INDIAN SCHOOL DARSAIT

DEPARTMENT OF CHEMISTRY

Subject: Chemistry Topic : Electrochemistry Date of Worksheet: 29.10.2017

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Name of the Student: _____ Class &Division: XII Roll Number: _____

1	Write the product obtained at anode on electrolysis of concentrated sulphuric acid using platinum electrodes.	1
2	Can a nickel spatula be used to stir a copper sulphate solution? Give reason. $E^o\ Ni^{2+}$ / Ni = - 0.25 V, $E^o\ Cu^{2+}$ / Cu = 0.34 V	1
3	Write the function of platinised platinum in standard hydrogen electrode.	1
4	How many faradays of electricity are required to liberate two moles of hydrogen gas in electrolysis of a solution?	1
5	How does concentration of H_2SO_4 changes in lead storage battery when current is drawn from it?	1
6	Why does a mercury cell give a constant voltage throughout its life?	1
7	Two metals A and B have reduction potential values -0.76 V and +0.34 V respectively. Which of these will liberate H_2 from dilute H_2SO_4?	1
8	Explain Kohlrausch law of independent migration of ions. Mention its applications.	2
9	Write the reactions at cathode and anode when the following substances are electrolysed: a) Molten NaCl b)Aqueous NaCl	2
10	State Faradays laws of electrolysis.	2
11	Calculate the molar conductivity of 0.02 M KCl solution if its conductivity is $0.00277 ohm^{-1}cm^{-1}$ at 298K. (Ans: $138.5 Scm^2mol^{-1}$)	
12	Define the terms given below: a) Conductivity b) Molar Conductivity	2
13	Describe the construction of a H_2-O_2 fuel cell and the reactions taking place in it.	2

14	Write overall cell reaction for lead storage battery when the battery is being charged.	2
15	Determine the values of equilibrium constant (Kc) and ΔG^0 for the following reaction: $Ni(s) + 2Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag(s)$, $E^0_{cell} = 1.05V$, (F= 96500C) (Ans: $\Delta G^0_{cell} = -202{,}650J$, $K_c = 3.917 \times 10^{35}$.)	2
16	Write the reaction taking place at cathode anode when the lead –acid storage battery is in use.	2
17	What is the difference between an electro-chemical cell and an electrolytic cell?	2
18	Calculate the standard cell potential of the galvanic cell in which the following reaction takes place: $2Cr(s) + 3Cd^{2+}(aq) \rightarrow 2Cr^{3+}(aq) + 3Cd(s)$ Given $E^o\ Cr^{3+}/Cr = -0.74V$, $E^o\ Cd^{2+}/Cd = -0.40V$, $F = 96500C\ mol^{-1}$ Also calculate the $\Delta_r G^0$ value of the reaction. (Ans: $E^0cell = 0.34V$, $\Delta_r G^0 = -196.86\ kJ\ mol^{-1}$)	2
19	For what concentration of Ag^+ (aq) will the emf of the given cell be zero at 298 K, if concentration of Cu^{2+} (aq) is 0.01M? $Cu(s)/Cu^{2+}(0.1M) // Ag^+(aq) / Ag(s)$. Given $E^o\ Ag^+/Ag = +0.80V$, $E^oCu^{2+}/Cu = +0.34\ V$. (Ans: $[Ag^+] = 1.48 \times 10^{-9}$ M)	2
20	The chemistry of corrosion is essentially an electrochemical phenomenon. Explain the reactions occurring during the corrosion of iron in the atmosphere.	2
21	Write the anode and cathode reactions occurring in a commonly used mercury cell. How is the overall reaction represented?	2
22	Define the molar conductivity and Explain the variation in molar conductivity with change in concentration of a weak electrolyte and a strong electrolyte in its solution.	2
23	A copper-silver cell is set up. The copper ion concentration is 0.10M. The concentration of silver ions is not known. The cell potential was found to be 0.422V. Determine the concentration of silver ions in the cell. (Given: $E^0_{Cu2+/Cu} = +0.34V$, $E^0_{Ag+/Ag} = +0.80V$) (Ans: 7.1×10^{-2} M)	3
24	What are primary cells and secondary cells? Give one example for each.	3
25	i)A current of 1.5 ampere was passed through an electrolytic cell containing $AgNO_3$ solution with inert electrodes. The weight of Ag deposited was 1.50g. How long did the current flow? (Ans: 893.51 sec) ii)Write the reactions taking place at the anode and cathode in the above cell? iii)Give reactions taking place at the two electrodes if these are made up of Ag.	3

26	A voltaic cell is set up at 25^0 C with the following half cells, Al^{3+} (0.001M) and Ni^{2+} (0.50M) . Write the cell reaction when the cell generates an electric current and determine the cell potential. (Given $E^0_{Ni2+/Ni} = -0.25V$, $E^0_{Al3+/Al} = -1.66V$) (Ans: $E_{cell} = 1.46V$)	3
27	The molar conductivity at infinite dilution for NH_4Cl, NaOH and NaCl are 129.8, 217.4, and 108 Scm^2mol^{-1} respectively. If the molar conductivity of 0.01M solution of NH_4OH is $9.33Scm^2mol^{-1}$. Calculate the dissociation constant of NH_4OH (Ans: 1.60×10^{-5})	3
28	One half cell in a voltaic cell is constructed from a silver wire dipped in silver nitrate solution of unknown concentration. The other half cell consists of a zinc electrode in a 0.10M solution of $Zn(NO_3)_2$. A voltage of 1.48V is measured for this cell. Use this information to calculate the concentration of silver nitrate solution. (Given: $E^0_{Zn2+/Zn} = -0.763V$, $E^0_{Ag+/Ag} = +0.80V$) (Ans: $[Ag^+] = 1.247 \times 10^{-2}M$)	3
29	Calculate the equilibrium constant for the reaction equilibrium $Fe(s) + Cd^{2+}(aq) \rightarrow Fe^{2+}(aq) + Cd(s)$ (Given: $E^0_{Cd2+/Cd} = -0.40V$, $E^0_{Fe2+/Fe} = -0.44V$) (Ans: $K_c = 22.57$)	3
30	a)Calculate the charge in coloumbs required for oxidation of 2 moles of water to oxygen?[Given 1F= 96,500$Cmol^{-1}$] b)Zinc/silver oxide cell is used in hearing aids and electric watches. The following reaction occur: $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$ $E^0_{Zn2+/Zn} = -0.76V$ $Ag_2O + H_2O + 2e^- \rightarrow 2Ag + 2OH^-$ $E^0_{Ag+/Ag} = +0.344V$ Calculate i) standard potential of the cell ii) Standard Gibbs energy (Ans: E^0cell = 1.104V , $\Delta G^0 = -213072J$)	3
31	Give reason: a)Why does an alkaline medium inhibit the rusting of iron? b)Why is zinc better than Tin in protecting iron from corrosion? c)What are antirust solutions? Give one example.	3
32	a)Why does a dry cell become dead after a long time even if it has not been used? b)What is the role of $ZnCl_2$ in a dry cell?	3
33	Two electrolytic cells containing electrolyte $AgNO_3$ and $CuSO_4$ are connected in series. A steady current of 2.5 Amperes were passed through them until 1.078g of Ag were deposited. How long did the current flow? What mass of copper was deposited? (Ans; 386sec, 0.3175g)	3

34	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 = 107.8gmol^{-1}, 1F = 96,500C] i) How much electricity was consumed? (Ans: 0.01 F or 965C) ii) What was the weight of oxygen gas liberated? (Ans: 0.16g) 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.	5
35.	a)What is a fuel cell? What is its main advantage? b)What are the reactions occurring at the cathode and anode of a Lechlanche cell? c)In the button cell widely used for watches and other devices, the following reaction takes place: $Zn(s) + Ag_2O(s) + H_2O(l) \rightarrow Zn^{2+}(aq) + 2Ag(s) + 2OH^-(aq)$ Give the cell representation and determine the value of Kc for the above reaction using the following data: $Ag_2O(s) + H_2O(l) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq)$ ($E^0 = 0.344V$) $Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$ ($E^0 = -0.76V$) (Ans: $\Delta G^0 = -213072J$, $K_c = 2.649x10^{37}$)	5
36.	The following chemical reaction is occurring in an electrochemical cell $Mg(s) + 2Ag^+(0.0001M) \rightarrow Mg^{2+}(0.10M) + 2Ag(s)$ Given $E^0Mg^{2+}/Mg = -2.36V$ and $Ag^+/Ag = 0.81V$ For this cell calculate/write i) a) E^0 value for the electrode $2Ag^+/2Ag$. b)Standard cell potential E^0_{cell}. ii) Cell potential (E_{cell}) iii) a) Symbolic representation of the above cell. b) Will the above cell reaction be spontaneous. (Ans: i) a)0.81V b) 3.17V (ii) 2.96 V , iii) b) yes.	5