Cell constant and Electrochemical Cells

1. (d) In the absence of electric field the ions in the solution move randomly due to thermal energy.

2. (d) Since E^o_{A/A^-} has large negative value, the tendency of *A* to be reduced to A^- is very small.

In other words tendency of A^- to be oxidized to *A* is very large.

3. (d) Practically only 60-70% efficiency has been attained.

4. (b) $K = \frac{1}{R} \times$ Cell constant

Cell constant $= K \times R$; $0.012 \times 55 = 0.66\ cm^{-1}$.

5. (b) In common dry cell.

Anode : $Zn \rightarrow Zn^{++} + 2e^-$

Cathode: $2MnO_2 + Zn^{++} + 2e^- \rightarrow ZnMn_2O_4$.

6. (a) Because the reduction potential of Cu is highest.

7. (c) Overall reaction - $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O(l)$.

8. **Answer:** (b) H_2SO_4 is regenerated

Explanation:

- During charging, electrical energy drives the reverse of the discharge reactions.
- $PbSO_4$ on the electrodes is converted back to Pb (on the negative plate) and PbO_2 (on the positive plate), and **H_2SO_4 concentration in the electrolyte increases**.
- This regeneration of sulfuric acid is why a charged lead–acid battery has a stronger electrolyte.

9. (b) During charging of a lead storage battery, the reaction at the anode and cathode are

Anode: $PbSO_4 + 2e^- \rightarrow Pb + SO_4^{2-}$

Cathode: $PbSO_4 + 2H_2O \rightarrow PbO_2 + 4H^+ + SO_4^{2-} + 2e^-$

In both the reactions H_2SO_4 is regenerated.

10. **Answer:** (b) Reduction

Explanation:

- At the **cathode**, **cations gain electrons** (reduction occurs).
- In dilute H_2SO_4, H^+ ions are reduced to form hydrogen gas:
  $2\ H^+ + 2\ e^- \rightarrow H_2$
- At the **anode**, water is oxidized:
  $2\ H_2O \rightarrow O_2 + 4\ H^+ + 4\ e^-$

11. (c) $2NH_4Cl + Zn \rightarrow 2NH_3 + ZnCl_2 + H_2\uparrow$.

13. (a) When platinum electrodes are dipped in dilute solution H_2SO_4 than H_2 is evolved at cathode.

14. (a) Electrode on which oxidation occurs is written on $L.H.S.$ and the other on the $R.H.S.$ as represented by

$Zn|\ Zn^{2+}||\ Cu^{2+}|\ Cu$.

Reduction

15. (d) $Zn^{2+} + 2e^- \rightarrow Zn$. It shows reduction reaction.

16. (c) In the electrolytic cell electrical energy change into chemical energy.

17. (c) In the cell $Zn|\ Zn^{2+}||\ Cu^{2+}|\ Cu$ the negative electrode (anode) is *Zn*. In electrochemical cell representation anode is always written on left side while cathode on right side.

18. (a) Galvanic cell converts the chemical energy into electrical energy.

19. (b) Fuel-cells are used to provide power and drinking water to astronauts in space programme.

21. (b) $E^{o}_{\text{cell}} = \frac{2.303\ RT}{nF}\log K = \frac{0.0591}{n}\log K_c\ at\ 298\ K$.

22. (b) $\underbrace{Cu^{2+} + 2e^{-} \rightarrow Cu}$
Reductio

24. (b) The cell in which *Cu* and *Zn* roads are dipped in its solutions called Daniel cell.

25. (c) $K = C \times \text{Cell constant} = \frac{K}{C} = \frac{0.2}{0.04} = 5\ cm^{-1}$.