

## (FOR THE CANDIDATES ADMITTED

**SUBJECT CODE** **20 UCY 509**

## **DURING THE ACADEMIC YEAR 2020-22 ONLY)**

**REG.NO. :**

## **N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI**

## **END-OF-SEMESTER EXAMINATIONS : DECEMBER – 2022**

## **B.Sc. –CHEMISTRY**

## **MAXIMUM MARKS: 70**

## **V SEMESTER**

**TIME : 3 HOURS**

## **PART – III**

# **ELECTROCHEMISTRY**

**SECTION – A (10 X 1 = 10 MARKS)**

## **ANSWER THE FOLLOWING QUESTIONS.**

## MULTIPLE CHOICE QUESTIONS.

(K1)

1. The unit of specific resistance is .....  
(a) ohm cm (b) ohm<sup>-1</sup> cm<sup>-1</sup>  
(c)  $\lambda$  (d) none of these
2. The cell reaction for the cell is  $Fe | Fe^{2+} \parallel Cd^{2+} | Cd$  .....  
(a)  $Fe + Cd^{2+} \rightleftharpoons Fe^{2+} + Cd$  (b)  $Fe^{2+} + Cd \rightleftharpoons Fe^{2+} + Cd$   
(c)  $Fe + Cd \rightleftharpoons Fe^{2+} + Cd^{2+}$  (d) all of the above
3. Which one of the following is an example of secondary standard electrode?  
(a) Calomel electrode (b) Hydrogen electrode  
(c) Quinhydrone electrode (d) Daniel cell
4. For a cell reaction to occur, the emf of the cell must be \_\_\_\_\_  
(a) positive (b) negative  
(c) zero (d) all the above
5. The example of storage cell is .....  
(a) Lead acid cell (b) Hydrogen cell  
(c) Daniel cell (d) none of theee

**ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. (K2)**

6. In a HCl solution, account for the sum of transport number of  $H^+$  and  $Cl^-$ .
7. Name the electrode which is reversible with respect to its anion. Why?
8. Calculate the pH of 0.1 M aqueous ammonium chloride.
9. Potassium sulphate cannot be used in a salt bridge. Justify
10. What is the emf of a  $H_2 - O_2$  fuel cell?

**SECTION - B****( 5 x 4 =20 MARKS)****ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.****K3**

11. a) At infinite dilution, the equivalent conductance of sodium butyrate, sodium chloride and hydrochloric acid are 85, 125 and 425 mho  $\text{cm}^2$  equi $^{-1}$ . Calculate  $\Lambda_0$  of butyric acid.  
**(OR)**  
 b. Explain the effects (i) high field and (ii) high frequency on the conductance of a strong electrolyte.

12. a. Derive Nernst Equation. Write the cell reaction and calculate the emf of the following cell at 25  $^{\circ}\text{C}$ .  $\text{Pb}|\text{Pb}^{2+}||\text{Ag}^+|\text{Ag}$ . The activities of the respective  $\text{Pb}^{2+}$  and  $\text{Ag}^+$  ions are at unit concentration. Given emf:  $E^0$  for  $\text{Pb}^{2+}/\text{Pb} = -0.125\text{V}$  and  $E^0$  for  $\text{Ag}^+/\text{Ag} = +0.799\text{V}$   
**(OR)**  
 b. Summarize any four applications of electrochemical series.

13. a. For a combined cell with notation as depicted below :  
 $\text{Hg}|\text{Hg}_2\text{Cl}_{2(\text{s})}|\text{KCl}_{(\text{sat})}||\text{H}^+_{(\text{unknown})}|\text{Q,QH}_2|\text{Pt}$  ; the emf of the cell is 0.2640 V at 25  $^{\circ}\text{C}$ . Calculate pH of unknown solution at 25  $^{\circ}\text{C}$ .  $E_{\text{calomel}} = 0.2422\text{ V}$  &  $E^0_{(\text{Q,QH}_2)} = 0.6996\text{ V}$   
**(OR)**  
 b. How will you determine the pH of a solution using glass electrode?

14. a. Construct concentration cell with transference and derive an emf expression for same cell.  
**(OR)**  
 b. Explain liquid junction potential.

15. a. Illustrate the construction and working of Ni-Cd cell  
**(OR)**  
 b. Describe the working of Hydrogen-Oxygen fuel cell.

**SECTION - C (4 x 10 =40 MARKS)****ANSWER ANY FOUR OUT OF SIX QUESTION****16<sup>th</sup> QUESTION I COMPULSORY AND ANSWER ANY THREE QUESTIONS FROM Qn.No . 17 to 21****K4 / K5**

16. Discuss the Debye-Hückel-Onsager theory of strong electrolytes.

17. i) State Kohlrausch law and explain any two applications of it.  
 ii) Define transport number of an ion. How is transport number of an ion determined by moving boundary method?

18. Give one example for the following electrodes and write the electrode reactions.  
 i) Metal / Metal ion electrode ii) Metal – insoluble salt ion electrode iii) Redox electrode

19. Derive an expression for the hydrolysis constant and pH of an aqueous solution of  $\text{NH}_4\text{Cl}$

20. Interpret liquid junction potential. Derive an expression for liquid junction potential

21. What are Inert storage cells? Describe the construction and working of Lead storage cell.