



DPP –4 [Nernst Equation -1]

Chapter: Electrochemistry

“ Don't ask, “Do I feel like studying?” Ask, “What would a serious aspirant do right now?” Act like that person — even for 30 minutes. Identity builds marks. Marks don't build identity.”

TYPE–1 : Factors Affecting Cell Potential

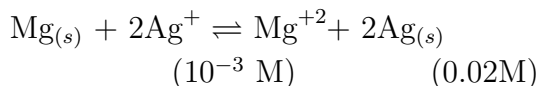
- The measured potential for $\text{Mg}^{2+} + 2\text{e}^- \rightleftharpoons \text{Mg (s)}$ does not depend upon**
 - Raising the temperature
 - Increasing the concentration of Mg^{2+} ion
 - Making the magnesium plate bigger
 - Decreasing the concentration of Mg^{2+} ion
- Which of the following does not affect the value of E_{cell} ?**
 - Volume of container
 - Concentration
 - Temperature
 - All of these
- The emf of the cell, $\text{Zn}|\text{Zn}^{2+}||\text{Cu}^{2+}|\text{Cu}$ is independent of**
 - The volume of Zn^{2+} and Cu^{2+} solution
 - The molarity of Zn^{2+} ions in solution
 - The molarity of Cu^{2+} ions in solution
 - Temperature
- E° for $\text{F}_2 + 2\text{e}^- \rightarrow 2\text{F}^-$ is 2.8V ,**
 E° for $\frac{1}{2}\text{F}_2 + \text{e}^- \rightarrow \text{F}^-$ is
 - 2.8 V (2) 1.4 V
 - 2.8 V (4) -1.4 V

TYPE–2 : EMF Calculations with Nernst Equation

- The standard emf for the cell reaction**
 $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$ is 1.10 V at 25 °C.
The emf for the cell reaction when 0.1 M Cu^{2+} and 0.1 M Zn^{2+} solution are used at 25 °C is :
 - 1.10 V (2) 0.110 V
 - 1.10 V (4) -0.110 V
- The EMF of the cell;**
 $\text{Cr}|\text{Cr}^{3+}(0.1 \text{ M})||\text{Fe}^{2+}(0.01 \text{ M})|\text{Fe}$
(Given $E^\circ_{\text{Cr}^{3+}|\text{Cr}} = -0.75 \text{ V}$, $E^\circ_{\text{Fe}^{2+}|\text{Fe}} = -0.45 \text{ V}$)
 - 0.30 V (2) 0.36 V

(3) 0.26 V (4) 0.22 V

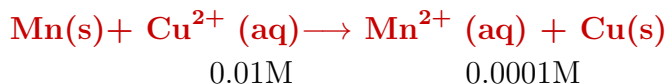
7. What will be value of E_{cell} for reaction



Given E°_{cell} is 3.17 V

(1) 2.67 (2) 2.13
(3) 3.27 (4) 3.041

8. What will be the emf of the cell in which the following reaction takes place at 298 K?



(Given: $E^\circ_{\text{cell}} = 1.52 \text{ V}$)

[NCERT Pg. 73]

(1) 1.58 V
(2) 1.52 V
(3) 0.059 V
(4) 1.21 V

9. For the redox reaction :

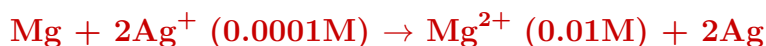


E°_{cell} is 1.10 V E_{cell} for the cell will be

$$\left(2.303 \frac{RT}{F} = 0.0591 \right)$$

(1) 1.07 V (2) 0.82 V
(3) 2.14 V (4) 1.80 V

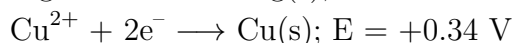
10. For the cell reaction



$E^\circ_{\text{cell}} = 3.177 \text{ V}$ then what will be the value of E_{cell} for the above reaction ?

(1) 2.5 (2) 3.0
(3) 3.2 (4) 3.8

11. The voltage of a cell whose half cell reactions are given below is



(1) 1.02 V (2) 1.36 V
(3) 2.71 V (4) 2.03 V

12. Calculate cell potential at 298 K for the following galvanic cell



$E_{\text{Cd}^{2+}/\text{Cd}} = -0.40\text{V}$

(1) 0.38 (2) -0.38
(3) 0.36 (4) -0.36

13. The emf of the cell in which the following reaction



occurs, is found to be 0.5105 V at 298 K. The standard e.m.f. of the cell is :-

(1) -0.5105 V (2) 0.5400 V
(3) 0.4810 V (4) 0.5696 V

14. Standard cell voltage for the cell $\text{Pb}/\text{Pb}^{2+} || \text{Sn}^{2+}/\text{Sn}$ is -0.01V. If the cell is to exhibit $E_{\text{cell}} = 0$ then the value of $\log [\text{Sn}^{2+}] / [\text{Pb}^{2+}]$ should be

- (1) 0.33 (2) 0.5
 (3) 1.5 (4) -0.5

TYPE-3: Nernst Equation [Concentration & Potential Changes]

15. **For given half cell; $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$; on increasing $[\text{Al}^{3+}]$, the reduction electrode potential**
- (1) Increases
 (2) Decreases
 (3) No change
 (4) First increases then decreases
16. **$\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$. On increasing $[\text{Cu}^{2+}]$ concentration, electrode potential**
- (1) Increases
 (2) Decreases
 (3) Will remain unchanged
 (4) First increases, then decreases
17. **How much will the potential of $\text{Zn} / \text{Zn}^{2+}$ change if the solution of Zn^{2+} is diluted 10 times**
- (1) increases by 0.03 V
 (2) decreases by 0.03 V
 (3) increases by 0.059 V
 (4) decreases by 0.059 V
18. **If Zn^{2+}/Zn electrode is diluted 1000 times, then the change in electrode potential is**
[NCERT Pg. 72]
- (1) Increase of 29.5 mV
 (2) Increase of 59 mV
 (3) Decrease of 88.5 mV
 (4) Increase of 88.5 mV
19. **For a half cell having reaction $\frac{1}{2}\text{Cl}_2 + \text{e}^- \rightarrow \text{Cl}^-$, if 1MCl^- solution is diluted to 100 times ($E^\circ_{\text{Cl}_2/2\text{Cl}^-} = 1.36\text{V}$) , then $E_{\text{Cl}_2/2\text{Cl}^-}$ will be (Given $P_{\text{Cl}_2} = 1\text{atm}$)**
- (1) 1.18 V (2) 1.48 V
 (3) 1.68 V (4) 3.48 V
20. **How much will the potential of a hydrogen electrode change when its solution initially at $\text{pH} = 0$ is neutralised to $\text{pH} = 7$?**
- (1) increases by 0.059 V
 (2) decreases by 0.059 V
 (3) increases by 0.41 V
 (4) decreases by 0.41 V
21. **The emf of the cell**
 $\text{Tl(s)} | \text{Tl}^+ (0.0001 \text{ M}) || \text{Cu}^{2+} (0.01\text{M}) | \text{Cu(s)}$ is 0.83 V
The emf of this cell will be increased by :-
- (1) Increasing the concentration of Cu^{+2} ions
 (2) Decreasing the concentration of Tl^+
 (3) Increasing the concentration of both

- (4) (1) & (2) both
22. **Which of the following will increase the voltage of the cell with following cell reaction**
 $\text{Sn}_{(s)} + 2\text{Ag}^+_{(aq)} \rightarrow \text{Sn}^{2+}_{(s)} + 2\text{Ag}_{(s)}$
 (1) Increase in the size of silver rod
 (2) Increase in the concentration of Sn^{2+} ions
 (3) Increase in the concentration of Ag^+ ions
 (4) Decrease in the concentration of Ag^+ ions
23. **Consider the cell $\text{Cu}/\text{Cu}^{2+} \parallel \text{Ag}^+/\text{Ag}$. If the concentration of Cu^{2+} and Ag^+ ions becomes ten times then the emf of the cell will :-**
 (1) Becomes 10 times
 (2) Remains same
 (3) Increases by 0.0295 V
 (4) Decreases by 0.0295 V
24. **In a cell that utilizes the reaction**
 $\text{Zn}_{(s)} + 2\text{H}^+_{(aq)} \rightarrow \text{Zn}^{2+}_{(aq)} + \text{H}_{2(g)}$
Addition of H_2SO_4 to cathode compartment, will
 (1) increase the E_{cell} and shift equilibrium to the right
 (2) lower the E_{cell} and shift equilibrium to the right
 (3) lower the E_{cell} and shift equilibrium to the left
 (4) increase the E_{cell} and shift equilibrium to the left
25. **E.M.F. of $\text{Ni}_{(s)}|\text{Ni}^{2+}(\text{aq}) \parallel \text{Cu}^{2+}(\text{aq})|\text{Cu}_{(s)}$ cell can be increased by**
 (1) Adding NH_3 in the right half-cell
 (2) Increasing the conc. of Ni^{2+} ions
 (3) Adding dimethyl glyoxime into the left half-cell
 (4) Changing the electrolyte present in salt bridge
26. **In the electrochemical cell :-**
 $\text{Zn} | \text{ZnSO}_4(0.01\text{M}) || \text{CuSO}_4(1.0\text{ M}) | \text{Cu}$, the emf of this Daniel cell is E_1 . When the concentration of ZnSO_4 is changed to 1.0M and that of CuSO_4 changed to 0.01M, the emf changes to E_2 . Which one of the relationship is correct between E_1 and E_2 ?
 (Given, $\frac{RT}{F} = 0.059$)
 (1) $E_1 < E_2$ (2) $E_1 > E_2$
 (3) $E_2 = 0 \neq E_1$ (4) $E_1 = E_2$
27. **Calculate the half cell potential at 298 K for the reaction, $\text{Zn}^{2+} + 2\text{e}^- \rightarrow \text{Zn}$ if $[\text{Zn}^{2+}] = 2\text{ M}$,**
 $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{ V}$
 (1) -0.90 V (2) -0.75 V
 (3) -0.85 V (4) -0.65 V
28. **Which of the following represents the potential of silver wire dipped into 0.1 M AgNO_3 solution at 25°C ?**
 (1) E°_{red} (2) $(E^\circ_{\text{red}} + 0.059)$
 (3) $E^\circ_{\text{ox}} - 0.059$ (4) $(E^\circ_{\text{red}} - 0.059)$
29. **If electrode potential of 0.01 M Cu^{2+}/Cu is 0.32 V then what will be its E°_{Cu} -**
 (1) 0.18 V (2) 0.28 V
 (3) 0.74 V (4) 0.38 V

30. If the standard electrode potential of Cu^{2+}/Cu electrode is 0.34 V, what is the electrode potential of 0.1 M concentration of Cu^{2+} ?
- (1) 3.99 V (2) 0.3105 V
 (3) 0.222 V (4) 0.176 V
31. In SHE, the pH of the acid solution should be
- (1) 7 (2) 14
 (3) 0 (4) 4
32. The electrode potential of hydrogen electrode is when H_3O^+ ion concentration is 10^{-5} M ($p\text{H}_2 = 1$ atm)
- [NCERT Pg. 68]
- (1) -0.059 V
 (2) -0.295 V
 (3) -0.118 V
 (4) -0.59 V
33. The potential of hydrogen electrode ($P_{\text{H}_2} = 1$ atm; $C_{\text{H}^+} = 0.1$ M) at 25°C will be -
- (1) 0.00 V (2) -0.059 V
 (3) 0.118 V (4) 0.059 V
34. The potential of a hydrogen electrode at $\text{pH} = 1$ is
- (1) 0.059 V (2) 0.00 V
 (3) -0.059 V (4) 0.59 V
35. The oxidation potential of hydrogen electrode at $\text{pH} = 10$ and $P_{\text{H}_2} = 1$ atm
- (1) 0.51 V (2) 0.00 V
 (3) 0.59 V (4) 0.059 V
36. The hydrogen electrode is dipped in a solution of $\text{pH} = 3$ at 25°C . The reduction potential of the electrode would be
- (1) 0.177 V (2) 0.087 V
 (3) -0.177 V (4) 0.059 V
37. The reduction potential of hydrogen half-cell will be negative if :-
- (1) $p(\text{H}_2) = 2$ atm and $[\text{H}^+] = 1.0$ M
 (2) $p(\text{H}_2) = 2$ atm and $[\text{H}^+] = 2.0$ M
 (3) $p(\text{H}_2) = 1$ atm and $[\text{H}^+] = 2.0$ M
 (4) $p(\text{H}_2) = 1$ atm and $[\text{H}^+] = 1.0$ M
38. The pressure of H_2 required to make the potential of H_2 -electrode zero in pure water at 298 K is :-
- (1) 10^{-14} atm (2) 10^{-12} atm
 (3) 10^{-10} atm (4) 10^{-4} atm
39. The electrode potential of hydrogen electrode is 18 mV then $[\text{H}^+]$ is :-
- (1) 0.2 (2) 1
 (3) 2 (4) 5