QB365

Important Questions - Electrochemistry

12th Standard CBSE

Chemistry Reg.No. : | | | | | | |

Time : 05:30:00 Hrs

Section - A

1) What will be the e.m.f of the given cell ? Pt | H_2 (P_1) | H^+ (aq) | H_2 (P_2) | Pt **1**

(a) $\frac{RT}{F}In\frac{P_1}{P_2}$ (b) $\frac{RT}{2F}In\frac{P_1}{P_2}$ (c) $\frac{RT}{F}In\frac{P_2}{P_1}$ (d) none of these

2) Using the data given below find out the strongest reducing agent. **1**

$E^{\ominus}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V$, $E^{\ominus}_{Cl_2/Cl^-} = 1.36V$ $E^{\ominus}_{MnO_4^-/Mn^{2+}} = 1.51V$, $E^{\ominus}_{Cr^{3+}/Cr} = -0.74V$

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

3) In the electrolysis of aqueous sodium chloride solution which of the half cell reaction will occur at anode ? **1**

(a) $Na^+(aq) + e^- \longrightarrow Na(s); E^{\ominus}_{cell} = -2.71V$ (b) $2H_2O(l) \longrightarrow O_2(g) + 4H^+(aq) + 4e^-; E^{\ominus}_{cell} = 1.23V$

(c) $H^+(aq) + e^- \longrightarrow \frac{1}{2}H_2(g); E^{\ominus}_{cell} = 0.00V$ (d) $Cl^-(aq) \longrightarrow \frac{1}{2}Cl_2(g) + e^-; E^{\ominus}_{cell} = 1.36V$

4) Molar conductivity of ionic solution depends on ------- **1**

(a) temperature (b) distance between electrodes (c) concentration of electrolytes in solution

(d) surface area of electrodes

5) The weight of silver (at.wt.=108) displaced by a quantity of electricity which displaces 5600 mL of O_2 at STP will be **1**

(a) 5.4 g (b) 10.8 g (c) 54.0 g (d) 108.0 g

6) Mercury cell (1) **1**

does not involve any ion in solution and is used in hearing aids

7) Au^{3+} (2) metal ion which is an oxidising agent **1**

8) Br- (3) anion that can be oxidised by Au^{3+} **1**

9) F^- (4) anion which is the weakest reducing agent **1**

10) E^0 (Fe^{3+}, Fe) (5) - 0.04 V **1**

Section - B

11) Explain how rusting of iron is envisaged as setting up of an electrochemical cell. **2**

12) Calculate the equilibrium constant for the following reaction at 298 K: $Cu(s) + Cl_2(g) \rightarrow CuCl_2(aq)$ **2**

$R = 8.314 \quad JK^{-1}mol^{-1}, E^o_{Cu^{2+}/Cu} = 0.34V, E^o_{\frac{1}{2}Cl_2/Cl^-} = 1.36V, 1F = 96500 \quad Cmol^{-1}$

13) The same quantity of electrical charge deposited 0.583 g of Ag when passed through **2**

$AgNO_3$, $AuCl_3$ solution.Calculate the weight of gold formed. (At weight of Au=197 g mol^{-1}).

14) Calculate the emf of the cell in which the following reaction takes place **2**

$Ni(s) + 2Ag^+(0.002M) \rightarrow Ni^{2+}(0.160M) + 2Ag(s)$ Given that E^o_{cell}=1.05V

15) Copper is conducting as such while copper sulphate is conducting only in molten state or in aqueous solution. Explain **2**

Section - C

16) For a cell: $Ag(s)\left|AgNO_3(0.01M)\right|\left|AgNO_3(1.0M)\right|Ag(s)$ (i) Calculate the e.m.f. of the cell at 25°C. (ii) Write the net cell reaction. (iii) Will the cell generate e.m.f. when two concentrations become equal? **3**

17) Why blue colour of copper sulphate solution gets discharged when zine rod is dipped in it? Given $E^0_{Cu^{2+}/Cu} = -0.34V, E^0_{Zn^{2+}/Zn} = -0.76V$ **3**

18) What pressure of H_2 would be required to make e.m.f. of the hydrogen electrode zero in pure water at 25°**C**? **3**

19) Calculate e.m.f. of the following cell at 298 K: **3**

$2Cr(s)+3Fe^{2+}(0.1M) \rightarrow 2Cr^{3+}(0.01M)+3Fe(s)$

$E^\circ\left(Cr^{3+}|Cr\right)$=-0.74

$E^\circ\left(Fe^{2+}|Fe\right)$=-0.44V

20) A 100W and 110 V incandescent lamp is connected in series with an electrolytic cell containing $CdSO_4$ solution. What mass of cadmium will be deposited at the cathode after 4 hrs of electricity? **3**

Section - D

21) Consider the figure given below and answer the questions (i) to (iv) that follow. **5**

(i) Redraw the diagram to show the direction of electron flow.

(ii) Is silver plate anode or cathode?

(iii) What will happen if the salt bridge is removed?

(iv) When will the cell stop functioning

(v) How will concentration of Zn^{2+} ions and Ag^+ ions be affected when the cell functions

(vi) How will the concentration of Zn^{2+} ions and Ag^+ ions be affected after the cell becomes dead?

22) Calculate the standard electrode potential of Cu^+/Cu half cell. Given that the standard reduction potentials of Cu^{2+}/Cu and Cu^{2+}/Cu^+ are 0.337 V and 0.153 V respectively. **5**

23) Two students use same stock solution of $ZnSO_4$ and a solution of $CuSO_4$. The e.m.f. of one cell is 0.03 V higher than the other. The concentration of $CuSO_4$ in the cell with higher e.m.f. value is 0.5 M. Find out the concentration of $CuSO_4$ in the other cell (2.303 RT/F = 0.06) **5**

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