

## UNIT-3 ASSIGNMENT ELECTROCHEMISTRY

### QUESTION CARRING 1 MARK

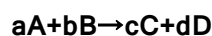
1. What is the effect of temperature on molar conductivity?
2. Why is it not possible to measure single electrode potential?
3. Name the factor on which emf of a cell depends:-

Ans. Emf of a cell depends on following factors.

4. What are the units of molar conductivity?

5. Write Nernst equation -

For the general cell reaction



6. What is the EMF of the cell when the cell reaction attains equilibrium?
7. What is the electrolyte used in a dry cell?
8. How is cell constant calculated from conductance value
9. What flows in the internal circuit of a galvanic cell.
10. Define electrochemical series.

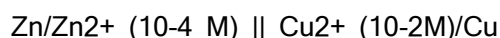
### QUESTIONS CARRYING TWO MARKS

1. How can you increase the reduction potential of an electrode.?

For the reaction



2. Calculate emf of the following cell at 298K



Given  $E^{\circ}_{Zn^{2+}/Zn} = -0.76V$

$E^{\circ}_{Cu^{2+}/Cu} = +0.34V$

- Q 3. Electrolysis of  $KBr(aq)$  gives  $Br_2$  at anode but  $KF(aq)$  does not give  $F_2$ . Give reason.

Ans. Oxidation takes place at anode. Now higher the oxidation Potential, easier to oxidize. Oxidation potential of  $Br^{-}$ ,  $H_2O$ ,  $F^{-}$  are in the following order.

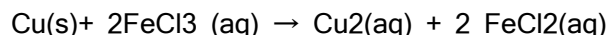
**$Br^{-} > H_2O > F^{-}$**  Therefore

in aq. Solution of  $KBr$ .  $Br^{-}$  ions are oxidized to  $Br_2$  in preference to  $H_2O$ . On the other hand, in aq. Solution of  $KF$ ,  $H_2O$  is oxidized in preference to  $F^{-}$ . Thus in this case oxidation of  $H_2O$  at anode gives  $O_2$  and no  $F_2$  is produced.

3. What happens when a piece of copper is added to (a) an aq solution of  $FeSO_4$  (b) an Aq solution of  $FeCl_3$ ?

a. Nothing will happen when the piece of copper is added to  $\text{FeSO}_4$  because reduction potential  $E^\circ_{\text{Cu}^{2+}/\text{Cu}}$  (0.34) is more than the reduction potential  $E^\circ_{\text{Fe}^{2+}/\text{Fe}}$  (0.44V).

b. Copper will dissolve in an aq solution of  $\text{FeCl}_3$  because reduction potential  $E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}}$  (0.77V) is more than the reduction potential of  $E^\circ_{\text{Cu}^{2+}/\text{Cu}}$  (0.34)



4. Define corrosion. Write chemical formula of rust.

Corrosion is a process of deterioration of metal as a result of its reaction with air and water, surrounding it. It is due to formation of sulphides, oxides, carbonates, hydroxides, etc.

Formula of rust-  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$

5. Write short notes on reduction and oxidation potentials.

6. How are standard electrode potentials measured?

7. What is cell constant? How it is determined?

8. what is conductivity water

9. Why it is necessary to platinize the electrodes of a conductivity cell before it is used for conductance measurement?

10. Why mercury cell gives the constant voltage.

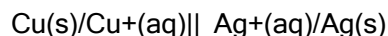
11. What is fuel cell, write reaction involved in  $\text{H}_2$ - $\text{O}_2$  fuel cell.

### QUESTION CARRYING THREE MARKS

1. Write any three differences between potential difference and e.m.f.

2. Why an electrochemical cell stops working after sometime?

3. for the standard cell



$$E^\circ_{\text{cell}} = +0.34 \text{ V}$$

$$E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V}$$

$$E^\circ_{\text{Ag}^{+}/\text{Ag}} = +0.80 \text{ V}$$

i. identify the cathode and the anode as the current is drawn from the cell.

ii. Write the reaction taking place at the electrodes.

iii. Calculate the standard cell potential.

4. Can we store copper sulphate in (i) Zinc vessel (ii) Silver vessel? Give reasons.

Given  $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34\text{V}$ ,  $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{V}$ ,  $E^\circ_{\text{Ag}^{+}/\text{Ag}} = +0.80\text{V}$

5. How many grams of chlorine can be produced by the electrolysis of molten  $\text{NaCl}$  with a current of 1.02 A for 15 min?

6. What is understood by a normal hydrogen electrode? Give its significance.

7. Define electrode potential. Why absolute value of reduction potential of

electrode cannot be determined?

8. Write the equation showing the effect of concentration on the electrode potential.
9. Derive the relationship between Gibb's free energy change and the cell potential.
10. How Nernst equation can be applied in the calculation of equilibrium constant of any cell reaction.?
11. The cell reaction as written is spontaneous if the overall EMF of the cell is positive. Comment on this statement.

### QUESTIONS CARRYING 5 MARKS

1. Explain the term electrolysis. Discuss briefly the electrolysis of (i) molten NaCl (ii) aqueous sodium chloride solution (iii) molten lead bromide (iv) water.
2. state and explain Faraday's laws of electrolysis. What is Electrochemical equivalent?
3. What do you understand by 'electrolytic conduction'? what are the factors on which electrolyte conduction depends.? What is the effect of temperature on electrolytic conduction?
4. How is electrolytic conductance measured experimentally?
5. Describe normal hydrogen electrode and its applications.

### 3/ 5 mark questions:-

1. What do you mean by ( i) negative standard electrode potential and (ii) positive standard electrode potential ?
2. Which cell is generally used in hearing aids?Name the material of the anode, cathode and the electrolyte. Write the reactions involved.
3. Iron does not rust even if Zinc coating is broken in agalvanised iron pipe but rusting occurs much faster if tin coating over iron is broken.Explain.
4. ' Corrosion is an electrochemical phenomenon', explain.
5. Calculate the pH of following cell: Pt, H<sub>2</sub>/ H<sub>2</sub>SO<sub>4</sub>, if its electrode potential is 0.03V.
- 6 . A cell contains two hydrogen electrodes. The negative electrode is in contact with a solution of 10<sup>-5</sup> M H<sup>+</sup> ions. The emf of the cell is 0.118 V at 298 K. Calculate the concentration of the H<sup>+</sup> ions at the positive electrode.
7. Crude copper containing Fe and Ag as contaminations was subjected to electro refining by using a current of 175 A for 6.434 min. The mass of anode was found to decrease by 22.260 g, while that of cathode was increased by 22.011 g. Estimate the % of copper, iron and silver in crude copper.
- 8 Zinc electrode is constituted at 298 K by placing Zn rod in 0.1 M aq solution of

zinc sulphate which is 95 % dissociated at this concentration. What will be the electrode potential of the electrode given that  $E^\theta_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$ . 3

9. At what pH will hydrogen electrode at 298 K show an electrode potential of  $-0.118 \text{ V}$ , when Hydrogen gas is bubbled at 1 atm pressure ? 3

10 Electrolysis of the solution of  $\text{MnSO}_4$  in aq sulphuric acid is a method for the preparation of  $\text{MnO}_2$  as per the chemical reaction



Passing a current of 27 A for 24 Hrs gives 1 kg of  $\text{MnO}_2$ . What is the current efficiency ? What are the reactions occurring at anode and cathode ?