B.Sc., CHEMISTRY

SUBJECT=THERMODYNAMICS OF IDEAL AND NON-IDEAL SOLUTIONS

SUB CODE=CH616S,

SEMESTER=VI

STAFF=T.ANTONY SANDOSH

UNIT 1

One marks

1. The colligative effect of an electrolyte solution is always--------- (greater) than that of a nonelectrolyte of the same molal concentration**.**
2. A colligative property depends upon (a) chemical nature of the particles (b) size of the particles (c) number of particles (d) temperature of the solution Answer. (c)
3. When a non-volatile solute is dissolved in a pure solvent, the vapour pressure of the pure solvent (a) increases (b) decreases (c) remains the same (d) none of these Answer. (b)
4. A real solution is that which (a) obeys Raoult's law (b) does not obey Raoult's law (c) obeys Henry's law (d) does not obey Henry's law Answer. (b)
5. A liquid boils when its vapour pressure becomes equal to (a) one atmospheric pressure (b) zero (c) very high (d) very low Answer. (a)
6. The addition of a non-volatile solute _____ the vapour pressure (a) enhances (b) lowers (c) diminishes (d) none of these Answer. (b)
7. Molal elevation constant is the boiling point elevation when _____ of the solute is dissolved in one kg of the solvent (a) one gram (b) one kg (c) one mole (d) none of these Answer. (c)
8. When a non-volatile solute is added to a solvent, the freezing point of the solvent _____. (a) increases (b) remains the same (c) decreases (d) none of these Answer. (c)
9. Freezing point depression is measured by (a) Beckmann's method (b) Rast's camphor method (c) both (d) none of these Answer. (c)

10.The colligative effect of an electrolyte is always _____ that of a non-electrolyte of the same molal concentration. (a) greater (b) smaller (c) equal to (d) none of these Answer. (a)

11.The ratio of the colligative effect produced by an electrolyte solution to the corresponding effect for the same concentration of a non-electrolyte solution is known as (a) degree of dissociation (b) degree of association (c) activity coefficient (d) van't Hoff factor Answer. (d)

12. Abnormal molecular masses are obtained when there exists (a) dissociation of molecules (b) association of molecules (c) either of the two (d) none of these Answer. (c)

13. The law of the relative lowering of vapour pressure was given by (a) van't Hoff (b) Ostwald (c) Raoult (d) Henry Answer. (c)

14.Which of the following is a colligative property? (a) molar refractivity (b) optical rotation (c) depression in freezing point (d) viscosity Answer. (c)

15. Which of the following is not a colligative property? (a) relative lowering of vapour pressure (b) surface tension (c) elevation in boiling point (d) depression in freezing point Answer. (b)

16. The mole fraction of the solvent in a solution of non-volatile solute is 0.950. The relative lowering of vapour pressure is (a) 0.050 (b) 0.020 (c) 0.010 (d) 0.095 Answer. (a)

17. An aqueous solution of Sodium chloride in water has vapour pressure (a) equal to that of water (b) more than that of water (c) less than that of water (d) none of these Answer. (c)

18. Which of the following is a colligative property? (a) Kb (b) Kf (c) ΔTf (d) degree of ionisation Answer. (c)

19. Which of the following 0.05 M aqueous solution will have the highest boiling point? (a) glucose (b) NaCl (c)K 2SO4 (d) Al(NO3)3 Answer. (d)

28. The depression in freezing point of an unknown solution is equal to the depression in freezing point of 0.1 molal aqueous solution of urea. The concentration of the unknown solution is (a) 0.1 M (b) 0.2 M (c) 0.5 M (d) 1.0 M Answer. (a)

29. The study of depression in freezing point of a solution is called (a) osmotic pressure (b) ebullioscopy (c) cryoscopy (d) none of these Answer. (c)

30.The colligative effect of an electrolyte solution is always _____ that of a non-electrolyte of the same molal concentration. (a) equal to (b) lesser than (c) greater than (d) none of these Answer. (c)

31. Which one of the following solutions will boil at highest temperature? (a) 1% glucose (b) 1% urea (c) 1% KCl (d) 1% K2SO4 Answer. (d)

32. At high altitudes, water boils at a temperature which is (a) higher than the normal boiling point (b) lower than the normal boiling point (c) is equal to normal boiling point (d) none of these Answer. (b)

33. The value of van't Hoff factor is _____ for an electrolyte
(a) greater than one (b) less than one (c) equal to one (d) equal to zero Answer. (a)

Two, Three marks

1. Calculate the vapour pressure lowering caused by the addition of 100 g of sucrose (mol mass = 342) to 1000 g of water if the vapour pressure of pure water at 25°C is 23.8 mm Hg.
2. A current of dry air was passed through a solution of 2.64 g of benzoic acid in 30.0 g of ether (C2H5OC2H5) and then through pure ether. The loss in weight of the solution was 0.645 g and the ether 0.0345 g. What is the molecular mass of benzoic acid ? SOLUTION
3. 0.440 g of a substance dissolved in 22.2 g of benzene lowered the freezing point of benzene by 0.567°C. Calculate the molecular mass of the substance. (Kf = 5.12°C mol–1)
4. 1.250 g of naphthalene was dissolved in 60 cm3 of benzene and freezing point of the solution was found to be 277.515 K, while that of benzene 278.495 K. Density of benzene =0.880 g cm–3, Kf =5.1 K per 1000 g benzene. Calculate the molecular mass of naphthalene.
5. Define or explain the following terms : (a) Colligative properties (b) Raoult's law (c) Molecular mass (d) Boiling point elevation (e) Boiling point constant (f) Molal Elevation constant (g) Freezing point depression (h) Electrolytes
6. State Raoult's law.
7. A solution of 8.585 g of sodium nitrate in 100 g of water freezes at –3.04°C. Calculate the molecular mass of sodium nitrate and account for the abnormal value. (Kf for water = 1.86 K mol–1) Answer. (b) 52.52
8. A 0.1 molar solution of urea at room temperature freezes at – 0.25°C at normal pressure. What would be approximate freezing point of 0.1 molar aqueous solution of aluminium chloride at room temperature assuming complete ionization? What is the principle underlying the calculation? Answer. – 0.25°C 4.
9. (a) Discuss van't Hoff theory of dilute solutions. What is van't Hoff factor? (b) The values of molal elevation constant and molal depression constant for water are 0.52 and 1.86°C kg mol–1 respectively. If the elevation in boiling point by dissolving a solute is – 0.2°C, what will be the depression in freezing point of this solution? Answer. (b) 0.71°C
10. When a certain amount of solute is added to 100 g of water at 25°C, the vapour pressure reduces to onehalf of that for pure water. The vapour pressure of water is 23.76 mm Hg. Find the amount of salt added. Answer. 2.78 moles
11. 0.3 × 10–3 kg of camphor (molar mass 154.4 × 10–3 kg mol–1) when added to 25.2 × 10–3 kg of chloroform raised the boiling point of the solvent by 0.299 K. Calculate the molar elevation constant of chloroform. Answer. 3.88°C
12. How is the molecular mass of a solute determined from elevation of boiling point? (b) Calculate the value of Kb for water, given that pure water boils at 100°C and the latent heat of its vaporization is 540 cal g–1. Answer. (b) 0.512°C

13. (a) Derive a relationship between the elevation in boiling point of a solution and the mole fraction of the solute from thermodynamic consideration. (b) The molal elevation constant (Kb) and the boiling point for carbon tetra chloride are 5.02 deg/molal and 76.8°C respectively. Calculate the boiling point of 1.0 molal solution of naphthalene in carbon tetrachloride. Answer. (b) 81.82°C
14. When 0.946 g of a sugar is dissolved in 150 g of water, the resulting solution is observed to have a freezing point of – 0.0651°C. What is the molecular mass of the sugar? Kf for water is 1.86°. Answer. 180
15. A freezing point depression of 1/200 molal solution of sodium sulphate in water was found to be 0.0265 K. Calculate the degree of dissociation of the salt at this concentration (Kf for water is 1.86 K mole–1) Answer. 0.404
16. Why the boiling point 0.1 m BaCl2 solution is more than 0.1 m NaCl solution? 12. Show that Raoult's law is a special case of Henry's law
17. Why benzoic acid dissolved in benzene shows a lesser value of osmotic pressure than expected one, but 0.1 molar HCl shows greater depression in freezing point than 0.1 molar acetic acid.
18. Explain the following : (a) Vapour pressure of a liquid does not depend upon the size of the container. (b) Boiling point of a liquid increases on adding non-volatile solute in it. (c) Vapour pressure of a liquid varies with temperature.
19. (a) Define Rauolt's law. Derive Henry's law thermodynamically. (b) Give physical significance of chemical potential.
20. Osmotic pressure and freezing point depression have the same origin. Explain.
21. (a) What are isotonic solutions? Explain .(b) Write a note on van't Hoff factor.
22. (a) Explain the term lowering of vapour pressure and relative lowering of vapour pressure. (b) What are the colligative properties? Explain. Why electrolytes have abnormally high values of colligative properties?
23. State and explain Raoult's law and Henry's law. Show that in any solution if the solvent obeys Raoult's law, the solute obeys Henry's law.
24. Describe a method for determining the molar mass of a non-volatile solute by the relative lowering in vapour pressure of the solvent.
25. What is molal depression constant? How is it related to the latent heat of fusion.
26. Write a short note on 'Elevation in boiling point'.
27. Explain giving reasons : (a) Addition of non-volatile solute lowers the freezing point and elevates the boiling point of a solvent. (b) Equimolar solutions of sucrose and sodium chloride in water are not isotonic.
28. 53.94 g of a substance of molecular mass 182 is dissolved in 1000 g of water at 20°C. At this temperature the vapour pressure of water is 17.5 mm Hg. Calculate the vapour pressure of this dilute solution. Answer. 17.4 mm Hg

29. What will be the boiling point of solution containing 0.6 g of urea (molecular mass = 60) in 2.5 g of water? (Boiling point of water = 373 K; Kb = 0.52 K mol–1 kg–1) Answer. 0.208 K
30. Explain ultrapurity and controlled impurity.
31. What is Osmosis and Osmotic pressure?
32. Explain the concept of reverse Osmosis.
33. Write about phase rule and explain the terms involved in it.
34. Explain liquid-liquid phase diagrams.
35. What is azeotropic mixture?
36. Explain fractional and azeotropic distillation.
37. Define CST.
38. Define UCST.
39. Define LCST.
40. Give some partially miscible liquid pairs in case of CST.
41. State lever rule.

UNIT 2

One marks

1. ---------- (Chemical equilibrium) may be defined as: the state of a reversible reaction when the two opposing reactions occur at the same rate and the concentrations of reactants and products do not change with time.
2. At equilibrium the forward reaction rate --------- (equals) the reverse reaction rate.
3. ---------- (Law of Mass action) states that : the rate of a chemical reaction is proportional to the active masses of the reactants.
4. The thermodynamic criterion for spontaneous change at constant temperature and pressure is ---------- ($\Delta G<0$).
5. The criterion for chemical equilibrium is, at constant temperature and pressure $\Delta G=0$.
6. -------- is a substance that accelerates a reaction without itself appearing in the overall chemical equation.
7. The equilibrium composition of an exothermic reaction shift towards----------.(reactants)
8. The equilibrium composition of an endothermic reaction shift towards----------.(products)
9. If $\Delta G°$ is --------- (negative), log K must be positive and the reaction proceeds spontaneously in the forward reaction.
10. If $\Delta G°$ is----------(positive), log K must be negative and K is less than one. The reverse reaction is then spontaneous.
11. If $\Delta G° =$----------(0) , log K = 0 and K = 1. The reaction is at equilibrium.
12. A chemical system is at equilibrium (a) when the rate of the forward reaction becomes zero (b) when the rates of the forward reaction and the reverse reaction are equal (c) when all of the reactants have been used up (d) when the rates of the forward reaction and the reverse reaction are both zero Answer. (b)

13. Equilibrium reactions are characterised by (a) going to completion (b) being non-spontaneous (c) the presence of both reactants and products in a definite proportion (d)(a) and (b) Answer. (c)
14. A dynamic equilibrium (a) is when the rate of the forward reaction is equal to the rate of the reverse reaction (b) is a form of static equilibrium (c) only occurs in chemical equilibrium (d) involves radioactivity Answer. (a)
15. Which of the following represent equilibrium constants? (a) weak acid or weak base dissociation constant (b) Kc for a reaction (c) concentration of a strong acid in water (d)(a) and (b) represent equilibrium constants Answer. (d)
16. If the equilibrium constant for a reaction is large, what can be said about the reaction? (a) very little product is formed (b) very little reactant remains at equilibrium (c) the reaction goes to completion (d) large quantities of reactants will remain at equilibrium Answer. (b)
17. Which of the following will change the equilibrium constant for a reaction mixture? (a) changing temperature (b) adding an inert gas (c) increasing pressure by decreasing volume (d) all of these Answer. (a)
18. A reaction is at equilibrium. What happens to the value of the equilibrium constant if an additional quantity of reactant is added to the reaction mixture? (a) the equilibrium constant is shifted to favour production of more reactant (b) the equilibrium constant is shifted to favour production of more product (c) the equilibrium constant is increased (d) the equilibrium constant stays the same Answer. (d)
19. What effect does a catalyst have on the equilibrium position of a reaction? (a) a catalyst favours the formation of products
    (b) a catalyst favours the formation of reactants (c) a catalyst does not change the equilibrium position of a reaction (d) a catalyst may favour reactants or product formation, depending upon the direction in which the reaction is written Answer. (c)

20. Which of the following can change the value of the equilibrium constant for a reaction (a) changing the concentration of the reactants (b) adding a catalyst (c) changing the solvent (d) removing the products as they are formed Answer. (c)

21. Which of the following changes the value of K? (a) adding reactant (b) adding product (c) changing temperature (d) adding a catalyst Answer. (c)

Two, Three marks

1. At 500°C, the reaction between N2 and H2 to form ammonia has Kc = 6.0 × 10–2. What is the numerical value of Kp for the reaction?
2. Explain the variation of Gibbs energy of a reaction mixture with progress of the reaction.
3. Explain the variation of ΔG with composition.
4. Explain reaction quotient for the conversion of glucose-6-phosphate into fructose-6-phosphate.

5. Write the reaction quotient for an esterification reaction.
6. Calculate the equilibrium constant of the reaction $N_2(g)+3H_2(g)\rightarrow 2NH_3(g)$ at 25^oC, given that $\Delta G=-32.90\ kjmol^{-1}$
7. Explain thermodynamic criteria of spontaneity.
8. Write a note on standard reaction Gibbs energy.
9. Give Le Chatelier's principle.
10. Explain the effects of a catalyst in an equilibrium reaction.
11. Explain the effects of temperature in an equilibrium reaction.
12. Explain the effects of compression in an equilibrium reaction.

UNIT 3

One marks

1. The higher the pH, the -------- (lower) the concentration of hydronium ions in the solution.
2. Most(weak) acids have the value of Ka = -------(<1) and pKa =--------(>0).
3. Few(strong) acids have the value of pKa = -------(<0) and Ka =--------(>1).
4. -------- is Henderson –Hesselbalch equation.
5. --------- is an example for buffer mixture.
6. What is common ion effect?
7. An acid buffer is which one stabilizes the pH of the solution -------(below) 7.
8. An acid buffer is which one stabilizes the pH of the solution -------(above) 7.
9. According to Bronsted-Lowry concept, an acid is a substance that (a) accepts a proton (b) releases a proton (c) accepts an electron pair (d) releases an electron pair Answer. (b)
10. A substance accepts a proton. According to Bronsted-Lowry concept it is (a) an acid (b) a base (c) a neutral substance (d) amphoteric Answer. (b)
11. A weak base has _____ conjugate acid and a weak acid has a _____ conjugate base (a) strong, strong (b) weak, strong (c) strong, weak (d) weak, weak Answer. (a)
12. Molecules or ions that can behave both as Bronsted acid and base are called (a) monoprotic acids (b) polyprotic acids (c) amphiprotic substances (d) polyprotic bases Answer. (c)
13. HCO3 – is an example of (a) conjugate acid (b) conjugate base (c) amphiprotic ion (d) amphoteric ion Answer. (c)
14. The strength of a Bronsted acid depends upon its tendency to _____ a proton (a) gain (b) donate (c) react with (d) none of these Answer. (b)
15. According to Lewis concept an acid is _____ acceptor (a) proton (b) base (c) electron (d) electron pair Answer. (d)
16. All cations and molecules that are short of an electron pair act as _____ (a) Lewis acids (b) Lewis bases (c) Bronsted acid (d) Bronsted bases Answer. (a)

17. According to Lewis concept, a reaction between an acid and a base is the transfer of (a) a proton from acid to base (b) OH – ion from bases to acid (c) electron pair from acid to base (d) electron pair from base to acid Answer. (d)

Two, Three marks

1. Explain Bronsted-Lowry theory.
2. Write a note on protonation and deprotonation.
3. What is autoprotolysis constant?
4. What is polyprotic and amphiprotic acids?
5. Write about zwitter ions.
6. Write about indicators.
7. Write about acid and base buffers.
8. Explain Common ion effect.
9. What is solubility constant?
10. The hydrogen ion concentration of a fruit juice is 3.3×10^{-2} M. What is the pH of the juice ? Is it acidic or basic ?
11. Find the pH of a buffer solution containing 0.20 mole per litre CH_3COONa and 0.15 mole per litre CH_3COOH. Ka for acetic acid is 1.8×10^{-5}.
12. Estimate the pH at 25°C containing 0.10 M sodium acetate and 0.03 M acetic acid pKa for CH_3COOH = 4.57.
13. Calculate the pH of a buffer solution that is 0.250 M in formic acid, HCOOH, and 0.100 M in sodium formate, HCOONa. Ka for formic acid is 1.8×10^{-4}.
14. Compare the Lewis theory of acids and bases with the Bronsted-Lowry concept.
15. What are conjugate acid-base pairs? Give two examples.
16. Why a solution of NaCl does not act as buffer?
17. What is a Buffer solution? Give examples. Explain the buffer action of an acidic buffer.

UNIT 4

One marks

1. (Electrolytes)---------- are electrovalent substances that form ions in solution which conduct an electric current.
2. The phenomenon of decomposition of an electrolyte by passing electric current through its solution is termed -------(Electrolysis).

3. The reciprocal of specific resistance is termed --------(Specific conductance or Specific conductivity).
4. Specific conductance is generally expressed in --------(reciprocal ohms (r.o) or mhos or ohm–1). Its internationally recommended unit for ohm–1 (or mho) is---------- (Siemens, S).
5. (Equivalent Conductance) --------is defined as the conductance of an electrolyte obtained by dissolving one gram-equivalent of it in V cc of water.
6. Upon ---------(dilution) specific conductance decreases, while Equivalent conductance and Molar conductance increases.
7. Select the incorrect statement about the chemical activity at electrodes during electrolysis. (a) anions give up electrons (b) cations take up electrons (c) oxidation occurs at the anode (d) proton transfer occurs in the reactions Answer. (d)
8. Copper metal will replace silver ions in solution, resulting in the production of silver metal and copper ions. This indicates that (a) silver has a higher oxidation potential than copper (b) a combustion reaction is occurring (c) copper has a higher oxidation potential than silver (d) silver is much less soluble than copper Answer. (c)
9. Specific conductance is the conductance of (a) one centimeter cube of solution of an electrolyte (b) one centimeter cube of a solid electrolyte (c) one gram of the solution of an electrolyte (d) one gram of the solid electrolyte Answer. (a)
10. The units of specific conductance are (a) ohm cm (b) ohm cm–1 (c) ohm–1 cm (d) ohm–1 cm–1 Answer. (d)
11. The equivalent conductance of a solution of an electrolyte (a) increases with dilution (b) decreases with dilution (c) does not vary with dilution (d) none of these Answer. (a)
12. The units of equivalent conductance are (a) ohm cm eqvt (b) ohm –1 cm–1 eqvt–1 (c) ohm –1 cm2 eqvt–1 (d) ohm –1 cm–2 eqvt–1 Answer. (c)
13. The molar conductance of solution of an electrolyte is measured in (a) ohm cm mol–1 (b) ohm–1 cm–1 mol–1 (c) ohm cm–1 mol–1 (d) ohm–1 cm2 mol–1 Answer. (d)
14. With rise in temperature the conductance of a solution of an electrolyte generally (a) decreases (b) increases (c) remains constant (d) none of these Answer. (b)
15. The cell constant can be obtained by (a) dividing specific conductance by observed conductance (b) dividing observed conductance by specific conductance (c) multiplying specific conductance by observed conductance (d) multiplying specific conductance by equivalent conductance Answer. (a)
16. The cell constant is the ratio of (a) distance between electrodes to area of electrode (b) area of electrode to distance between electrodes (c) specific conductance to area of electrode (d) specific conductance to distance between the electrodes Answer. (d).
17. charged ions are free to move through the solution to the oppositely charged--------(electrode).
18. loss in concentration around any electrode is proportional to the ---------(speed of the ion) moving away from it.

Two, Three marks

1. Write a note on redox reactions.
2. 0.5 Normal solution of a salt placed between two platinum electrodes, 20 cm apart and of area of cross-section 4.0 sq cm has a resistance of 25 ohms. Calculate the equivalent conductance of the solution.
3. The resistance of a N/10 solution of a salt is found to be 2.5 × 103 ohms. Calculate the equivalent conductance of the solution. Cell constant = 1.15 cm–1.
4. The specific conductance of an N/50 solution of KCl at 25ºC is 0.002765 mho. If the resistance of a cell containing this solution is 400 ohms, what is the cell constant?
5. Define or explain the following terms : (a) Electrolysis (b) Specific conductance (c) Equivalent conductance (f) Molar conductance (e) Degree of Dissociation (d) Cell constant
6. Explain the factors affecting the conductance of an electrolyte.
7. Explain Debye Huckle Onsager theory of strong electrolytes.
8. Explain Ohm's law.

UNIT 5

One marks

1. Write Nernst equation.

2. In Daniel cell, the anode is ----------.

3. For Voltaic cell,the free energy change of cell reaction will be ---------

4. The work done by a given transfer of electrons depends on the ------- (cell potential).

5. At constant temperature and pressure w_{max}=-----(ΔG)

6.------- (galvanic cell)is an electrochemical cell that produces electricity.

7. In an electrochemical cell, ---------- takes place at anode,---------- occurs at cathode.

Two, Three marks

1. What is meant by standard electrode potential?
2. What is meant by electrochemical cell. Give example.
3. Write a note on Cell potential.
4. Explain the variation of potential with pH.
5. What is liquid junction potential?

6. What is electrode concentration cell?
7. Explain the determination of pH.
8. Write a note on electrochemical series.
9. How will you determine the reaction entropy from the cell potential?
10. Explain the temperature dependence of the cell potential.
11. Give the Debye-Huckel-Onsager equation.
12. What is half-cell and half-cell reaction.
13. Define cell potential.

CLASS: III CHE (S-II)

SUBJECT:THERMODYNAMICS OF IDEAL AND NON IDEAL SOLUTION

SUBJECT.CODE:CH616S

NAME OF THE STAFF: B.CHRISTINA &K.VENGADESAN

CH616S

UNIT-I **1 Marks**

1. 1 ppm means _____
2. Normality = _____
3. No. of moles = _____
4. Molarity = _____
5. Mole fraction of X1 + X2 = _____
6. ΔS mix for ideal solution is _____
7. ΔG mix for ideal solution is _____
8. ΔH mix for ideal solution is _____
9. ΔV mix for ideal solution is _____
10. A zeotropic mixture means _____
11. Raout's law _____
12. Henry's law _____
13. Unit for Kf is _____
14. Kb is called as _____
15. Reduced phase rule is _____
16. Eutetic point means _____
17. Degrees of freedom in Eutetic point is _____
18. Vant' factor i = _____
19. Isotonic solution means _____

20. Equation for elevation of B.pt _____

21. Equation for Depression of .Pt _____

22. Equation for Lowering of F.pt _____

23. Colligative property depends on _____

24. Acetone an chloroform from _____ solution.

25. Maximum Boiling azeotropic mixture having _____ vapour pressure.

UNIT-II

1. Δg = _____

2. For spontaneous Rxn ΔG= _____

3. For spontaneous Rxn ΔH= _____

4. For spontaneous Rxn ΔS= _____

5. For non-spontaneous Rxn ΔG= _____

6. For non-spontaneous Rxn ΔH= _____

7. For non-spontaneous Rxn ΔS= _____

8. Gibbs free energy of standard elements is _____

9. Standard Gibbs free energy is at _____ temp and _____ pressure.

10. Increase in concentration of reactants favours _____ Rxn.

11. Increase pressure in Haber's process favours _____ Rxn.

12. Increase tempreture in Haber's process favours _____ Rxn.

13. Addition of catalyst to equilituim reaction _____ effect on Rxn.

III B.Sc., CHEMISTRY

CH616S

UNIT-I **3 Marks**

1. Raoult's law
2. Henry's law
3. Ideal solution
4. Non Ideal solution
5. What is positive deviation from ideal solution.
6. What is Negative deviation from ideal solution.
7. What is Azeotropic mixture.
8. Write example for maximum Boiling and minimum boiling Azeotropic mixture.
9. What is partial molar properties.
10. What happen ΔH, ΔV for spontaneous mixing of ideal solution
11. ΔS, ΔG for spontaneous mixing of ideal solution.
12. What is real solution.
13. What are colligatine properties.
14. What is reverse osmosis.
15. Write reduced phase rule.
16. What is Eutectic point.
17. What is congruent melting point.
18. Lever Rule.

UNIT-II

1. Write about Gibbs free energy.
2. What is standard Gibbs free energy.

3. Lechatlier's principle.

4. What is equilibrium reaction.

5. What is catalyst and how it affect the equilibrium reaction.

6. What are the principle of chemical equilibrium.

7. What are the condition to disturb the equilibrium.

UNIT-I 5 Mark

1. Explain the concentration expressions. Molarity, molality, Mole fraction, mars percentage ppm.

2. Gibbs free energy change of mixing for an Ideal Solution.

3. Entropy change of mixing for an ideal solution.

4. Explain elevation of boiling point an depression of freezing point.

5. Calculate ΔH, ΔG of one mole of toluene and two mole of zenzene 25c assuming Ideality.

6. Explain pb-Ag phase diagram.

7. Explain simple Eutetic system.

8. Explain the phase diagram with two components form a stable compound.

9. Explain vant Hott factor.

UNIT-II

1. How ΔG variation with composition.

2. How ΔG variation with temperature.

3. Explain the Haber's process

4. What are the factors affecting equilibrium reaction.

UNIT – III,IV &V

1.A std electrode potential for SHE is----------.
2. Write electrochemistry & thermodynamic bridging equation----------
3.According to ---------- concept, base is a substance that dissociates to give hydroxyl ion when dissolved in water.
4.--------- is the mathematical form of pH scale formula.

5.---------- is the relation between Ka,Kh and Kw.

6.The formula used to determine the degree of hydrolysis value by electrical conductance method is---------.

7."It is the only absorbed light radiation that are effective in producing a chemical reaction". This is the statement of _____.

9.In any electrochemical cell, the cathode is always _____

10.In a Galvanic cell the following reaction takes place, $2H_2O \leftrightarrow O_2 + 4H^+ + 4e^-$. It occurs at the _____.

11.The site of oxidation in an electrochemical cell is _____

12.$t_+ + t_- =$ _____

13. $\frac{\lambda +}{nF} =$ _____

14. $\wedge_0 =$ _____ + _____

16.In moving boundary method $t_{\pm} =$ _____

17.In the reaction

Zn(s)+2HCl→ZnCl2(aq) +H2(g)

a) Zinc is oxidized
b) The oxidation number of chlorine remains unchanged
c) The oxidation number of hydrogen changes from +1 to 0.
d) All are correct

18.In the galvanic cell the following reaction takesplace;

2H2O→O2 +4H+ +4e-

It occurs at a) cathode b)anode c)both d)none of these

19.Φ= For a reaction that obeys Einstein law ,

(a) 1 (b) Φ>1 (c) Φ<1 (d) Φ=0

20.Out of the three isomers of dichlorobenzene, one with highest dipole moment will be _____.

(a) Ortho isomer (b) Meta isomer

(c) Para isomer (d) All of the above

21.In the reaction $Zn(s) + 2Hcl \rightarrow Zncl_2(aq) + H_2(g)$

(a) Zn is oxidized

(b) The oxidation No. of Chlorine remains unchanged

(c) The oxidation No. of hydrogen changes from +1 to 0.

All are correct.

SECTION - B

1.Write any two types of reversible electrodes ?

2.Derive Nernst equation.

3.For the Daniel cell involving the cell reaction$Zn(s)+Cu^{2+}(aq) \rightarrow Zn^{2+}(s)+Cu(s)$The std free energies of formation of Zn(s), Cu^{2+} (aq), Zn^{2+}(s)& Cu(s) are 0,64.4Kj, -154.0KJ &0.calculate the std EMF of the cell.

4.How does the lewis acid concept account for the formation of thio sulphate ion[$S_2O_3^{2-}$]from sulphite ion SO_3^{2-}?

5.Explain buffer with an example.

8. Specific conductance of 0.1M Nacl is 1.06 X 10^{-2} mho.cm^{-1}.What is the molar conductance? (4)

9. The conductance at infinite dilution of NaCl , Hcl and CH3COONa are 126.45,426.16 and 91.0 mho cm2 respectively.What will be the conductance of CH3COOH?

10.Define. 1. Electrochemical series (2)

2. Single electrode Potential (2)

11.Explain the Calomel electrode. (4)

12.Calculate the potential of an electrode consisting of Zn metal in $ZnSO_4$ solution in which $[Zn^{2+}]$ = 0.01 M, for the reaction $Zn^{2+} + 4e^- \leftrightarrow Zn$ (s).

E° = -0.76 V. (4)

13.The 0.0185 mol dm^{-3} solution of acetic acid has the conductance 2.34 x $10^{2\mu}$ mho. If the cell constant is 105 m^{-1} and $\Lambda^0(CH_3\ COOH)$ = 391 X 10^{-4} mho m^2 mol^{-1}, calculate the equilibrium constant of acetic acid. (4)

14.If 50 x 10^{-3} amp of current is passed through copper coulometer for 60 min., calculate the amount of copper deposited.

15.Calculate the equilibrium constant of the cell reaction

$2Ag^+ + Zn \leftrightarrow 2\ Ag + Zn^{2+}$ occurring in the Zn – Ag cell at 25° C when

$[Zn^{2+}]$ = 0.10 M and $[Ag^+]$ = 10 M. EMF=1.62 V.

16.Explain the Nernst equation with examples.

17.Is 1.0 M H^+ solution under H_2 gas at 1.0 atm pressure capable of oxidizing Ag metal in the presence of 1.0 M Ag^+ ion? (4)

18.Calculate the emf of the following electrochemical cell at 25° C.

Cu, Cu^{2+} (a= 0.1 M) ‖ H^+ (a=0.01 M), H_2 (0.95 atm).

SECTION - C

20.a) 0.1 molar KCl solution shows equivalent conductance 149.1x10^{-4} Sm^2equ^{-1} in a conductivity constant 0.5001cm^{-1} calculate 0 specific conductance of given solution. (5)

b) The resistance of 0.01M solution of an electrolyte was found to be 210 ohm at 25°c. Calculate the molar conductance of the solution at 25°c. cell constant = 0.88 cm^{-1}.
(5)

c.Specific conductance of 1M KNO_3 solution is observed to be 5.55 X 10^{-3} mho cm^{-1}.What is the equivalent conductance of KNO_3 when 1 litre of the solution is used?

21.a) What is std electrode potential? **(1)**

b) Explain the relationship between thermodynamic quantities **(7)**
c) The EMF of the std weston cell written as
Cd(Hg),CdSO4.8/3H2O|| CdSO4(sat),Hg2SO4(S),Hg
In which the cell reaction is
Cd(Hg)+ Hg2SO4(S8)+8/3H2O→ CdSO4.8/3H2O+2 Hg(l) is 1.0185V at 25°C.Calculate ΔG, ΔH&ΔS for the cell reaction if temperature coefficient is 5.00x10^$^{-5}$ VK^{-1}
(7)

22.a) The dissociation constant of aniline as a base at 25^0C is 5.93X10^{-10} the ionic product of water at 25^0C is 1.008X10^{-14}. Calculate the percentage hydrolysis of aniline hydrochloride. **(3)**
b) Explain Handerson equation. **(2)**
c) What is buffer capacity and buffer index? **(1+1)**
d) What would be the pH of a solution obtained by mixing 5g of acetic acid and 7.5g of a sodium acetate and making the volume to 500 mL. dissociation constant of acetic acid= 1.75X10^{-5}. **(4)**
e) Explain the hydrolysis of salts of weak acid and strong base. **(4)**