ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

FOR GOD AND COUNTRY

SOLUTION-31(CLASS-12)

TOPIC- ELECTROCHEMISTRY

SUBTOPIC- ELECTROCHEMICAL CELL

SUBJECT – CHEMISTRY **F.M. - 15**

DURATION – 30 mins **DATE -27.06.20**

1.1 **E_1, E_2 and E_3 are the e.m.f. values of the three galvanic cells respectively-**

(a) $Zn\,|\,Zn^{+2}_{1M}\,||\,Cu^{+2}_{0.1M}\,|\,Cu$

(b) $Zn\,|\,Zn^{+2}_{1M}\,||\,Cu^{+2}_{1M}\,|\,Cu$

(c) $Zn\,|\,Zn^{+2}_{0.1M}\,||\,Cu^{+2}_{1M}\,|\,Cu$

Which one of the following is true?

(a) $E_2 > E_3 > E_1$ (b) $E_3 > E_2 > E_1$ (c) $E_1 > E_2 > E_3$ (d) $E_1 > E_3 > E_2$

Ans. b

1.2 **The standard e.m.f. of galvanic cell involving 3 moles of electrons in its redox reaction is 0.59 V. The equilibrium constant for the reaction of the cell is-**

(a) 10^{25} (b) 10^{20} (c) 10^{15} (d) 10^{30}

Ans. d

1.3 **The potential of a hydrogen electrode at pH = 10 is-**

(a) 0.59 V (b) 0.00 V (c) –0.59 V (d) –0.059 V

Ans. c

1.4 **For the reduction of silver ions with copper metal the standard cell potential was found to be +0.46V at 25°C. The value of standard Gibbs energy, ΔG° will be (F = 96500 C mol^{-1})-**

(a) –44.5 kJ (b) –98.0 kJ (c) –89.0 kJ (d) –89.0 J

Ans. c

1.5 **Which of the following statement is correct?**

(a) E_{Cell} and Δ_rG of cell reaction both are extensive properties.

(b) E_{Cell} and Δ_rG of cell reaction both are intensive properties.

(c) E_{Cell} is an intensive property while Δ_rG of cell reaction is an extensive property.
(d) E_{Cell} is an extensive property while Δ_rG of cell reaction is an intensive property.
Ans. c

1.6 $E^{\ominus}_{Cell}$ **= 1.1V for Daniel cell. Which of the following expressions are correct description of state of equilibrium in this cell?**

(a) $1.1 = K_c$

(b) $\frac{2.303RT}{2F} \log K_c = 1.1$

(c) $\log K_c = \frac{2.2}{0.059}$

(d) $\log K_c = 1.1$

Ans. b and c

1.**The Gibbs energy for the decomposition of Al_2O_3 at 500°C is as follows:**

$\frac{2}{3}$ **Al_2O_3** ~~$\frac{4}{3}$ Al +~~**O2, Δ_rG = +966 kJ mol^{-1}**

The potential difference needed for electrolytic reduction of Al_2O_3 at 500°C is at least:

a) 2.5 V b) 5.0 V c) 4.5 V d) 3.0 V

Ans. a

1.8 **The highest electrical conductivity of the following aqueous solutions is of-**

(a) 0.1 M acetic acid (b) 0.1 M chloroacetic acid (c) 0.1 M fluoroacetic acid(d) 0.1 M difluoroacetic acid

Ans. d

1.9 **Saturated solution of KNO_3 is used to make 'salt bridge' because –**

(a) Velocity of K+ is greater than that of NO_3^-(b) velocity of NO_3^- is greater than that of K^+
(c) velocity of both K+ and NO_3^- are nearly the same (d) KNO_3 is highly soluble in water

Ans. c

1.10 **For the electrochemical cell:**

M | M+ ||X- | X, E° [M+ | M] = 0.44 V and

E° [X | X-] = 0.33 V.

From the data one can deduce that-

(a) M + X → M+ + X- is the spontaneous reaction (b) M+ + X → M + X is the spontaneous reaction
(c) Ecell = 0.77 V (d) Ecell = -0.77 V

[Given F = 96500 (mol^{-1}); R = 8.314 JK^{-1} mol^{-1}]

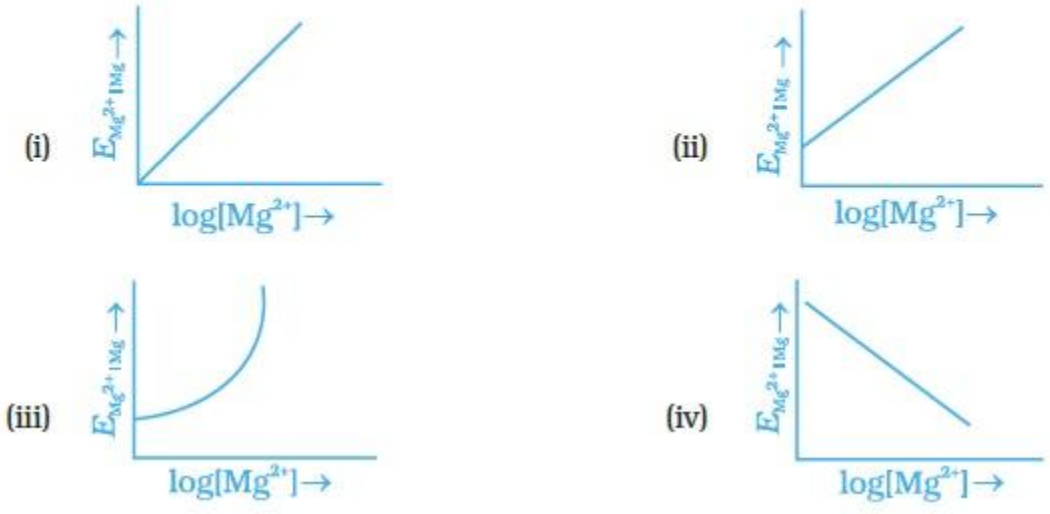
Ans. b

1.11**An electrochemical cell can behave like an electrolytic cell when –**
(a) $E_{cell} = 0$ (b) $E_{cell} > E_{ext}$ (c) $E_{ext} > E_{cell}$ (d) $E_{cell} = E_{ext}$
Ans. c

1.12**Which cell will measure standard electrode potential of copper electrode?**
(a) Pt (s) | H_2 (g,0.1 bar) | H^+ (aq.,1 M) || Cu^{2+}(aq.,1M) | Cu
(b) Pt(s) | H_2 (g, 1 bar) | H^+ (aq.,1 M) || Cu^{2+} (aq.,2 M) | Cu
(c) Pt(s)| H_2 (g, 1 bar) | H^+ (aq.,1 M) || Cu^{2+} (aq.,1 M) | Cu
(d) Pt(s) | H_2 (g, 1 bar) | H^+ (aq.,0.1 M) || Cu^{2+} (aq.,1 M) | Cu
Ans. c

1.13

$E_{Mg^{2+}|Mg} = E^{\ominus}_{Mg^{2+}|Mg} - \frac{0.059}{2} \log\frac{1}{[Mg^{2+}]}$. The graph of $E_{Mg^{2+}|Mg}$ vs $\log [Mg^{2+}]$ is



Ans. b

1.14**Using the data given below find out the strongest reducing agent.**

$E^{\ominus}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V$ $E^{\ominus}_{Cl_2/Cl^-} = 1.36V$

$E^{\ominus}_{MnO_4^-/Mn^{2+}} = 1.51V$ $E^{\ominus}_{Cr^{3+}/Cr} = -0.74V$

a) Cl^- b) Crc) Cr^{3+} d)Mn^{2+}

Ans. b

1.15 **The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called-**

a) Cell potential b) Cell e.m.f c) Potential difference d) Cell voltage

Ans. b

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