D.K.M. COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1

ELECTROCHEMISTRY (15CCH6C)

UNIT – I SECTION A

1. Define specific conductance.
2. Define molar conductance.
3. What are strong and weak electrolytes? Give examples.
4. What is cell constant? What is its unit?
5. What is transport number of an ion?
6. State Kohlrausch's law.
7. What is meant by Henderson equation?
8. Define pH of a solution.
9. What are buffer solutions? Give example.
10. What is meant by buffer action?
11. What is hydrolysis constant of a salt?
12. What is degree of hydrolysis?
13. Write any two differences between metallic and electrolytic conductors.
14. What is salt hydrolysis? Mention different types.
15. Define solubility product.
16. Define pOH of a solution.

SECTION B

1. What is meant by equivalent conductance of an electrolyte? How is it determined experimentally?
2. Explain why the equivalent conductance of a strong electrolyte gradually increases with dilution and ultimately assumes a limiting value.
3. Define the terms specific conductance, equivalent conductance and cell constant. Write their units.
4. Describe the method of determining equivalent conductance of a weak electrolyte.
5. What is cell constant? How is it determined experimentally?

6. What is transport number of an ion? How is it determined using Hittorff's method?
7. Discuss Hittorff's method for determination of transport number of ions.
8. What is meant by transport number of an ion? How is it determined by moving boundary method?
9. State Kohlrausch's law and explain any two of it applications.
10. Give reason for the following: The pH of a buffer solution is not appreciably altered by the addition of small quantities of an acid or base.
11. Explain the following terms: hydrolysis, degree of hydrolysis and hydrolysis constant.
12. Establish the relation between degree of hydrolysis and hydrolysis constant.
13. Explain the variation of dilution of specific conductance and equivalent conductance with dilution.
14. Explain the buffer action.
15. What is cell constant? How is it determined experimentally?

SECTION C

1. Define the terms specific and equivalent conductance. Explain clearly why at dilution equivalent conductance increases and specific conductance decreases. How is the equivalent conductance determined experimentally?
2. How will you show that in the solution of an electrolyte undergoing electrolysis, the ions are moving towards the electrodes at different speed?
3. Derive the Henderson equation for pH of a basic buffer solution.
4. Explain the working of a buffer solution. How will you calculate pH of a buffer solution?
5. Derive the equation for the hydrolysis constant of a salt of weak acid and strong base. Explain how pH of such salt solution can be calculated.

6. What is meant by the terms degree of hydrolysis and hydrolysis constant. Deduce the relation between hydrolysis constant and dissociation constant of the base in the case of the hydrolysis of salt of a strong acid and weak base.
7. Derive the relation between hydrolysis constant and dissociation constant of strong acid and weak base.
8. Define salt hydrolysis and degree of hydrolysis. Establish the relation between hydrolysis constant and dissociation constant a salt of weak acid and weak base.
9. How will you determine the pH of a salt solution formed from weak acid and weak base.

UNIT – II SECTION A

1. Define ionic strength.
2. What is meant by activity?
3. What is meant by activity coefficient?
4. Define ionic mobility.
5. Write the principle behind conductometric titrations.
6. What is degree of hydrolysis?
7. What are strong electrolytes? Give examples.
8. What is meant by solubility product?
9. Write the principle behind Debye- Huckel theory?
10. Write the principle behind Wien effect?

SECTION B

1. Draw and explain the conductometric titration curves for the following titrations: HCl Vs NH_4OH, NaOH Vs HCl.
2. Explain the main assumptions of Arrhenius theory of electrolytic conduction. What are its merits and demerits?
3. Explain the Debye-Falkenhagen effect.
4. Explain the activity and activity coefficient
5. Write notes on the conductometric titrations.

6. Write notes on Falkenhagen and Wein effect.
7. Write the principle behind conductometric titrations.
8. Explain the principle of determining the solubility of a sparingly soluble salt conductometrically.

SECTION C

1. Discuss the Debye-Huckel theory of strong electrolytes. Give Debye-Huckel- Onsager equation and explain the terms involved.
2. Explain the following a) Debye-Falkenhagen effect b) Activity and activity coefficient
3. What is the principle behind condutometric titrations? Discuss the titration curves obtained in the titration of $AgNO_3$ Vs KCl, HCl Vs acetic acid + NaOH. What are the advantages of condutometric titrations?
4. Explain in detail Debye-Huckel- Onsager theory?

UNIT – III SECTION A

1. What are galvanic cells? Give an example.
2. What is meant by a standard cell?
3. What is meant by oxidation potential?
4. Define electrode potential.
5. Write the different types of electrodes.
6. What is meant by standard electrode potential?
7. Define EMF.
8. What is single electrode potential?
9. Write the disadvantages of standard hydrogen electrode.
10. Write any four types of electrodes.
11. Write the uses of EMF.
12. Write the cell relation of Daniel cell.
13. Explain any four types of electrode.
14. What is meant by a reversible cell? Give an example.
15. What are the conditions for reversible cells?
16. Write the difference between reversible cell and irreversible cell.

SECTION B

1. What are reversible and irreversible electrodes? Give an example.
2. Explain the construction and use of calomel electrode.
3. What is meant by single electrode potential? How is it determined?
4. Write notes on reference electrodes. Give an example.
5. Describe a method of determination of EMF.
6. What is quinhydrone electrode? Write the representation of it.
7. Write the uses of EMF.
8. What are the procedures to representation a cell?
9. How will you construct a Weston cadmium cell?
10. Explain any four types of electrode reactions.

SECTION C

1. Write notes on reference electrodes. Describe a method of determination of EMF.
2. How will you construct a Weston cadmium cell and calomel electrode.
3. What is meant by a standard cell? Compare standard hydrogen electrode with calomel electrode.

UNIT – IV SECTION A

1. What are concentration cells?
2. What are chemicals cells?
3. What is salt bridge?
4. What is meant by electrochemical series?
5. What is meant by cell emf?
6. What is liquid junction potential?
7. What is cell reaction?
8. What do you understand by cell emf?
9. Write the differences between concentration cell and galvanic cell.
10. What is single electrode potential?

SECTION B

1. Derive an expression for emf of a concentration cell without transference.
2. Derive an expression for the potential of metal-metal ion electrode.
3. Explain what is meant by standard reduction potential.
4. Deduce the Nernst equation for the emf of the cell.
5. What is salt bridge? Why it is used? What substance is used as a standard in preparing the salt bridge?
6. What is electrochemical series? Write the applications of electrochemical series.
7. In what way an indicator electrode is different from a reference electrode? Describe an experiment for the measurement of emf of a cell.
8. What is meant by hydrogen electrode? How would you made use of this electrode to determine H^+ ion concentration in a solution?
9. Write notes on liquid junction potential. Write the emf of electrode concentration cells.
10. Derive an expression for emf of a concentration cell with transference.
11. Write the Nernst equation for the following equation. $M = M^{n+} + ne^-$
12. Mention the applications of concentration cells.

SECTION C

1. How do concentration cells with and without transference differ from each other? How will you determine the strength of $AgNO_3$ solution accurately with the help of emf measurements?
2. Describe the construction of a simple electrochemical cell. Indicate the positive and negative electrodes. What are the reactions taking place at these electrodes? Give the overall cell reaction.
3. What are chemical cells? Write the difference between reversible and irreversible cells. Explain two uses of emf measurements.
4. What do you understand by emf? Discuss briefly the Nernst concept of the origin of EMF.
5. Give the half cell reactions and explain the standard electrode potential for the following electrodes. (i) $H^+ / H_{2\,(g)}$ Pt (ii) Cl^- /AgCl (insoluble) /Ag.

6. Deduce the Nernst equation for emf of the cell.
7. What is single electrode potential? Derive the Nernst equation for single electrode potential of calomel electrode, hydrogen electrode and Fe3+/Fe2+ electrode.

8. Write notes on liquid junction potential. Write the emf of electrode concentration cells.
9. Discuss electrochemical series and its applications.
10. Explain concentration cells with and without transference with examples. Mention the applications of concentration cells.

UNIT – V SECTION A

1. Define fuel cell.
2. What are storage cells?
3. What is H_2-O_2 fuel cell?
4. What is known as discharging of a battery?
5. Write the merits of glass electrode.
6. Write the principle behind potentiometric titrations.

SECTION B

1. Discuss potentiometric titrations.
2. Explain H_2-O_2 fuel cell.
3. How will you determine pH of a solution using quinhydrone electrode?
4. Explain any two types of potentiometric titrations.
5. How will you construct a H_2-O_2 fuel cell?
6. Discuss the mechanism of discharging and recharging in lead-acid battery.
7. Write notes on fuel cells.
8. How will you determine pH of a solution using glass electrode?

SECTION C

1. Define the construction and working of lead storage battery in detail.
2. Explain the following a) Electrode reactions b) Reference electrodes.

3. Write notes on (i) lead acid battery (ii) Determination of pH using glass electrode.
4. Obtain an expression to calculate the G, S and H for a cell reaction from emf measurements.
5. Derive expression for equilibrium constant using emf measurements.
6. How will you determine the pH using quinhydrone and glass electrodes?
7. How will you determine the G, S, H and equilibrium constant of a cell reaction using emf measurements?
8. Discuss the construction and working of lead storage battery in detail. Write notes on H_2-O_2 fuel cell.