POINTS ON ELECTROCHEMISTRY - II

21. In the electrochemical series, various elements are arranged as per their standard reduction potential values.

22. A substance with higher reduction potential value means that it has a higher tendency to get reduced. So, it acts as a good oxidising agent.

23. A substance with lower reduction potential value means that it has a higher tendency to get oxidised. So, it acts as a good reducing agent.

24. The electrode with higher reduction potential acts as a cathode while the electrode with a lower reduction potential acts as an anode.

25. The potential difference between the 2 electrodes of a galvanic cell is called cell potential and is measured in Volts.

26. The cell potential is the difference between the reduction potential of cathode and anode.

$$E_{cell} = E_{cathode} - E_{anode}$$

Cell potential is called the electromotive force of the cell (EMF) when no current is drawn through the cell.

27. Nernst studied the variation of electrode potential of an electrode with temperature and concentration of electrolyte.

28. Nernst formulated a relationship between standard electrode potential $E^\ominus$ and electrode potential E.

$$E = E^\ominus - \frac{2.303RT}{nF}\log\frac{1}{[M^{n+}]}$$

$$E = E^\ominus - \frac{0.059}{n}\log\frac{1}{[M^{n+}]} \quad \text{(At 298 K)}$$

29. Electrode potential increases with increase in the concentration of the electrolyte and decrease in temperature.

30. Nernst equation when applied to a cell:

$$E_{cell} = E^\ominus_{cell} - \frac{2.303RT}{nF}\log\frac{[\text{Anode ion}]}{[\text{Cathode ion}]}$$

This helps in calculating the cell potential

31. At equilibrium, cell potential E_{cell} becomes zero

32. Relationship between equilibrium constant K_c and standard cell potential $E^{\ominus}_{cell}$:

$$E^{\ominus}_{cell} = \frac{0.059}{n}\log K_c \text{ (At 298 K)}$$

33. Work done by an electrochemical cell is equal to the decrease in Gibbs energy

$\Delta G^{\ominus} = -nFE^{\ominus}_{cell}$

34. The substances which allow the passage of electricity through them are known as conductors.

35. Every conducting material offers some obstruction to the flow of electricity which is called resistance. It is denoted by R and is measured in ohm.

36. The resistance of any object is directly proportional to its length l and inversely proportional to its area of cross section A.

$$R = \rho \frac{l}{A}$$

ρ is called specific resistance or resistivity. Its SI unit is ohm metre.

37. The inverse of resistance is known as conductance, G

$$G = \frac{1}{R}$$

Unit of conductance is ohm^{-1} or mho. It is also expressed in Siemens denoted by S.

38. The inverse of resistivity is known as conductivity. It is represented by the symbol κ. The SI unit of conductivity is Sm^{-1}. But it is also expressed in Scm^{-1}

$$\kappa = \frac{1}{\rho} = \frac{1}{R}\left(\frac{l}{A}\right) = G\,\frac{l}{A}$$

So, conductivity = Conductance × Cell constant

39. For measuring the resistance of an ionic solution, there are 2 problems:

a) Firstly, passing direct current changes the composition of the solution

b) Secondly, a solution cannot be connected to the bridge like a metallic wire or a solid conductor.