UNIT-3: QUESTION BANK

1. **The standard reduction potentials of three metallic cations X, Y, Z are -0.44 V, 0.79 V and -1.18 V resp., arrange them in decreasing order of their reducing powers.**
2. **What are the differences between primary cells and secondary cells? Explain their construction and working. Write down the reactions involved in charging and discharging of the cell.**
3. **Pinholes on tin coated iron are more prone to corrosion than those on zinc coated iron. Why?**
4. **Comment on the use of aluminium in place of zinc for cathodic protection of iron from rusting.**
5. **Why is a block of magnesium attached through an insulated metallic wire to an underground iron pipeline?**
6. **What is a galvanic cell? Explain its construction and working with the help of a diagram. Give the cell representation. Give the electrode and net cell reactions. What is the role of salt bridge?**
7. **Derive Nernst equation to show the dependence of electrode potential and cell potential on concentration of electrolyte.**
8. **Define corrosion. Explain the mechanisms involved in Wet or Electrochemical theory of corrosion.**
9. **Give the types of corrosion. Explain pitting and waterline corrosion.**
10. **What are corrosion inhibitors? Explain with examples how cathodic and anodic inhibitors provide protection against corrosion.**
11. **How can corrosion be minimized by:**
    (i) Proper designing
    (ii) Cathodic protection methods
    (iii) Anodic and Cathodic metallic coatings
12. **Explain the setting and hardening of cement with relevant chemical reactions involved during the process.**
13. **What is POP? Give its preparation, and uses. What do you mean by dead burnt plaster?**
14. Explain the terms Oxidation potential, Reduction potential and EMF, and their formula.
15. Write a note on electrochemical series by explaining its applications with examples.
Give important applications of electrochemical series.
16. Discuss the mechanism of electrochemical theory of corrosion by absorption of oxygen. What effect will increased oxygen supply have on such corrosion? How can corrosion be minimized by proper design?
17. What do you understand by standard hydrogen electrode? Show the construction of SHE. Why is it known as reference electrode?
18. What do you understand by dry corrosion?
19. Derive a relation between Thermodynamic functions for an electrochemical change ΔG, ΔS and ΔH.
20. Explain the type of corrosion occurring when Bolt and nut made from different metals are in contact with each other.
21. What are the different factors on which rate of corrosion depends? Explain. **22.**

Define Corrosion. How can corrosion be minimized by sacrificial anodic protection and impressed current cathodic protection methods?

23. Discuss the mechanism of electrochemical corrosion of iron with evolution of hydrogen. What will happen if a zinc rod is vertically half submerged under water?

24. Discuss the differences between anodic and cathodic metallic coatings. Explain the processes of Galvanizing and Electroplating? What will happen if an iron ship travelling in the sea is attached through an insulated metallic wire to a small sheet of magnesium?

25. Describe how: **(i)** anodic and cathodic area and **(ii)** electrode potential values affect the rate of corrosion.

26. What is a galvanic series? Mention the differences between galvanic series and electrochemical series.

Numerical Problems

1. Calculate the standard emf of the cell: Zn / $ZnSO_4$// $CuSO_4$/ Cu The standard reduction potentials are E^0 Zn^{2+}/ Zn = -.763 V and E^0 Cu^{2+}/ Cu = +0.337 V.

2. What is the potential of a lead electrode that is in contact with a solution of 0.015 M in Pb^{2+} ions. The standard electrode potential (E^0) for $Pb \rightarrow Pb^{2+} + 2\ e^-$ is equal to 0.13 V.

3. Calculate the emf of the following cell: Zn / Zn^{2+} (0.1 M) // Cu^{2+} (0.5 M) / Cu. The standard reduction potentials of Zn and Cu are -0.76 V and +0.34 V, respectively.

4. A Zinc rod is dipped in 0.1 M solution of $ZnSO_4$. The salt is 95% dissociated at 298 K. Calculate the electrode potential. (E^0 Zn^{2+}/ Zn = -0.76 V)

5. The emf of the following cell is found to be 0.20 V at 298 K. Cd / Cd^{2+}// Ni^{2+}/ Ni. If molar concentration of Ni^{2+} is 2.0 M, what is the molar concentration of Cd^{2+} ions in the solution? [E^0Cd^{2+}/Cd = -0.40 V; E^0Ni^{2+}/ Ni = -0.25 V]

6. Calculate E^0_{Cell} of the following cell: Co(s) / Co^{2+}(aq) // Ag^+(aq) / Ag(s) Given E^0 (Ag^+/Ag) = 0.78 V and E^0 (Co^{2+}/Co) = -0.28 V

7. A cell uses (Zn/Zn^{2+}) and (Ag^+/Ag) electrodes. Write the cell representation, half cell reactions and net cell reaction. Calculate the EMF of the cell. Given $E^0_{(Zn2+/Zn)}$ = -0.76 V and $E^0_{(Ag+/Ag)}$ = 0.8 V.

8. Calculate the emf of the cell: Zn(s)/Zn^{2+}(0.2 M) // Ag^+(0.002M)/ Ag(s) at 25^0C. Write cell reaction. The standard emf of the cell is 1.54 V.

9. Calculate the potential of the following electrochemical cell at 25^0C:

Cu (s)/Cu^{2+}(aq) (0.50 M)//H^+(0.01M)/H_2(0.95 atm); Pt

(Given: $E^0_{cathode}$= 0.00 V and E^0_{anode}= 0.34 V)

10. For Weston cell, e.m.f. is 1.018 V at 293 K. Its temperature coefficient $\left(\frac{\partial E}{\partial T}\right)_P$ = - 4.00 x 10^{-5} VK^{-1}. Calculate ΔG, ΔS and ΔH for the cell reaction of the cell.

11. What is electrochemical series? What is the potential of a half cell consisting of zinc electrode in 0.01M ZnSO4 solution at 25℃. E◦= 0.763V

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