ASSIGNMENT OF ELECTROCHEMISTRY (KV NO-2, CRPF,BHUBANESWAR)
CLASS-XII CBSE BOARD QUESTION PREPARED BY A K SAMAL, PGT (CHEM.) PH-7381884606[5 MARKS]

2019

Q. Explain with a graph, the variation of molar conductivity of a strong electrolyte with dilution. [2]
Q.Define electrochemical cell.What happens when the applied external potential is greater than E^{o}_{cell} of electrochemical cell.
Q.Using the E^{o} values of X and Y,predict which is better for coating the surface of iron to prevent rust and why.

Given: [$E^{O}\ Fe^{2+}$ | Fe = -0.44 V, $E^{O}\ X^{2+}$ | X = -2.36 V, $E^{O}\ Y^{2+}$ | Y = -0.14 V]
Q.Calculate $\Delta_r G^{o}$ and logK_c for the following reaction: [3]
$Cd^{2+}_{(aq)} + Zn_{(s)} \rightarrow Zn^{2+}_{(aq)} + Cd_{(s)}$

Given: [$E^{O}\ Cd^{2+}$ | Cd = -0.403 V, $E^{O}\ Zn^{2+}$ | Zn = -0.763 V
[Ans. E^{o}_{cell} = + 0.360 V, $\Delta_r G^{o}$=-69.480kj /mol, logKc =12.20]

OR

Chromium metal is electroplated using an acidic solution containing CrO_3 according the following equation: $CrO_{3(aq)} + 6H^{+} + 6e^{-} \rightarrow Cr_{(s)} + 3H_2O$
Calculate how many grams of chromium will be electroplated by 24,000 coulombs. How long will it take to electroplate 1.5gm of chromium using 12.5A current?ans-2.155g and 1336sec]

2018

Q.Calculate the emf of the following cell at 25°C [3]

$Sn_{(S)}$ | Sn^{2+} (0.004M) || H^{+}(0.020M) | $H_{2(g)(1\ bar)}$ |$Pt_{(S)}$

(Given: $E^{O}\ Sn^{2+}$ | Sn = -0.14 V)

(b)Give reasons:
(i)On the basis of E^{O} values O_2 gas should be liberated at anode but it is Cl_2 gas which is liberated in the electrolysis of aqueous NaCl.
(ii) Conductivity of CH_3COOH decreases on dilution.

OR

(a) For the reaction

$2AgCl_{(S)} + 3H_{2(g)} \rightarrow 2Ag_{(S)\ (aq)} + 2H^{+}$ (0.1M)+$2Cl^{-}$(0.1M]
$\Delta_r G^{o}$=-43600J at 25^{0}C
Calculate the e.m.f of the cell.[$\log 10^{-n} = -n$]
(b)Define fuel cell and write two advantages.

2017 **[3]**

Q.(a)The cell in which the following reaction occurs:$2Fe^{3+}_{(aq)} + 2I^{-} \rightarrow 2Fe^{2+}_{(aq)} + I_{2(s)}$

has E_{cell}= 0.236V at 298K.Calculate the standard Gibbs energy of the cell reaction.
(Given=96,500C mol^{-1})

(b)How many electrons flow through a metallic wire if a current of 0.5A is passed for 2hours?
(Given=96,500C mol^{-1})

Q,Write the name of cell which is generally used in hearing aids.Write the reactions taking place at anode and the cathode of this cell. [2]

Q.Write the name of the cell which is generally used in inverters. Write the reactions taking place at anode and the cathode of this cell. [2]

Q.Write the name of the cell which is generally used in transistors.Write the reactions taking place at anode and the cathode of this cell. [2]

2016

Q.Calculate $\Delta_r G^o$ and $\log K_C$ for the following reaction at 298K: [3]

$2Al_{(S)} + 3Cu^{2+}_{(aq)} \rightarrow 2Al^{3+}_{(aq)} + 3Cu^{2+}_{(S)}$ Given: $E^o_{cell} = 2.02V$

Q.Using the E^o values of A and B predict which is better for coating the surface of iron [E^o(Fe2+/Fe=-0.44V] to prevent corrosion and why? Given: $E^o_{(A^{2+}/A)} = -2.37V$; $E^o_{(B^{2+}/B)} = -0.14V$ [2]

OR

(a)The conductivity of 0.001 mol L^{-1} solution of CH_3COOH is 3.905 x 10-5 S cm^{-1}.Calculate its molar conductivity and degree of dissociation (α). Given: $\lambda^o(H+)=349.6$ Scm^2 mol^{-1} and $\lambda^o(CH_3COO^-)=40.9$ S cm^2 mol^{-1}

(b)What type of battery is dry cell? Write the overall occurring in dry cell.

2015

Q.Calculate the time to deposit 1.17g of Ni at cathode when a current of 5A was passed through solution of $Ni(NO_3)_2$.[Molar mass of Ni=58.7g mol^{-1},1F=96500C mol^{-1}] [2]

Q.Calculate E^o_{cell} for the following reaction at 25°C: $A + B^{2+}_{(0.001M)} \rightarrow A^{2+}_{(0.0001M)} + B$

Given: $E_{cell} = 2.6805V$, 1F=96500C mol^{-1}

2014

Q. Define the following terms: **[2+3]**
(i) Molar conductivity (Λ_m)
(ii) Secondary batteries

Q. Define the following terms:
(i) Fuel cell
(ii) Limiting molar conductivity (Λ_m^o)

Q. (i) State Kohlrausch's law of independent migration of ions.Why does the conductivity of a solution decreases with dilution?

(ii) Calculate $\Delta_r G^o$ for the reaction
$Mg(s) + Cu^{2+}(aq) \rightarrow Mg^{2+}(aq) + Cu(s)$
Given: $E^o_{cell} = +2.71$ V, 1 F = 96500 C mol^{-1}.

(iii)Name the type of cell which was used in Apollo space programme for providing electrical power.

2013

Q. The standard electrode potential (E^o_{Cell}) for Danial cell is +1.1V. Calculate the ΔG^o for the reaction [**2]**
$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$.($1F = 96500$ C mol^{-1})

Q Calculate the emf of the following cell at 25°C [3]
Ag (s) | Ag+ (10^{-3}M) || Cu^{2+}(10^{-1}M) | Cu (s)
Given: $E^O_{Cell} = +0.46$ V and $\log 10^n = n$

2007

1.

(a) Write the formulation for the galvanic cell in which the reaction,
$Cu\ (s) + 2\ Ag^+\ (aq) \rightarrow Cu^{2+}\ (aq) + 2\ Ag\ (s)$ takes place.
Identify the cathode and the anode reactions in it.

(b) Write Nernst equation and calculate the emf of the following cell :
$Sn\ (s)\ |\ Sn^{2+}\ (0.04\ M)\ ||\ H^+\ (0.02\ M)\ |\ H_2\ (g)\ (1\ bar)\ |\ Pt\ (s)$
(Given $E^{\ominus}_{Sn^{2+}/Sn} = -0.14$ V)

2.

(a) Explain with one example each the terms weak and strong electrolytes.

(b) Write the Nernst equation and calculate the emf of the following cell :

$Fe\ (s)\ |\ Fe^{2+}\ (0\text{-}001\ M)\ ||\ H^{+}\ (1\ M)\ |\ H_2\ (g)\ (1\ bar)\ |\ Pt\ (s)$

(Given $E^{\ominus}_{Fe^{2+}/Fe} = -0.44\ V$) 2, 3

3.

(a) Calculate the emf of the cell 3

$Mg(s)\,|\,Mg^{2+}(0.1M)\,||\,Cu^{2+}(1\times10^{-3}M)\,|\,Cu(s)$

Given : $E^{\ominus}Cu^{2+}/Cu = +0.34V, E^{\ominus}Mg^{2+}/Mg = -2.37V,$

(b) Explain with examples the terms weak and strong electrolytes. 2

OR

(a) The resistance of a conductivity cell containing 0.001 M KC1 solution at 298 K is 1500 Ω. What is the cell constant, if the conductivity of 0.001 M KCl solution at 298 K is $0.146\times10^{-3}\ S\ cm^{-1}$? 3

(b) Predict the products of electrolysis in the following: 2

A solution of H_2SO_4 with platinum electrodes.

2009

4.

(a) Define molar conductivity of a substance and describe how for weak and strong electrolytes, molar conductivity changes with concentration of solute. How is such change explained ? **5**

(b) A voltaic cell is set up at 25 °C with the following half cells :

$Ag^{+}\ (0.001\ M)\ |\ Ag$ and $Cu^{2+}\ (0.10\ M)\ |\ Cu$

What would be the voltage of this cell ? ($E^{\circ}_{cell} = 0.46\ V$)

OR

(a) State the relationship amongst cell constant of a cell, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solute related to conductivity of its solution ?

(b) A voltaic cell is set up at 25 °C with the following half-cells :

$Al\ |\ Al^{3+}\ (0.001\ M)$ and $Ni\ |\ Ni^{2+}\ (0.50\ M)$

Calculate the cell voltage [$E^{\circ}_{Ni^{2+}\,|\,Ni} = -0.25\ V$, $E^{\circ}_{Al^{3+}\,|\,Al} = -1.66\ V$]

5.

How do metallic and ionic substances differ in conducting electricity ? *1*

6.

What type of cell is a lead storage battery ? Write the anode and the cathode reactions and the overall cell reaction occurring in the use of a lead storage battery. 2

OR

Two half cell reactions of an electrochemical cell are given below :

$MnO_4^-(aq) + 8\,H^+(aq) + 5\,e^- \rightarrow Mn^{2+}(aq) + 4\,H_2O(l)$, $E^\circ = +1{\cdot}51$ V

$Sn^{2+}(aq) \rightarrow Sn^{4+}(aq) + 2\,e^-$, $E^\circ = +0{\cdot}15$ V

Construct the redox equation from the two half cell reactions and predict if this reaction favours formation of reactants or product shown in the equation. 2

7.

(a) Define molar conductivity of a substance and describe how for weak and strong electrolytes, molar conductivity changes with concentration of solute. How is such change explained ? 5

(b) A voltaic cell is set up at 25 °C with the following half cells :

Ag^+ (0.001 M) | Ag and Cu^{2+} (0.10 M) | Cu

What would be the voltage of this cell ? ($E^\circ_{cell} = 0.46$ V)

OR

(a) State the relationship amongst cell constant of a cell, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solute related to conductivity of its solution ?

(b) A voltaic cell is set up at 25 °C with the following half-cells :

Al | Al^{3+} (0.001 M) and Ni | Ni^{2+} (0.50 M)

Calculate the cell voltage [$E^\circ_{Ni^{2+}|Ni} = -0.25$ V, $E^\circ_{Al^{3+}|Al} = -1.66$ V]

7.

A copper-silver cell is set up. The copper ion concentration in it is 0·10 M. The concentration of silver ion is not known. The cell potential measured 0·422 V. Determine the concentration of silver ion in the cell.

Given : $E^\circ_{Ag^+/Ag} = +0{\cdot}80$ V, $E^\circ_{Cu^{2+}/Cu} = +0{\cdot}34$ V. 3

8.

(a) State Kohlrausch law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch law.

(b) Calculate Λ°_m for acetic acid.

Given that Λ°_m (HCl) = 426 S cm^2 mol^{-1}

Λ°_m ($NaCl$) = 126 S cm^2 mol^{-1}

Λ°_m (CH_3COONa) = 91 S cm^2 mol^{-1} 5

OR

(a) Write the anode and cathode reactions and the overall reaction occurring in a lead storage battery.

(b) A copper-silver cell is set up. The copper ion concentration is 0.10 M. The concentration of silver ion is not known. The cell potential when measured was 0.422 V. Determine the concentration of silver ions in the cell. (Given $E^\circ_{Ag^+/Ag} = +0.80$ V, $E^\circ_{Cu^{2+}/Cu} = +0.34$ V) 5

2010

9.

What is meant by 'limiting molar conductivity' ? *1*

10.

Express the relation among the cell constant, the resistance of the solution in the cell and the conductivity of the solution. How is the conductivity of a solution related to its molar conductivity ? *2*

11.

Given that the standard electrode potentials (E°) of metals are :

$K^+ / K = -2{\cdot}93$ V, $Ag^+ / Ag = 0{\cdot}80$ V, $Cu^{2+} / Cu = 0{\cdot}34$ V,

$Mg^{2+} / Mg = -2{\cdot}37$ V, $Cr^{3+} / Cr = -0{\cdot}74$ V, $Fe^{2+} / Fe = -0{\cdot}44$ V.

Arrange these metals in an increasing order of their reducing power. *2*

OR

Two half-reactions of an electrochemical cell are given below :

$MnO_4^- (aq) + 8\ H^+ (aq) + 5\ e^- \rightarrow Mn^{2+} (aq) + 4\ H_2O\ (l)$, $E^\circ = +1{\cdot}51$ V

$Sn^{2+} (aq) \rightarrow Sn^{4+} (aq) + 2\ e^-$, $E^\circ = +0{\cdot}15$ V.

Construct the redox reaction equation from the two half-reactions and calculate the cell potential from the standard potentials and predict if the reaction is reactant or product favoured. *2*

Given that the standard electrode potentials (E°) of metals are :

$K^+ / K = -2{\cdot}93$ V, $Ag^+ / Ag = 0{\cdot}80$ V, $Cu^{2+} / Cu = 0{\cdot}34$ V,

$Mg^{2+} / Mg = -2{\cdot}37$ V, $Cr^{3+} / Cr = -0{\cdot}74$ V, $Fe^{2+} / Fe = -0{\cdot}44$ V.

Arrange these metals in an increasing order of their reducing power. *2*

OR

Two half-reactions of an electrochemical cell are given below :

$MnO_4^- (aq) + 8\ H^+ (aq) + 5\ e^- \rightarrow Mn^{2+} (aq) + 4\ H_2O\ (l)$, $E^\circ = +1{\cdot}51$ V

$Sn^{2+} (aq) \rightarrow Sn^{4+} (aq) + 2\ e^-$, $E^\circ = +0{\cdot}15$ V.

Construct the redox reaction equation from the two half-reactions and calculate the cell potential from the standard potentials and predict if the reaction is reactant or product favoured. *2*

12.

a) Calculate the charge in coloumbs required for oxidation of 2 moles of water to oxygen? [Given IF = 96, 500 C mol^{-1}]

b) Zinc/silver oxide cell is used in hearing aids and electric watches. The following reactions occur:

$Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$ $\quad E^\circ Zn^{2+} / Zn = -0.76v$

$Ag_2O + H_2O + 2\ e^- \rightarrow 2Ag + 2\ OH^-$ $\quad E^\circ Ag^+ / Ag = 0.344v$

Calculate (i) standard potential of the cell

(ii) standard Gibbs energy

13.

Describe the construction of a H_2-O_2 fuel cell and the reactions taking place in it.

OR

Define the terms given below:

(a) Conductivity (b) Molar Conductivity

What are their units?

14. Give reason

(a) Why does an alkaline medium inhibit the rusting of iron?

(b) Why does a dry cell become dead after a long time even if it has not been used?

(c) Why is Zinc better than Tin in protecting iron from corrosion?

15.

(a) Two electrolytic cells containing silver nitrate solution and dilute sulphuric acid solution were connected in series. A steady current of 2.5 amp was passed through them till 1.078g of silver was deposited. [Ag = 107.8g mol^{-1}, IF = 96, 500 C]

(i) How much electricity was consumed?

(ii) What was the weight of oxygen gas liberated? 3

(b) Give reason:-

(i) Rusting of iron pipe can be prevented by joining it with a piece of magnesium.

(ii) Conductivity of an electrolyte solution decreases with the decrease in concentration. 2

16.

OR

(a) What is a fuel cell? What is its main advantage? 1

(b) What are the reactions occurring at the cathode and anode of a Lachlanche cell? 1

(c) In the button cell widely used for watches and other devices, the following reaction takes place:

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

Give the cell representation and determine the value of Kc for the above reaction using the following data:

$Ag_2O(s) + H_2O(l) + 2e^- \longrightarrow 2Ag(s) + 2\,OH^-(aq)$

$(E^o = 0.344V)$

$Zn^{2+}(aq) + 2e^- \longrightarrow Zn(s)$

$(E^o = -0.76V)$ 3

<u>2005</u>

17.

(a) Define electrical conductivity and molar conductivity of a solution and write the units of molar conductivity.

(b) The E° values corresponding to the following two reduction electrode pro cesses are:

(i) $Cu^+ / Cu = +0.52\ V$

(ii) $Cu^{2+} / Cu^+ = 0.16\ V$

Formulate the galvanic cell for their combination. What will be the standard cell potential for it? Calculate $\Delta_r G^0$ for the cell reaction. (F=96500 C mol^{-1}) 2, 3

18.

(a) In the button cell, widely used in watches and other devices, the following reaction takes place:

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

Determine E° and $\Delta_r G^0$ for the reaction.

Given $E^0_{Ag^+/Ag} = +0.80V,\ E^0_{Zn^{2+}/Zn} = -0.76V$

(b) Explain with examples the terms weak and strong electrolytes. How can these be distinguished?

19.

. The E° values at 298 K corresponding to the following two reduction electrode processes are:

(i) Cu^{+} /Cu=+0.52 V

(ii) Cu^{2} +/Cu+=+0.16 V

Formulate the galvanic cell for their combination. What will be the cell potential?

Calculate the $\Delta_r G^{\circ}$ for the cell reaction. (F=96500 C mol^{-1}) **3**

20. Predict the products of electrolysis obtained at the electrodes in each case when the electrodes used are of platinum: 2

(i) An aqueous solution of $AgNO_3$

(ii) An aqueous solution of H_2SO_4

2006

21.a. Explain why electrolysis of aqueous solution of NaCl gives H_2 at cathode and Cl_2 at anode.

Write overall reaction. (2)

$(E^0_{Na^+/Na} = -2.71V;\quad E^O_{H_2O/H_2} = -0.83\,V,$

$E^0_{Cl_2/2Cl^-} = +1.36\,V,\ E^0_{H^+ + O_2/H_2O} = 1.23\,V)$

b. Calculate the emf of the cell $Zn/Zn^{2+}(0.1M)\,\|\,Cd^{2+}(0.01M)/Cd$ *at* 298 *K*, [*given* $E^0_{Zn^{2+}/Zn} = -0.76\,V$ *and* $E^0_{Cd^{2+}/Cd} = -0.40\,V$]. **(3)**

22.

a. Account for the following:

i. Alkaline medium inhibits the rusting of iron. **(1)**

ii. iron does not rust even if the zinc coating is broken in a galvanized iron pipe. **(1)**

b. $Cu^{2+} + 2e^- \rightarrow Cu\ E^0 = +0.34V$

$Ag^+ + Le^- \rightarrow E^0 = +0.80\,V$

i. Construct a galvanic cell using the above data.

ii. For what concentration of Ag^+ ions will the emf of the cell be zero at 25°C, if the concentration of Cu^{2+} is 0.01 M? **(3)**

[log 3.919 = 0.593]

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23. a. State two advantages of $H_2 - O_2$ fuel cell over ordinary cell. (2)

b. Silver is electrodeposited on a metallic vessel of total surface area 900 cm^2 by passing a current of 0.5 amp for two hours. Calculate the thickness of silver deposited.

[Given: Density of silver = 10.5 g cm^{-3},

Atomic mass of silver = 108 amu, F= 96,500 C mol^{-1}] (3)

Or

a. Give reasons for the following: (2)

i. Rusting of iron is quicker in saline water than in ordinary water.

ii. Aluminium metal cannot be produced by the electrolysis of aqueous solution of aluminium salt.

b. Resistance of a conductivity cell filled with 0.1 M KCl solution is 100 ohm. If the resistance of the same cell when filled with 0.02 M K Cl solution is 520 ohms, calculate the conductivity and molar conductivity of 0.02 M K Cl solution. Conductivity of 0.1 KCl solution is 1.29 S m^{-1} (3)

25.

a. Define the terms specific conductance and molar conductivity for solutions of electrolytes.
b. Write the cell formulation and calculate the standard cell potential of the galvanic cell in operation of which the following reaction takes place:
$2\ Cr\ (s) + 3\ Cd^{2+}\ (aq) \rightarrow 2\ Cr^{3+}\ (aq) + 3\ Cd\ (s)$
Calculate $\Delta r\ G^0$ *for the above reaction.* **(2, 3)**
(*Given*: $E^0 Cr^{3+} / Cr = -0.74\ V$; $E^0\ Cd^{2+} / Cd = -0.40\ V$; $F = 96500\ C\ mol^{-1}$)

26. a. Explain with an example how weak and strong electrolytes can be distinguished.
b. In the button cell used in watches the following reaction occurs
$Zn\ (s) + Ag_2O\ (s) + H_2O\ (l) \rightarrow Zn^{2+}\ (aq) + 2\ Ag\ (s) + 2\ OH^-\ (aq)$
Determine E^0 for the cell and $\Delta_r G^0$ for the reaction.
(Given: $Zn^{2+}\ (aq) + 2e^- \rightarrow Zn\ (s)$; E° = — 0.76 V
$Ag_2O\ (s) + 2\ H_2O\ (l) + 2e^- \rightarrow Ag\ (s) + 2\ OH^-(aq)$,
$E^0 = + 0.34$ V, F = 96500 C mol^{-1})

2007

27.

(a) Calculate the emf of the cell 3

$$Mg(s)\,|\,Mg^{2+}(0.1M)\,||\,Cu^{2+}(1\times10^{-3}M)\,|\,Cu(s)$$

Given : $E^{\Theta}Cu^{2+}/Cu = +0.34V, E^{\Theta}Mg^{2+}/Mg = -2.37V,$

(b) Explain with examples the terms weak and strong electrolytes. 2

OR

(a) The resistance of a conductivity cell containing 0.001 M KC1 solution at 298 K is 1500 Ω. What is the cell constant, if the conductivity of 0.001 M KC1 solution at 298 K is 0.146×10^{-3} S cm^{-1} ? 3

(b) Predict the products of electrolysis in the following: 2

A solution of H_2SO_4 with platinum electrodes.

28.

Calculate the standard cell potential of the galvanic cell in which the following reaction takes place : 3

$$2\,Cr(s) + 3\,Cd^{2+}(aq.) \rightarrow 2\,Cr^{3+}(aq.) + 3\,Cd(s)$$

Also calculate the $\Delta_r G^{\Theta}$ value of the reaction.

(Given : $E^{\Theta}_{Cr^{3+}/Cr} = +0.74V; E^{\Theta}_{Cd^{2+}/Cd} = -0.40V$ and $F = 96500\ C\ mol^{-1}$)

29.

On the basis of the standard electrode potential values stated for acid solution, predict whether Ti^{4+} species may be used to oxidise Fe^{II} to Fe^{III}. 2

Reaction	$E^{\ominus}$ / V
$Ti^{IV} + e^- \rightarrow Ti^{3+}$	: +0.01
$Fe^{3} + e^- \rightarrow Fe^{2+}$	: +0.77

30.

(a) Write the formulation for the galvanic cell in which the reaction,

$Cu\ (s) + 2\ Ag^{+}\ (aq) \rightarrow Cu^{2+}\ (aq) + 2\ Ag\ (s)$ takes place.

Identify the cathode and the anode reactions in it.

(b) Write Nernst equation and calculate the emf of the following cell :

$Sn\ (s)\ |\ Sn^{2+}\ (0.04\ M)\ ||\ H^{+}\ (0.02\ M)\ |\ H_2\ (g)\ (1\ bar)\ |\ Pt\ (s)$

(Given $E^{\ominus}_{Sn^{2+}/Sn} = -0.14\ V$) 2, 3

(a) Explain with one example each the terms weak and strong electrolytes.

(b) Write the Nernst equation and calculate the emf of the following cell :

$Fe\ (s)\ |\ Fe^{2+}\ (0\text{-}001\ M)\ ||\ H^{+}\ (1\ M)\ |\ H_2\ (g)\ (1\ bar)\ |\ Pt\ (s)$

(Given $E^{\ominus}_{Fe^{2+}/Fe} = -0.44\ V$) 2, 3

2009

31.

(a) What type of a cell is the lead storage battery? Write the anode and the cathode reactions and the overall reaction occurring in a lead storage battery while operating. [5]

(b) A voltaic cell is set up at 25° C with the half – cells, Al | Al^{3+} (0.001 M) and Ni | Ni^{2+} (0.50 M). Write the equation for the reaction that occurs when the cell generates an electric current and determine the cell potential.

$\left(Given: E^{o}_{Ni^{2+}|Ni} = -0.25V, E^{o}_{Al^{3+}|Al} = -1.66\right)$.

OR

(a) Express the relationship amongst cell constant, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solute related to conductivity of its solution?

(b) Calculate the equilibrium constant for the reaction

$$Fe_{(s)} + Cd^{2+}{}_{(aq)} \rightleftharpoons Fe^{2+}{}_{(aq)} + Cd_{(s)}$$

$\left(Given: E^{o}_{Cd^{2+}|Cd} = 0.40V, E^{o}_{Fe^{2+}|Fe} = -0.44V\right)$.

2008

32. Conductivity of 0.00241 M acetic acid solution is 7.896×10^{-5} S cm^{-1}. Calculate its molar conductivity in this solution. If Λ_m^0 for acetic acid be 390.5 S cm^2 mol^{-1}, what would be its dissociation constant?

OR

Three electrolytic cells A, B and C containing solutions of zinc sulphate, silver nitrate and copper sulphate respectively, are connected in series. A steady current of 1.5 ampere was passed through them until 1.45 g of silver was deposited at the cathode of cell B. How long did the current flow? What mass of copper and what mass of zinc were deposited in the concerned cells?

(Atomic masses of Ag = 108, Zn = 65.4, Cu = 63.5)

33. The conductivity of a 0.20 M solution of KCl at 298 K is 0.0248 S cm^{-1}. Calculate its molar conductivity.

34. Formulate the galvanic cell in which the following reaction takes place:

$Zn(s) + 2Ag^+(aq) \longrightarrow Zn^{2+}(aq) + 2Ag(s)$

State:

(i) Which one of its electrodes is negatively charged.

(ii) The reaction taking place at each of its electrode.

(iii) The carriers of current within this cell.

35. Express the relation between conductivity and molar conductivity of a solution.

36. The resistance of a conductivity cell containing 0.001 M KCl solution at 298 K is 1500 Ω. What is the cell constant if the conductivity of 0.001 M KCl solution at 298 K is 0.146×10^{-3} S cm^{-1}?

2004

37. Conductivity of 0.00241 M acetic acid is 7.896×10^{-5} S cm^{-1}. Calculate its molar conductivity and if Λ_m^0 for acetic acid is 390.5 S cm^2 mol^{-1}, what is its dissociation constant?

38. Write the cell reactions which occur in lead storage battery (i) when the battery is in use and (ii) when the battery is on charging.

39. Conductivity of 0.00241 M acetic acid is 7.896×10^{-5} S cm^{-1}. Calculate its molar conductivity and if Λ_m^0 for acetic acid is 390.5 S cm^2 mol^{-1}, what is its dissociation constant?