Resonance®
Educating for better tomorrow

TARGET : NEET (UG) 2024

Course : SARANSH (Youtube Live CRASH COURSE)

I-CHEMISTRY
DPP
DAILY PRACTICE PROBLEMS
DPP NO. 1

Physcial Chemistry : ELECTROCHEMISTRY

DPP No. : 1

1. Given below are half-cell reactions:

$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O,$

$E^{o}_{Mn^{2+}/MnO_4^-} = -1.510V$

$\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O$

$E^{o}_{O_2/H_2O} = +1.223V$

Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid ?

(1) Yes, because E^o_{cell} = + 2.733 V
(2) No, because E^o_{cell} = – 2.733 V
(3) Yes, because E^o_{cell} = + 0.287 V
(4) No, because E^o_{cell} = – 0.287 V

2. Two half cell reactions are given below :

$Co^{3+} + e^- \rightarrow CO^{2+}$, $E^{\circ}_{Co^{2+}/CO^{3+}} = -1.81$ V

$2Al^{3+} + 6e^- \rightarrow 2\,Al(s)$, $E^{\circ}_{Al/Al^{3+}} = +1.66$ V

The standard EMF of a cell with feasible redox reaction will be :

(1) +7.09 V
(2) +0.15 V
(3) +3.47 V
(4) –3.47 V

3. The correct value of cell potential in volt for the reaction that occurs when the following two half cells are connected, is

$Fe^{2+}_{(aq)} + 2e^- \rightarrow Fe(s), E^{\circ} = -0.44V$

$Cr_2O_{7\,(aq)}^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O, E^{\circ} = +1.33V$

(1) + 1.77 V
(2) + 2.65 V
(3) + 0.01 V
(4) + 0.89 V

4. A button cell used in watches functions as following

$Zn(s) + Ag_2O(s) + H_2O(l) \rightleftharpoons 2Ag(s) + Zn^{2+} (aq) + 2OH^- (aq)$

If half cell potentials are :

$Zn^{2+} (aq) + 2e^- \rightarrow Zn(s)$; $E^o = - 0.76$ V

$Ag_2O (s) + H_2O (l) + 2e^- \rightarrow 2Ag(s) + 2OH^- (aq)$; $E^o = 0.34$ V

The cell potential will be :

(1) 0.42 V (2) 0.84 V (3) 1.34 V (4) 1.10 V

5. Standard reduction potentials of the half reactions are given below :

$F_2(g) + 2e^- \rightarrow 2F^- (aq)$; $E^o = + 2.85$ V

$Cl_2(g) + 2e^- \rightarrow 2Cl^- (aq)$; $E^o = + 1.36$ V

$Br_2(l) + 2e^- \rightarrow 2Br^- (aq)$; $E^o = + 1.06$ V

$I_2(s) + 2e^- \rightarrow 2I^- (aq)$; $E^o = + 0.53$ V

The strongest oxidising and reducing agents respectively are :

(1) F_2 and I^- (2) Br_2 and Cl^- (3) Cl_2 and Br^- (4) Cl_2 and I_2

6. Zinc can be coated on iron to produce galvanized iron but the reverse is not possible. It is because

(1) Zinc has higher negative electrode potential than iron

(2) Zinc is lighter than iron

(3) Zinc has lower melting point than iron

(4) Zinc has lower negative electrode potential than iron

7. Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below

$$BrO_4^- \xrightarrow{1.82V} BrO_3^- \xrightarrow{1.5V} HBrO \xrightarrow{1.595V} Br_2 \xrightarrow{1.0652V} Br^-$$

Then the species undergoing disproportionation is

(1) BrO_3^- (2) HBrO (3) Br_2 (4) BrO_4^-

8. Identify the reaction from following having top position in EMF series (Std. red. potential) according to their electrode potential at 298 K.

(1) $Mg^{2+} + 2e^- \longrightarrow Mg(s)$ (2) $Fe^{2+} + 2e^- \longrightarrow Fe(s)$

(3) $Au^{3+} + 3e^- \longrightarrow Au(s)$ (4) $K^+ + 1e^- \longrightarrow K(s)$

9. At 298 K, the standard electrode potentials of Cu^{2+}/ Cu, Zn^{2+}/ Zn, Fe^{2+}/Fe and Ag are 0.34 V, –0.76V, –0.44 V and 0.80 V, respectively.

On the basis of standard electrode potential, predict which of the following reaction can not occur?

(1) $FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)$
(2) $2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)$
(3) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$
(4) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

10. The E° Values for

Al^+ / Al= + 0.55 V and Tl^+ / Tl = -0.34 V

Al^{+3} / Al= - 1.66 V and Tl^{+3} / Tl = + 1.26 V

Identify the incorrect statement.

(1) Al is more electropositive than Tl.
(2) Tl^{3+} is a good reducing agent than Tl^+.
(3) Al^+ is unstable in solution.
(4) Tl can be easily oxidised to Tl^+ than Tl^{3+}.

Answer Key

1.	(3)	**2.**	(3)	**3.**	(1)	**4.**	(4)	**5.**	(1)	**6.**	(1)	**7.**	(2)
8.	(3)	**9.**	(2)	**10.**	(2)								