



DPP –2 [Electrode Potential and EMF] Chapter: Electrochemistry

“Take a deep breath. Detach from marks, parents, rank, and future. Earn this page with full focus.”

TYPE–1 : Standard Hydrogen Electrode & Standard Potentials

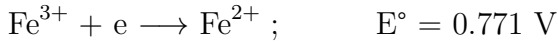
- The equation representing the process by which standard reduction potential of zinc can be defined is:**
 - $\text{Zn}^{2+}(\text{s}) + 2\text{e}^{-} \rightarrow \text{Zn}(\text{s})$
 - $\text{Zn}(\text{g}) \rightarrow \text{Zn}^{2+}(\text{g}) + 2\text{e}^{-}$
 - $\text{Zn}^{2+}(\text{g}) + 2\text{e}^{-} \rightarrow \text{Zn}(\text{s})$
 - $\text{Zn}^{2+}(\text{aq.}) + 2\text{e}^{-} \rightarrow \text{Zn}(\text{s})$
- A standard hydrogen electrode has zero electrode potential because:**
 - Hydrogen is easiest to oxidize.
 - This electrode potential is assumed to be zero.
 - Hydrogen atom has only one electron.
 - Hydrogen is the lightest element.
- Which is not true for a standard hydrogen electrode?**
 - The hydrogen ion concentration is 1 M.
 - Temperature is 25°C.
 - Pressure of hydrogen is 1 bar.
 - It contains a metallic conductor which does not adsorb hydrogen.

TYPE–2 : EMF & Cell Potential Calculations

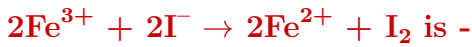
- Consider the following relations for emf of an electrochemical cell :**
 - emf of cell = (Oxidation potential of anode) – (Reduction potential of cathode)
 - emf of cell = (Oxidation potential of anode) + (Reduction potential of cathode)
 - emf of cell = (Reduction potential of anode) + (Reduction potential of cathode)
 - emf of cell = (Oxidation potential of anode) – (Oxidation potential of cathode)**Which of the above relations are correct :**
 - (a) and (b)
 - (c) and (d)
 - (b) and (d)
 - (c) and (a)
- The emf of the cell,**
 $\text{Ni}|\text{Ni}^{2+}(1.0\text{ M})||\text{Ag}^{+}(1.0\text{ M})|\text{Ag}$ (E° of $\text{Ni}^{2+}|\text{Ni} = -0.25$ volt, E° for $\text{Ag}^{+}|\text{Ag} = 0.80$ volt)
 - 0.55 volt
 - 1.05 volt
 - +1.05 volt

(4) -0.55 volt

6. **Given electrode potentials :**



E° cell for the cell reaction



(1) $(2 \times 0.771 - 0.536) = 1.006 \text{ V}$

(2) $(0.771 - 0.5 \times 0.536) = 0.503 \text{ V}$

(3) $0.771 - 0.536 = 0.235 \text{ V}$

(4) $0.536 - 0.771 = -0.235 \text{ V}$

7. **$E^\circ(\text{Ni}^{2+}/\text{Ni}) = -0.25 \text{ V}$**



The emf of the voltaic cell.



(1) 1.25 V (2) -1.75 V

(3) 1.75 V (4) 4.0 V

8. **If $E^\circ_{\text{Fe}^{2+}/\text{Fe}} = -0.441 \text{ V}$ and $E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771 \text{ V}$**

the standard EMF of the reaction



(1) 0.330 V

(2) 1.653 V

(3) 1.212 V

(4) 0.111 V

9. **For $\text{Zn}^{+2} / \text{Zn}$ $E^\circ = -0.76 \text{ V}$ then EMF of this cell**



(1) -0.76 V (2) 0.76 V

(3) 0.38 V (4) -0.38 V

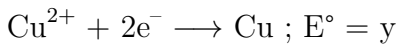
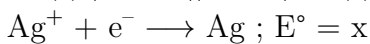
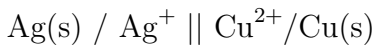
10. **The standard reduction potential of Pb and Zn electrodes are -0.126 and -0.763 volts respectively. The e.m.f. of the cell**



(1) 0.637 V (2) 0.607 V

(3) 0.667 V (4) 0.889 V

11. **Consider the cell given below :**



E°_{cell} is

(1) $x + 2y$ (2) $2x + y$

(3) $y - x$ (4) $y - 2x$

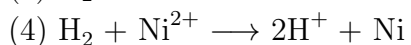
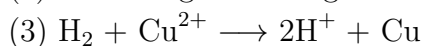
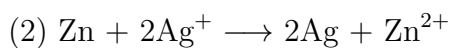
12. **For an electrochemical cell $\text{Al} / \text{Al}^{3+} (1 \text{ M}) \parallel \text{Cu}^{2+}(1\text{M}) / \text{Cu}$, it is given that $E^\circ_{\text{Al}/\text{Al}^{3+}} = 1.66 \text{ V}$ and $E^\circ_{\text{Cu}/\text{Cu}^{2+}} = -0.34 \text{ V}$.**

The value of E_{cell} is

(1) 2.00 V (2) 3.02 V

(3) 1.75 V (4) 2.25 V

13. **E° for the half cell**
 $Zn^{2+} | Zn$ is -0.76 V. E.m.f. of the cell
 $Zn | Zn^{2+} (1M) || 2H^+ (1M) | H_2 (1 \text{ atm})$ is
 (1) -0.76 V (2) $+0.76$ V
 (3) -0.38 V (4) $+0.38$ V
14. **Consider the following E° values**
 $E^\circ_{Fe^{3+}/Fe^{2+}} = +0.77V$
 $E^\circ_{Sn^{2+}/Sn} = -0.14V$
Under standard conditions the potential for the reaction
 $Sn(s) + 2Fe^{3+}(aq) \rightarrow 2Fe^{2+}(aq) + Sn^{2+}(aq)$ is
 (1) 0.91 V (2) 1.40 V
 (3) 1.68 V (4) 0.63 V
15. **A button cell used in watches function as following**
 $Zn(s) + Ag_2O(s) + H_2O(\ell) \rightleftharpoons 2Ag(s) + Zn^{2+}(aq) + 2OH^-(aq)$
If half cell potentials are
 $Zn^{2+}(aq) + 2e^- \rightarrow Zn(s); E^\circ = -0.76$ V
 $Ag_2O(s) + H_2O(\ell) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq);$
 $E^\circ = 0.34$ V
The cell potential will be :-
 (1) 1.34 V (2) 1.10 V
 (3) 0.42 V (4) 0.84 V
16. **Find out the E°_{cell} from the given data**
 (a) $Zn | Zn^{+2} || Cu^{+2} | Cu ; E^\circ_{cell} = 1.10$ V
 (b) $Cu | Cu^{+2} || Ag^+ | Ag ; E^\circ_{cell} = 0.46$ V
 (c) $Zn | Zn^{+2} || Ag^+ | Ag ; E^\circ_{cell} = ?$
 (Given $E_{Cu^{+2}/Cu} = 0.34V$)
 (1) -0.04 V (2) $+0.04$ V
 (3) $+0.30$ V (4) 1.56 V
17. **Aluminium displaces hydrogen from dilute HCl whereas silver does not, the E.M.F. of a cell prepared by combining Al/Al^{+3} and Ag/Ag^+ is 2.46 V. The reduction potential of silver electrode is $+0.80$ V. The reduction potential of aluminium electrode is :**
 (1) -3.26 V (2) $+1.66$ V
 (3) -1.66 V (4) 3.26 V
18. **Deduced from the following E° values of half cells, what combination of two half cells would result in a cell with the largest potential?**
 (i) $A^{3-} \rightarrow A^{2-} + e^-$, $E^\circ = 1.5$ V
 (ii) $B^{2+} + e^- \rightarrow B^+$, $E^\circ = 2.1$ V
 (iii) $C^{2+} + e^- \rightarrow C^+$, $E^\circ = +0.5$ V
 (iv) $D \rightarrow D^{2+} + 2e^-$, $E^\circ = -1.5$ V
 (1) (i) and (iii) (2) (i) and (ii)
 (3) (ii) and (iv) (4) (iii) and (iv)
19. **The oxidation potential of Zn, Cu, Ag, H_2 and Ni are 0.76 V, -0.34 V, -0.80 V, 0 V, 0.55 V respectively. Which of the following reaction will provide maximum voltage ?**
 (1) $Zn + Cu^{2+} \rightarrow Cu + Zn^{2+}$



20. **Standard electrode potential for $\text{Sn}^{4+}/\text{Sn}^{2+}$ couple is +0.15 V and that for the Cr^{3+}/Cr couple is -0.74 V. These two couples in their standard state are connected to make a cell. The cell potential will be :-**



21. **$\text{Cu(s)} \mid \text{Cu}^{+2}(1 \text{ M}) \mid \mid \text{Zn}^{+2}(1 \text{ M}) \mid \text{Zn(s)}$**

A cell represented above should have emf.

(1) Positive

(2) Negative

(3) Zero

(4) Cannot be predicted