CHE 6B 11 PHYSICAL CHEMISTRY III

MODULE 1

ELECTROCHEMISTRY

SECTION A

1. Give debye huckel onsager eqn and show its experimental verification
2. The soluability of AgCl is 1.05 x 10-5 moles per litre. Calculate the soluability product
3. Calculate the ionic strength of solution containing 0.2 M CaCl2 and 0.05M NaCl.
4. Calculate the ionic strength of a solution containing 0.2M NacL and 0.1M $BaCl_2$
5.
6. The specific conductance increase with dilution while the molar conductance decrease with dilution. Why?
7. What is salt bridge . why it is used?
8. Define transport number
9. Represent the graph of SB SA and WB SA conductometric titrations
10. Discuss arhenius theory of electrolytes
11. Discuss faradays law
12. Differentiate between molar and equivalent conductance
13. Discuss the applications of conductometric titrations.
14. Define electrochemical equivalent of a substance. How is it related to equivalent mass.
15. How will you determine ionic product of water by consuctance measurements.

SECTION B

1. Explain Kohlrauschs law with applications
2. Explain the terms strong electrolytes and weak electrolytes with suitable examples
3. What is meant by cell constant. How is it determined
4. Define degree of dissociation of an electrolyte and give two factors affecting it.
5. Explain wein effect and Debye Falken hagen effect.
6. Explain the limitations of Ostwald dilution law.
7. Discuss conductometric titrations of acids and bases
8. Explain moving boundary method
9. Discuss Hittorf method
10.

SECTION C

1. Briefly discuss the Debye Huckel theory of strong electrolytes. Write Debye Onsager eqn and explain the terms.Briefly explain the effect of high AC frequencies and high potential gradients in the conductivity of strong electrolytes
2. Discuss the applications of conductivity measurements
3. State and explain Kohlaushes law. How is it helpful for determining limiting molar conductivity of acetic acid.
4. Define molar conductivity and explain is variation with dilutions.

MODULE 2

ELECTROCHEMISTRY II

SECTION A

1. What is calomel electrode
2. Write the oxidation reduction process involved in fuel cell.
3. Explain the construction of glass electrode
4. Explain SHE
5. What is meant by standard electrode potential
6. What is the relationship between electrical energy and free energy
7. What is the difference between galvanic cell and Daniel cell
8. What is electrochemical series
9. Write Nernst eqn for electrode potential and explain the terms involved.
10. Write down the Nernst eqn for Daniel cell
11. Represent calomel electrode and write the corresponding Nernst eqn
12. Distinguish between electrode concentration and electrolytic concentration cell
13. What is meant by potentiometric titration ? Sketch the general shape of the potentiometric titration curve for SA SB titration
14. What is fuel cell. Give example

SECTION B

1. Write a note on concentration cells without transference.
2. Discuss quin hydron electrode wih applications and limitations
3. Discuss fuel cells.
4. How will you determine the pH of a solution using quinhydrone electrode.
5. How emf of measurements helps to find out thermodynamic parameters

6. Illustrate the applications of conductivity measurements.
7. Describe the set up of hydrogen oxygen fuel cell
8. Explain the electrochemical theory of corrosion of metals

SECTION C

1. Explain the terms i) liquid junction potential ii)Fuel cell iii) Glass electrode
2. Discuss the applications of emf measurements
3. Discuss potentiometric titrations
4. Discuss how soluability and soluability products of sparingly soluable salt can be determined through emf measurements.

MODULE 3

SOLUTIONS

SECTION A

1. What is reverse osmosis
2. Define ebulioscopic and cryoscopic constant
3. What do you mean by vant hoff factor
4. What are buffer solutions.
5. What happens when nitrogen gas bubbled through ammonia solution?
6. Calculate the osmotic pressure of a 0.1M organic solute at 17oc.
7. HCl gas is passed hrough common salt for its purification process. What is the principle involved.
8. State Rault law of vapour pressure lowering
9. What are colligative properties
10. What are isotonic solutions
11. What are the characteristics of ideal solution
12. What is reverse osmosis
13. Define osmotic pressure

SECTION B

1. Differentiate between ideal and non ideal solutions
2. How will you find out the mass of a non ionic solid using elevation in boiling point method
3. How will u determine the viscosity of a liquid by Ostwald viscometer
4. Explain reverse osmosis and its applications
5. Differentiate between positive nad negative deviation of Raults law with examples
6. Discuss the abnormal molecular mass and vant hoff factor
7. What is viscosity. How to findout molecular mass from viscosity measurements
8. What is reverse osmosis. Explain with application
9. Define molal elevation constant. Calculate the the boiling point of a 0.15 molal aques solution of urea. Kb for water = 0.52Kg /mol
10. Define molal depression constant. Explain the principle behind the determination of molar mass of a solute and from depression in freezing point.

SECTION C

1. Discuss molar refraction and optical exaltation
2. What is surface tension ? Discuss its method of determination
3. State and explain Henrys law with applications and limitations.
4. Discuss the reason for abnormal values for molecular masses of certain solutes when determined from colligative property measurements.

MODULE IV

IONIC EQUILIBRIA

SECTION A

1. What is Henderson equation
2. Mention the applications of buffer solution
3. The soluability of AgCl is 1.05 x 10-5 moles per litre. Calculate the soluability product
4. What is common ion effect
5. Using suitable example, Write the importance of soluability product in qualitative analysis
6. Explain the common ion effect.
7. Define soluability product
8. What is meant by buffer index

SECTION B

1. Briefely discuss the mechanism of buffer action and in a mixture of weak acid and its salt
2. Briefely discuss the mechanism of buffer action and in a mixture of weak base and its salt
3. Derive Henderson eqn
4. Calculate the pH of 0.001HCl and 0.03M H_2SO_4
5.

SECTION C

1. A) Define hydrolysis constant and degree of hydrolysis
   B) Illustrate the relationship between Kb with Kw

2. What is meant by buffer solution? Explain buffer action using examples. Derive Henderson eqn

3. Discuss the applications of common ion effect and soluability product

MODULE 5

SOLID STATE 1

SECTION A

1. What are crystal angles of a unit cell of tetragonal , and monoclinic systems.
2. What do you understand by space lattice and unit cell
3. Calculate the miller indices of a crystal plane which passes through the crystal axes 2a, 3b ,c.
4. Write Braggs eqn and explain the terms
5. Differentiate between amorphous and crystalline solids
6. What is law of consistency of angles.
7. What is law of rational indices
8. What are seven crystal systems
9. Give the coordination number of each sphere in ccp and hcp structure
10. What are the coordination number of Ca and F in the fluorite structure
11. Define coordination number. What are the coordination number of Na and Cl in NaCl
12. If a crystal makes intercepts ½ a ½ b and ½ c , What are the miller indices of the plain.
13. Calculate the miller indices of a planw which makes which makes the intercept ½ a on X axis, ½ b on Y axis and goes parrel to the Z axis
14. Sketch (100) and (010) plaines of a primitive cubic lattice

15. The Weiss indices of a lattice plane are 3,3 and 2. Calculate its miller indices

SECTION B

1. Derive Braggs eqn
2. Discuss the structure of NaCl.
3. Discuss hcp and ccp arrangements in crystals
4. Discuss rotating crystal method
5. Discuss powder pattern method
6. Discuss the structure of CaF_2
7. Discuss the hcp and ccp arrangements
8. Discuss fluorite and rock salt structure

SECTION C

1. Derive Braggs eqn. Explain how will you determine the structure of NaCl by rotating crystal method. Predict the difference that can be observed in the interplanar distance of KCl and NaCl even though both have the same unit cell.
2. Explain the various close packing in solids with examples
3. Discuss the powder diffraction patterns of NaCl, KCl and CsCl, and correlate them with their crystal strucures.
4. Discuss the structures of NaCl and CsClW

MODULE 6

SOLID STATE 2

SECTION A

1. What are liquid crystals? How they are classified
2. **Wha**t is frenkel defect? How it affect the density of the crystal?

3. What do you mean by intrinsic conductors.? Write two examples.
4. Differentiate intrinsic and extrinsic semiconductors
5. Explain briefly band theory of metals
6. Which are the types of metal excess defects
7. Discuss the theory of insulators
8. What is doping
9. What is meant by extrinsic defect
10. What is meant by intrinsic defect
11. Differentiate point and plain defect
12. What are F centres
13. How schotky defect affects density of crystals.
14. What is meant by metal deficiency defect

SECTION B

1. Briefly discuss the band theory of metals
2. Define the various systems of solid crystals. Define liquid crystals and give example
3. Discuss liquid crystals with applications
4. What are n type and p type semi conductors
5. Discuss frenkel and shotky defect
6. Discuss extrinsic metal defects
7. Discuss the applications of semiconductors

SECTION C

1. Explain stoichiometric and non stoichiometric defects.
2. Discuss the band theory of solids
3. What are liquid crystals. How are they classified . Explain the structural features of each class.
4. Explain band theory