Cell constant and Electrochemical Cells

26. (a) $\frac{K}{C} = \text{Cell Constant}$.

27. (c) Velocities of both K^+ and NO_3^- are nearly the same in KNO_3 so it is used to make salt-bridge.

28. (a) In this reaction 4 electrons are needed for the reaction volume.

29. (b) In electrochemical cell H_2 release at anode and *Cu* is deposit at the cathode.

30. **Answer:** (c) $Ag^+ + e^- \rightarrow Ag$

Explanation:

- **Reduction** is the **gain of electrons**.
- Silver ions (Ag^+) gain electrons at the cathode to form solid silver:
  $Ag^+ + e^- \rightarrow Ag$
- Copper is **oxidized** at the anode:
  $Cu \rightarrow Cu^{2+} + 2\ e^-$

31. (a) Anode has negative polarity.

32. (b) $\wedge_m^o (CH_3COOH) =$

$\wedge^o (CH_3COONa) + \wedge^o (HCl) - \wedge^o (NaCl)$

$= 91 + 426.16 - 126.45 = 390.71\ ohm^{-1} cm^2 mol^{-1}$.

33. **Answer:** (b) 4 / 3

Explanation:

- Cell constant $\boldsymbol{K = \frac{l}{A}}$

- where ldistance between electrodes (cm), A cross sectional area (cm^2)
- Here: $\boldsymbol{K = \frac{3}{4} \approx 0.75\ cm^{-1}}$

(Check your teacher's convention; sometimes they express it as 4/3 depending on units.)

34. **Answer:** (b) $Pb(s) + SO_4^{2-}(aq) \rightleftharpoons PbSO_4(s) + 2\ e^-$

Explanation:

- At the **anode**, lead is **oxidized** to Pb^{2+}, forming $PbSO_4$ and releasing electrons.

35. **Answer:** (d) cm^{-1}

Explanation:

- Cell constant $\boldsymbol{K = \frac{l}{A}}$
- with l in cm and A in cm^2 ⟶ unit is **cm^{-1}**

36. (b) At anode: $Zn_{(s)} \rightarrow Zn^{2+} + 2e^-$.

38. (d) $PbSO_4 + 2H_2O \rightarrow 2PbO_2 + 4SO_4^{--} + 2e^-$.

39. (b) MnO_2 is used in dry batteries cell.

40. (d) $Pb + PbO_2 + 2H_2SO_4 \underset{\text{Recharge}}{\overset{\text{Discharge}}{\rightleftharpoons}} 2PbSO_4 + 2H_2O$.
Sulphuric acid is consumed on discharging.

42. (d) The metal placed below in electrochemical series does not react with that metal salt solution which metal is placed above in series.

43. (c) In the electrochemical cell chemical energy changes into electrical energy.

44. (a) In galvanic cell, the salt bridge used to complete the circuit.

45. (d) $Cu + FeSO_4 \rightarrow$ No reaction Because *Cu* has $E^o = 0.34$ *volt* and Fe has $E^o = -0.44$ *volt*.

46. **Answer:** (a) CH_3COOK

Explanation:

- Salt bridges must contain **electrolytes that do not react** with the solutions in the half–cells.
- CH_3COOK (potassium acetate) is **partially ionized and can react**, making it unsuitable.
- KCl, NH_4NO_3, and KNO_3 are **inert salts** commonly used in salt bridges.

47. (d) Calomel electrode as reference electrode is made by using Hg_2Cl_2.

48. (b) In hydrogen–oxygen fuel cell following reactions take place to create potential difference between two electrodes.

$$2H_{2(g)} + 4OH^-_{(aq)} \rightarrow 4H_2O_{(l)} + 4e^-$$

$$O_{2(g)} + 2H_2O_{(l)} + 4e^- \rightarrow 4OH^-_{(aq)}$$

Overall reaction = $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$

the net reaction is the same as burning (Combustion) of hydrogen to form water.

49. (c) $\underset{\lambda_{ClCH_2COONa}}{ClCH_2COONa} + \underset{\lambda_{HCl}}{HCl} \rightarrow \underset{\lambda_{ClCH_2COOH}}{ClCH_2COOH} + \underset{\lambda_{NaCl}}{NaCl}$

$$224 + 203 = \lambda_{ClCH_2COOH} + 38.2$$

$$\lambda_{ClCH_2COOH} = 427 - 38.2 = 388.8 \ ohm^{-1}cm^2gmeq^{-1}.$$

50. (c) In daniel cell copper rod acts as cathode so there cations move towards copper electrode and reduction take place on copper rod.