**18.** Name the element which is having highest electronegativity in the periodic table.
19. What is Ionisation enthalpy? How does it varies along a period and down a group
**20.** How does Ionisation enthalpy vary along a period? Give reason
21. Define electron gain enthalpy.
22. Name the most electronegative element in the periodic table
**23.** What is ionization enthalpy? How does it vary down a group in the periodic table?
24. Give the increasing order of their metallic character for the elements B,Al, Mg and K.
25. Which group of elements are called „Chalcogens'?
**26.** Write the IUPAC name of an element with atomic number 108.
**27. Define electron gain enthalpy. How it varies along a period and down the group.**
**28. What are isoelectronic species?**
29. Define ionization enthalpy. How does it vary along a period and down the group in the periodic table?
**30.** Define electron gain enthalpy.
31. Explain why cations are smaller and anions are larger than their parent atoms.
32. Nitrogen has higher enthalpy of ionization than that of oxygen. Give reason.
**33.** Write the IUPAC name of an element with atomic number 107.
**34.** Define electron gain enthalpy .How does it varies along a period and down the group?State Modern periodic law
35. What is ionization enthalpy? How does it vary in group?
**36.** Which quantum number corresponds to the period number in the modern periodic table?
37. What is the electron gain enthalpy? How does it generally vary across the period and down the group ?

## CHEMICAL BONDING AND MOLECULAR STRUCTURE

**1.** Define bond length?
2. Define hydrogen bond? Name a compound having intra molecular H-bond?
3. Mention the bond angle in water?
4. **Write the postulates of Molecular orbital theory**?
5. Explain sp hybridization in ethyne?
**6. Mention the Molecular geometry in $PCl_5$?**
7. Sketch s-p overlaps of atomic orbitals?
**8. Write the electronic configuration of $Li_2$ molecule and calculate its bond order?**
9. Write the Lewis symbol for N?

10. **Distinguish between sigma (σ) and pi (π) bond.**
11. **Explain the shape of ammonia molecule using VSEPR theory?**
12. Write the electronic configuration of Lithium molecule on the basis of molecular orbital theory.Calculate the bond order.
13. Define the following term i) Bond length ii) Bond angle iii) Bond enthalpy
14. The dipole moment of $BeF_2$ is zero. Give reason.
15. Explain $sp^2$ hybridization of $BeCl_2$
16. Draw energy level diagram for Helium molecule and calculate its Bond order.
17. **Define Hydrogen bond. Mention the types of H-bond.**
18. What is meant by dipole moment? Why dipole moment of $BF_3$ is zero?
19. Write the electronic configuration of lithium molecule. What is its bond order.
20. **Write any three postulates of VSEPR theory.**
21. Explain $sp^2$ hybridization with Boron tri chloride as an example.
22. Mention the type of hydrogen bond in the following compounds? i) Water ii) Ortho-nitro phenol?
23. Write the state of hybridization in $BF_3$.
24. Mention two conditions for the formation of covalent bond.
25. Explain $sp^2$ hybridization in the formation of $BCl_3$ molecule?
26. What is VSEPR theory? Explain taking water as an example.
27. Explain the monoatomic property of Helium on the basis of MOT (Molecular orbital theory)
28. Define bond order. Write electronic configuration of Lithium molecule.
29. Write any three important features of valence bond theory.
30. What is covalent bond? Explain the formation of covalent bond in Hydrogen chloride.
31. Explain the structure of ammonia molecule on the basis of VSEPR theory.
32. What is sigma bond? Why sigma bond is stronger than pi-bond?
33. Define bond order. Calculate the bond order in Hydrogen molecule
34. Explain $sp^3$ hybridization in methane molecule
35. Write any three postulates of molecular orbital theory
36. Mention the hybridization of carbon in diamond.
37. **Define dipole moment. Write the name of the unit**
38. **Write any three postulates of VSEPR theory**
39. Explain $sp^2$ hybridization taking $BCl_3$ as an example
40. Write the electronic configuration of Lithium molecule. Predict its stability and magnetic property.
41. Give any two limitations of octet rule.
42. Write any two postulates of VSEPR theory
43. Define dipole moment
44. Explain $sp^2$ hybridization in $BCl_3$
45. Based on MOT give the electronic configuration, bond order & magnetic property of Lithium molecule.
46. What is the hybridization of carbon in graphite?
47. Write the Lewis dot structure of i) $Cl_2$ ii) $CO_2$
48. Explain sp-hybridization by taking ethyne as example.
49. Write the electronic configuration of Lithium molecule. Calculate its bond order and mention itsmagnetic property.
50. What is ionic bond?
51. Mention any two conditions for the formation of covalent bond.
52. Draw the Lewis symbol for $CCl_4$
53. What is the shape of $NH_3$ molecule according to VSEPR theory
54. What is meant by hydrogen bonding? Sketch the hydrogen bonding in HF.
55. Define bond length.
56. Write the molecular electronic configuration, bond order and magnetic property of Lithium molecule.
57. Define dipole moment. What is its unit?
58. State Octet rule.
59. Mention the hybridized state of carbon in fullerene
60. What is ionic bond? Give an example for ionic compound.
61. Write the postulates of VSEPR thory.
62. How is sigma bond and pi-bond formed?
63. **Define formal charge.**
64. Draw the energy level diagram for hydrogen molecule, write its electronic configuration and bond order.

65. Mention any two conditions for the combination of atomic orbitals.
66. Define the terms a) Bond angle b) Bond order c) Co-valent radius
67. Give any three important postulates of VSEPR theory
68. Explain bonding in $H_2$ molecule based on the basis of Molecular orbital theory.
69. Define : a) Lattice enthalpy b) Covalent radius c) Bond enthalpy
70. **What is hydrogen bonding? Mention the types of hydrogen bonding involved in O-nitrophenol**
71. Write the molecular orbital electronic configuration of oxygen molecule and calculate the bond order.
72. Mention the type of hybridization, geometry and bond angle in $BCl_3$molecule
73. Write Lewis dot symbols for $CH_4$ molecule and $Cl_2$ molecule.
74. Give any three postulates of VSEPR theory
75. **Explain the formation of $BCl_3$ using the concept of hybridization.**
76. Write the molecular orbital electronic configuration for the carbon molecule. Calculate the bond orderand comment on magnetic property

## THERMODYNAMICS

1. **Give an example for extensive property?**
2. **What is a spontaneous process? Give an example.**
3. The enthalpies of combustion of carbon, hydrogen and ethane are -393.5kJ, -285.8kJ and -1410kJ respectively. Calculate enthalpy of formation of ethane?
4. What is an isolated system?
5. Define enthalpy of combustion?
6. **Derive the relationship between $C_p$ and $C_v$ for an ideal gas.**
7. **Calculate the enthalpy of formation of Benzene ($C_6H_6$) given enthalpy of formation of $CO_2(g)$ and$H_2O(l)$ are -393.5kJ and -286kJ. The enthalpy of combustion of benzene is -3267kJ.**
8. State Hess's law of constant heat summation.
9. Derive the relationship between Cp and Cv for an ideal gas.
10. Give an example for the reaction $\Delta H=\Delta U$.
11. Define the following thermodynamic terms.
12. Open system ii) Closed system iii) Isolated system.
13. i) State first law of thermodynamics. ii) Give an example for $\Delta H=\Delta U$.
14. State Hess's law of constant heat summation.
15. Calculate the enthalpy of formation of liquid Benzene (C6H6), given
    $C + O2 \rightarrow CO2 \quad \Delta H = -393.5kJ$
    $H2 + 1/1\ O2 \rightarrow \Delta H = -285.8kJ$
    $C6H6 + 15/2O2 \rightarrow 6\ CO2 + 3\ H2O \quad \Delta H = -3267kJ$
16. Standard enthalpy of combustion.
17. **The Equilibrium constant of a reaction is 10. Calculate the value of standard free energy change.(Given R= 8.314 $JK^{-1}mol^{-1}$ and T = 300K)**
18. Write the Gibb's equation and explain the terms in it.
19. Calculate the standard free energy change for a reaction at 298K. The equilibrium constant for thereaction is 50.
20. What is exothermic reaction? Give an example.
21. State Hess's law and illustrate with an example.
22. Write Gibbs-Helmohltz equation. Explain terms involved in it.
23. Calculate the enthalpy of combustion of benzene. Given standard enthalpies of $CO_2$, $H_2O$ and $C_6H_6$are -393.5kJ, -286.2kJ and +49kJ respectively.
24. What is molar heat capacity ? Write the relation between $C_p$ and $C_v$
25. What is entropy? Give its SI unit.
26. Calculate the enthalpy of formation of benzene. Given that enthalpies of combustion of benzene,carbon and hydrogen are -3267kJ,-393.5kJ and -286kJ respectively.
27. **What is an intensive property? Pick out the intensive property from i) Mass ii) Density and iii) Internal energy**
28. Write the Gibb's equation using $\Delta G$, how you predict whether a reaction at a given temperature is spontaneous or non-spontaneous?

**29.** Explain the measurement of ΔH by calorimetry method

30. Give an example each for i) Isolated system ii) External property iii) Intensive property

31. Calculate the enthalpy of combustion of methane from following data

$C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H = -393.5\ kJmol^{-1}$

$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$ $\Delta H = -285.83 kJmol^{-1}$

$C(s) + 2H_2(g) \rightarrow CH_4(s)$ $\Delta H = -75.16\ kJmol^{-1}$

**32. What is entropy? Write Gibbs equation.**

33. Calculate the standard enthalpy of formation of $CH_3OH$ (l). If standard enthalpy of combustion of methanol, carbon and hydrogen are $-726 kJmol^{-1}$, $-393 kJmol^{-1}$ and $-286 kJmol^{-1}$ respectively.

34. What is an intensive property? Give an example.

35. What is the effect of entropy for a reaction, $H_2(g) \rightarrow 2H(g)$

36. Calculate the standard enthalpy of formation of benzene. Given that the enthalpies of combustion of carbon, hydrogen and benzene are $-393.5 kJmol^{-1}$, $-285.83\ kJmol^{-1}$ and $-3267\ kJmol^{-1}$ respectively.

37. What is an extensive property? Give an example.

38. State Hess's law of constant heat summation

39. Write Gibb"s free energy equation

40. What is extensive property ? Give one example.

41. Calculate the standard enthalpy of formation of $CH_3OH$ form the following data.

$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$ $\Delta H = -285.83 KJmol^{-1}$

$C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H = -393.5\ KJmol^{-1}$

$CH_3OH(l) + 3/2\ O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$ $\Delta H = -726.0\ KJmol^{-1}$

42. State first law of thermodynamics. Write its mathematical form.

43. What is entropy? What happens to entropy when ice melts?

44. Write the relation between enthalpy change and internal energy change.

45. Define entropy.

46. Calculate the enthalpy of combustion of methyl alcohol ($CH_3OH$) from the given data :

47. $\Delta H_{f(H_2O)} = -285.83\ KJmol^{-1}$, $\Delta H_{f(CO_2)} = -393.5\ KJmol^{-1}$, $\Delta H_{f(CH_3OH)} = -238.86\ KJmol^{-1}$,

48. Define the enthalpy of solution with an example.

49. State First law of thermodynamics.

50. What is Spontaneous reaction ?

51. Calculate the enthalpy of formation of Benzene from the following data :

$C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H = -393.5 kJ$

$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$ $\Delta H = -285.9 kJ$

$C_6H_6(l) + 15/2\ O_2(g) \rightarrow 6CO_2(g) + 3H_2O(l)$ $\Delta H = -3264\ kJ$

52. What is entropy?

53. Calculate the total work done when one mole of a gas expands isothermally and reversibly from anintial volume of $10dm^3$ to a final volume of $20dm^3$ at 298K

54. What is an intensive property? Give an example.

**55. State Hess's law of constant heat summation.**

56. Calculate the standard enthalpy of formation of $CH_3OH(l)$ from the data.

$CH_3OH(l) + 3/2\ O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$ $\Delta H = -726\ KJmol^{-1}$

$C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H = -396\ KJmol^{-1}$

$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$ $\Delta H = -286\ KJmol^{-1}$

57. Define entropy? What happens to the entropy when liquid water changes to vapour state?

58. What is isolated system? Give an example

59. Calculate the standard enthalpy of formation of benzene from the following data.

60. Calculate $\Delta G^o$ for the conversion of oxygen to Ozone is 2.47x $10^{-29}$. (Given $R = 8.314 JK^{-1}mol^{-1}$)

# EQUILIBRIUM

1. Write the conjugate base of $HCO_3^-$ ?
2. **What is Homogeneous equilibrium? Give an example?**
3. State Lechatelier's principle?
4. A solution of $CH_3COONa$ is basic. Explain?
5. What is a Bronsted acid? Give an example.
6. Define ionic product of water?
7. Mention three characteristics of chemical equilibrium?
8. **The $[H^+]$ in an aqueous solution is $2.0 \times 10^{-3}$M. What is its $P^H$?**
9. **The values of $K_p$ for a reaction at 300K is $4 \times 10^{10}$.Calculate standard free energy change?**
10. The value of ionic product of water at 298K is $1 \times 10^{-14}$M. What is its $[H^+]$? State Lechatelier's principle?
11. For equilibrium $BaCO_3(s) \leftrightarrow BaO(s) + CO_2(g)$ i) Write the expression for Kp
12. ii) What is the effect of increase pressure on the above equation?
13. What is the effect of catalyst on equilibrium of reversible reactions?
14. Calculate the $P^H$ of solution whose hydrogen ion concentration is $2.5 \times 10^{-4}$M.
15. What is homogeneous equilibria? Write $K_p$ and $K_c$ for the reaction $PCl_5(g) \leftrightarrow PCl_3(g) + Cl_2(g)$
16. **What is meant by Buffer solution?**
17. Express $K_c$ for the following equation. $H_2(g) + I_2(g) \leftrightarrow 2HI(g)$
18. **State Lechatelier's principle.**
19. Explain common ion effect with an example.
20. Show that $P^H + P^{OH} = 14$
21. The concentration of hydrogen ion in a sample of soft drink is $3.8 \times 10^{-3}$. What is $P^H$ and $P^{OH}$
22. Define Lewis concept of acids and bases.
23. Write the relationship between $K_p$ and $K_c$
24. Write any three applications of equilibrium constant.
25. State Lechatelier's principle.
26. Define Bronsted-Lowry concept of acids and bases. Illustrate with an equation.
27. Give two examples for strong electrolytes.
28. What is chemical equilibrium?
29. Write any four applications of equilibrium constants Kc or Kp
30. What do you mean by a reversible process?
31. What is common ion effect? Give an example.
32. What are conjugate acid-base pairs? Explain with an example.
33. Define buffer action?
34. What is Heterogeneous equilibrium?
35. Write any three characteristics of equilibrium constants $K_c$ or $K_p$.
36. Explain Lewis concept of acid and base with an example.
37. State Le-Chatlier's principle. What is the effect of change of temperature?
38. What happens to the $P^H$ of water when solid $NH_4Cl$ is dissolved in it and why?
39. Aqueous solution of ammonium chloride is acidic or basic?
40. What is Homogenius equilibrium? Give an example
41. State Le-chatlier's principle
42. Write $K_c$ for the reaction $N_2 + 3H_2 \leftrightarrow 2NH_3$
43. What is common ion effect? Give an example
44. Give an example for acidic buffer
45. Write the relationship between solubility and solubility product for $AB_2$ type salt.
46. The $P^H$ of boiling water is 6.90. Is the boiling water acidic or neutral?
47. Mention the conjugate acid for $H_2O$
48. Write the expression for the equilibrium constant ($K_c$) for the reaction $Ni(s) + 4CO(g) \leftrightarrow Ni(CO)_4(g)$
49. How do you predict the direction of reaction in terms of equilibrium constant ($K_c$) and the reaction quotient ($Q_c$)
50. Explain the effect of pressure on the equilibrium $CO(g) + 3H_2(g) \leftrightarrow CH_4(g) + H_2O(g)$
51. Assuming complete dissociation, calculate the $P^H$ value of 0.005M NaOH
52. **What is common ion effect? Give an example.**
53. **Write Henderson-Hasselbalch equation for acidic buffer**
54. Give an example for liquid-vapour equilibrium
55. **$PCl_5$, $PCl_3$ and $Cl_2$ are at equilibrium at 500K and having concentration 1.59M $PCl_3$, 1.59M $Cl_2$ and 1.41M $PCl_5$, Calculate the $K_c$ for the reaction.**

56. State Le-chatleir's principle.
57. What is Conjugte acid-base pair? Give one example.
58. Show that $p^H + p^{OH} = p^{Kw} = 14$
59. Give the relation between solubility and solubility product of $A_2B$ type salt.
**60.** Write the value of ionic product of water at 298K
61. What are Buffer solutions? Give one example for an acidic buffer.
62. State Le-Chatelier's principle
63. Write the expression of equilibrium constant $K_p$ for the gaseous reaction $aA+bB \rightarrow cC+dD$
64. What is common ion effect? Give an example.
65. Explain Bronsted-Lowry theory of acids and bases.
66. When does reaction quotient is equal to equilibrium constant.
**67.** Give an example for solid-liquid equilibrium.
68. Prove that $P^H + P^{OH} =$
69. What is the heterogenius equilibrium? Give an example.
70. Write the relation between $K_p$ and $K_c$ for $H_2(g) + I_2(g) \rightarrow 2HI(g)$
71. Define acid and base according to Bronsted –Lowry concept.
72. Calculate the $P^H$ of 0.001M HCl
73. What is buffer solution?
**74.** What is hydronium ion?
**75. For the hydrolysis of sucrose the equilibrium constant $K_C$ is $2 \times 10^{-3}$ at 300K. Calculate $\Delta G^0$ at 300K.**
76. Calculate the $P^{OH}$ of a solution obtained when 0.05 mol $NH_4Cl$ is added and dissolved in0.025Mammonia solution (Given $K_b$ for ammonia = $1.77 \times 10^{-5}$)
77. What is solubility product?
78. Derive Henderson-Hasserbalch equation for acidic buffer.
**79.** What is the $P^H$ of 1M NaOH?
80. State Lechatlier's principle. What is the effect of temperature on the equilibrium when the forwardreaction is exothermic.
81. Relate the $K_p$ and $K_c$ for the equilibrium $H_2(g) + I_2(g) \leftrightarrow 2HI(g)$
82. What is common ion effect? Explain with an example.
83. What is buffer solution? Give an example for acidic buffer.
84. Write the conjugate acid for
**85.** Give an example for a reaction for which $K_p = K_c$
86. Write the expression for $K_p$ and $K_c$ for the reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
87. State Lechatelier's principle.
88. If the equilibrium constant for the reaction $H_2(g) + I_2(g) \leftrightarrow 2HI(g)$ is 100. What is the equilibriumconstant for the reaction $2HI(g) \leftrightarrow H_2(g)\ I_2(g)$?
89. Define acid and base on the basis of Bronsted-Lowry concept.Give the conjugate base of $H_2O$.
90. Calculate the $P^H$ of 0.001M HCl, assuming complete ionization.

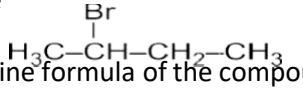
## REDOX REACTIONS

1. What is the oxidation number of S in $NaHSO_4$?
2. Balance the following redox equation by oxidation number method.
3. $MnO + H_2S \longrightarrow S + Mn^{2+}$
4. What is the oxidation number of oxygen in peroxides?
5. **What is the oxidation number of S in $H_2S_2O_7$?**
6. Balance the following chemical equation by oxidation number method in acidic medium
7. **What is the oxidation number of Mn in $MnO_2$** ?
8. Balance the following equation using oxidation number method in acidic medium.
9. Define oxidation number?
10. Give oxidation number is terms of electronic concepts.
11. Balance the chemical equation by oxidation number method ( in acidic medium) $Fe^{+2} + MnO_4^- \rightarrow Fe^{+3} + Mn^{2+}$
12. **Mention the oxidation number of Mn in $KMnO_4$**
13. **Balance the redox equation by oxidation number method in acidic medium.**
    **$Cr_2O_7^{2-} + SO_3^{2-} \rightarrow Cr^{3+} + SO_4^{2-} + H_2O$**

14. Calculate the oxidation number of oxygen in $Na_2O_2$
15. Consider the element Na , F and I
16. Identify the element that exhibits only negative oxidation states
17. Identify the element that exhibits only positive oxidation state
18. Identify the element that exhibits both positive and negative oxidation state.
19. What is oxidation in terms of electron transfer?
20. Balance the following redox reaction by oxidation number method
21. Assign the oxidation number of oxygen in $O_2F_2$
22. Balance the following redox reactions using oxidation number method.
    Mn + → $MnO_2$ + Br ( in acidic medium)
23. What is the oxidation state of Nitrogen in nitric acid ($HNO_3$)
24. Balance the redox reaction using oxidation number.
25. Give the oxidation state of Calcium in $CaO_2$.
26. **Balance the following redox reaction by oxidation number method $MnO_2 + Br^- \rightarrow Mn^{+2} + Br_2 + H_2O$ (acid medium)**
27. Give an example for decomposition reaction.
28. Balance the following redox reactions by oxidation number method
29. Identify the element in the compound $K_2Cr_2O_7$ showing negative oxidation number.
30. What is the oxidation number of Cl in $KClO_3$?
31. Write the separate equations for the oxidation and reduction reactions occurring in the given redox reaction.
    $2Fe + HCl \rightarrow FeCl_2 + H_2$
32. Calculate the oxidation number of Mn in $MnO_4^-$.
33. Balance the following redox reaction by using oxidation number method in acidic medium Mn + → $MnO_2$ + Br
34. Mention the oxidation number of Mn in $MnO_4^-$ ion.

## SOME BASIC PRINCIPLES AND TECHNIQUES

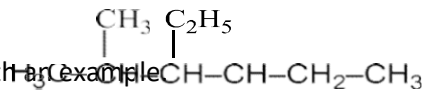
1. **Describe the experiment to estimate the percentage of Carbon and Hydrogen in an organic compound.**
2. Explain i) Sublimation method of separating organic compound in a mixture.
3. ii) Distilling method of separating organic compounds.
4. **What is meant by inductive effect? Give an example of a group causing +I effect?**
5. **What is functional isomerism? Give an example**
6. What are electrophiles? Give an example.
7. With a neat labeled diagram describe the estimation of carbon and hydrogen in an organic compound?
8. Define functional isomerism? But-1-ene and But-2-ene exhibit which type of isomerism?
9. Write the functional group of i) Aldehyde ii) carboxylic acids?
10. Give the IUPAC name of the following :
11. Mention the name of any two methods of purification of organic compounds
12. Explain Homolysis and Heterolysis with an example
13. What is the functional isomerism? Explain with an example
14. Which metal is used to prepare Lassaigne's extract solution?
15. Describe the detection of carbon and hydrogen.
16. **Write the IUPAC names for the following.**
    $CH_3\text{-}C(CH_3)_2CH_2\text{-}CH\text{-}(CH_3)_2$ $CH_3\text{-}CO\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}COOH$
17. For the molecule



18. Write the bond-line formula of the compound
19. What is the hybridization of carbon attached to bromine?
20. How many sigma bonds are present in it
21. What is functional isomerism? Give example
22. How can halogen present in an organic compound be estimated by carius method?
23. **Explain the preparation of Sodium fusion extract. Which metal is used to prepare lassaigne extract solution ?**
24. Is isobutene a straight chain or branched chain hydrocarbon?
25. Identify the type of isomerism exhibited by i) n-butane and isobutene ii) Propanone and propanal
26. Write the IUPAC names of i) $CH_3\text{-}CH_2\text{-}CH\ (CH_3)\text{-}CH_2\text{-}OH$ ii) $CH_3\text{-}CH{=}CH\text{-}CH_3$
27. Give the bond line structures for But-1-ene
28. **Define electromeric effect. Give an example**.
29. Mention any two differences between inductive effect and Mesomeric effect.

30. Give one example of an atom or group which shows I-effect.
**31. How is percentage of sulphur estimated in an organic compound?**
**32. Mention any two methods used for the purification of organic compound.**
**33. What is meant by homolysis of a covalent bond.**
34. Which effect involves the displacement of electron pair under the influence of an attacking reagent?
35. How is percentage of sulphur estimated in an organic compound by Carius method?
36. Give IUPAC name of the following i) $CH_3$-$CH_2$-CH=$CH_2$ ii) $CH_3$-C($CH_3$)$_2$-$CH_2$-$CH_2$-$CH_3$
37. Write short notes on thin layer chromatography (TLC)
**38.** What is catenation?
39. Mention the best and latest technique for isolation, purification and separation of organic compound.
40. Give the IUPAC name and bondline formula for the compound. $CH_3$-CH=CH-$CH_2$-$CH_3$
41. For the compound CH ≡ C-CH = CH–$CH_3$
42. Identify the number of sigma and pi-bond
43. Write the bondline formula for the compound
44. Mention the compound is saturated or unsaturated.
45. Give any two differences between inductive effect and Electromeric effect
46. Write the principle involved in the estimation of carbon and hydrogen present in the organic compound by Liebig's method.
47. Explain Functional isomerism with an example.
48. Describe Crystallisation
49. Expalin chain isomerism with an example
**50. Describe carius method for the estimation of halogen**
**51. What is homologoues series?**
52. Write the IUPAC name of $Cl_2$-CH-$CH_2$-$CH_2$OH
53. Explain functional group isomerism with suitable example.
54. Write a bondline formula for a compound N≡C-CH(OH)-C≡N
55. What is positive resonance (+R) effect? Illustsrate with an example.
56. Describe the estimation of sulphur by Carius method.

57. Name a suitable technique of separation of the components from a mixture of aniline and water
58. Indicate the colour formed in Lassaigne‟s test for the detection of nitrogen.
59. What is the functional group of alcohol?
60. Give the chain isomers of Butane ($C_4H_{10}$)
61. What is Electromeric effect? Which type of electromeric effect is shown by $H^+$
62. Explain the free radical mechanism of Chlorination of Methane.
63. Mention one use of chromatorgraphy.
64. Give any two differences between inductive effect and Electromeric effect
65. Explain the functional isomerism with an example
66. Write the IUPAC name of ($CH_3$)$_2$-CH-$CH_2$-$CH_2$-OH
67. Write the principle involved in the estimation of halogen by carius method.
68. How is nitrogen detected using sodium fusion extract?(Lassaigne's reagent)

69. Write the IUPAC name of 
70. Define position isomerism with an example
71. Explain the estimation of carbon and hydrogen by Liebig's method. Write the calculation method.
**72. Write the differences between inductive effect and mesomeric effect.**
73. On complete combustion 0.246g of an organic compound gave 0.198g of carbon dioxide and 0.101g of water. Determine the percentage composition of carbon and hydrogen in the compound.
**74.** Write the bond line formula for 3-chloro octane.
75. Write the principles involved in the estimation of i) Halogens ii) Sulphur present in an organic compound by Carius method.
76. Describe the estimation of carbon and Hydrogen by Liebig‟s method
77. Name the element estimated by Kjeldhal‟s method. What is cracking ?
**78.** Which is the highly stable conformation of ethane among staggered and eclipsed form
79. Write any two differences between inductive effect and electromeric effect
80. Explain Functional isomerism with example.

**81. What is carbocation? Mention the stability order among $1^0$, $2^0$ and $3^0$ carbocations.**
82. Name the method used to separate the liquids with small difference in boiling point
**83. Write the principle and formulae of calculation for the determination of percentage of nitrogen by Kjeldahl's method.**
84. How do you detect sulphur using Lassaigne's extract?
**85.** Draw the bond line structure of $(CH_3)_2CH\text{-}CH_2\text{-}CH_2\text{-}OH$
86. What type of isomerism the following pairs of compounds exhibit?
87. Propan-1-ol and propan-2-ol ii) Pentane and 2-methyl butane.
88. Explain the principle and calculation involved in the estimation of carbon in the orgnic compound,
**89. Using sodium fusion extract (Lassaigne"s extract) how do you detect nitrogen present in the organiccompound.**
**90. How are free radicals formed?**
**91. On complete combustion, 0.246g of an organic compound gave 0.198g of carbondioxide and 0.1014g ofwater. Determine the percentage composition of carbon and hydrogen in the compound.**

## HYDROCARBONS

**1.** Mention the catalyst in Friedel-craft"s alkylation?
**2. Explain the mechanism of chlorination of methane?**
3. Explain nitration of benzene?
4. How is methane converted to Methanol?
5. How is ethyne prepared from calcium carbide?
6. Explain the reaction between propene and HBr.
**7.** Explain the mechanism of chlorination of methane with equations?
8. Write the general formula of alkenes.
**9. Describe the mechanism of chlorination of Benzene with equations.**
10. State Markownikov"s rule.
11. Draw staggered conformation of ethane?
12. Name the products formed when ethyne is passed through red hot iron tube?
13. What happens when phenol is heated with zinc dust?
**14.** Explain Friedel-craft"s reaction with an example.
15. How do you prepare Ethyne from calcium carbide?
16. Describe the mechanism of chlorination of Benzene
17. State Markovnikoff's rule?
**18.** Draw the staggered conformation of ethane?
19. Mention the product obtained due to cyclic polymerization of ethyne?
**20. Explain the mechanism involved in the nitration of benzene?**
21. How are alkenes prepared from unsaturated hydrocarbons? Give equation.
**22. Explain Wurtz reaction with an example.**
23. How the ozonolysis taking place? Explain using alkene
**24.** Why are alkenes reactive in nature?
25. Explain the preparation of alkane by Kolbe"s electrolytic method?
26. What is pyrolysis? Give example.
27. Explain the mechanism of chlorination of benzene.
28. Mention the conditions for aromaticity.
**29.** Give any two lists to distinguish between alkane and alkene.
30. Explain the mechanism of nitration of benzene
31. State Markownikoffs rule
32. Draw the structure of cis-isomer of 2-butene.
33. Give the IUPAC name and bond line formula for the compound
**34.** The simple compounds from which polymers are made are called as $H_3C\text{–}CH = CH\text{–}CH_2\text{–}CH_3$
35. Explain Wurtz reaction taking bromo ethane as example. Write the equation.
36. How benzene in prepared from phenol? Write the equation.
37. Explain the mechanism of Friedel craft's alkylation of benzene.
38. What is the product obtained by the cyclic polymerization of ethane?
39. Complete the following equation. HCOOH →
40. Draw the Newman projection for staggered conformation of ethane.
41. Write the major product formed in the following reaction
42. Name the product formed when phenol is heated with zinc dust
43. State Markownikoff's rule with an example.

44. Explain the mechanism of chlorination of methane
45. Write the Geometrical isomers of But-2-ene
46. How do you convert Benzene into nitrobenzene?

47. **Give the three conditions for aromaticity**.
48. Draw the staggered conformation of ethane.
49. **What is a cis-isomer? Give an example**
50. How phenol is converted to Benzene?
51. Name the reagent used in dehydro halogenation of alkyl halides**.**
52. How is benzene converted into toluene? Write the chemical equation.
53. **Write the Saw horse eclipsed and staggered representation of ethane.**
54. Complete the following reactions :
55. $CH_4 + Cl_2 \rightarrow + HCl$
56. $CH_4 + O_2 \rightarrow$
57. What is the hybridization of carbon in alkanes and shape of alkanes?
58. What are benzenoids ? Give an example.
59. Name the product formed when phenol vapours are passed over heated zinc dust. Write the chemical equation.
60. Alkanes are not soluble in water. Give reason.
61. Write the two geometrical isomers of but-2-ene.
62. What happens when ethyne is passed through red hot iron tube? Give equation.
63. **Write the equations for the steps involved in the mechanism of chlorination of benzene.**
64. Write any two conditions for the aromaticity of an organic molecule.

| | **Marks** | **Part – A**<br>**15 X 1 = 15M**<br>**5 X 1= 5M** | | **Part – B**<br>$\frac{5}{9}$**X 2 = 10M** | **Part – C** | **Part – D** | **Part – B**<br>$\frac{4}{8}$**X 3 = 12M** |
|---|---|---|---|---|---|---|---|
| | | | | | $\frac{3}{6}$**X 3 = 9M** | | |
| **<u>Physical chemistry</u>**<br>Some basic concepts | **11** | 1,2 | | | 35 | | 45,46 |
| Structure of atom | **13** | 3 | | | 36,37 | | 47,48 |
| Thermodynamics | **14** | 7,8 | 17 | 21 | 38 | | 49,50 |
| Equilibrium | **17** | 9,10 | 18 | 22 | 39,40 | | 51,52 |
| | | | | | $\frac{3}{5}$**X 3 = 15M** | | |
| **<u>Inorganic chemistry</u>**<br>Classification of elements | **06** | 4 | | 23 | 30 | | |
| Chemical bonding | **16** | 5,6 | 16 | 24,25,26 | 31,32,33 | | |
| Redox reactions | **06** | 11 | | 27 | 34 | | |
| | | | | | | $\frac{2}{4}$**X 5 = 10M** | |
| **<u>organic chemistry</u>**<br>Some basic principles | **17** | 12,13 | 19 | 28,29 | | 41,42 | |
| Hydrocarbons | **15** | 14,15 | 20 | | | 43,44 | |