**KIIT WORLD SCHOOL**

**ASSIGNMENT**

**CLASS 12 CHEMISTRY**

**UNIT 3: ELECTROCHEMISTRY**

**KNOWLEDGE**

**Q1: Define electrochemical series. 1**

**Q2: How is galvanic cell different from Daniel cell? 2**

**Q3: Describe the terms: electrode potential and standard electrode potential. 2**

**Q4: What flows in the internal circuit of a galvanic cell? 1**

**Q5: How would you determine the standard electrode potential of the system Mg2+|Mg? 2**

**Q6: What is the standard electrode in determining the standard electrode potential? 2**

**Q7: What is the emf of the cell when the cell reaction attains equilibrium? 2**

**Q8: Define the following terms: 3**

**Specific conductance, molar conductivity, cell constant**

**Q9: Express the relation among cell constant, resistance of the solution and conductivity of the solution. How does the molar conductivity of a solution related to its conductivity? 3**

**Q10: Why does the conductivity of a solution decreases with dilution? 2**

**Q11: Define conductivity and molar conductivity for the solution of an electrolyte. Discuss their variation with concentration. 3**

**Q12: Write the equation showing the relationship between equivalent or molar conductance and conductance of a strong electrolyte. 2**

**Q13: Describe Kohlraush’s Law. State its mathematical expression. 2**

**Q14: What is meant by Faraday constant? 1**

**Q15: Write the chemistry of recharging the lead storage battery, highlighting all the materials that are involved during recharging. 2**

**Q16: Write the chemical formula of rust. 1**

**Q17: Explain how rusting of iron is envisaged as setting up of an electrochemical cell. 2**

**Q18: describe the terms: cathodic protection , galvanisation. 2**

**Q19: Write the cell reaction for the lead storage battery when it is discharged. How does the density of the electrode change when the battery is discharged? 2**

**UNDERSTANDING**

**Q1: Depict the galvanic cell in which the cell reaction is- Cu + 2Ag 2Ag + Cu2+ 1**

**Q2: Why is it necessary to use a salt bridge in a galvanic cell? 1**

**Q3: Depict the galvanic cell in which the reaction Zn(s)+2Ag+(aq) Zn2+(aq)+2Ag(s) takes place. Further show: 3**

**(i) Which of the electrode is negatively charged?**

**(ii) The carriers of the current in the cell.**

**(iii) Individual reaction at each electrode.**

**Q4: Can you store copper sulphate solutions in a zinc pot? 1**

**Q5: Arrange the following metals in the order in which they displace each other from the solution of their salts- Al, Cu, Fe, Mg and Zn. 1**

**Q6: What does the negative sign in the expression – standard electrode potential (Zn+2//Zn) = -0.76V mean? 1**

**Q7: why is it not possible to measure the single electrode potential? 1**

**Q8: write the Nernst equation for single electrode potential. 1**

**Q9: Write the aNernst equatrion for the reaction: 1**

 **2Cr + 3Fe+2 2Cr3+ + 3Fe**

**Q10: write the Nernst equation for the general cell reaction: aA + bB ne- xX + yY 1**

**Q11: If a current of 0.5 ampere flows through a metallic wire for 2 hours, then how many electrons would flow through the wire? 2**

**Q12: Rusting of iron is quicker in saline water than in normal water. Give reasons. 2**

**APPLICATION/SKILL**

**Q1: What will happen if no salt bridge were used in an electrochemical cell (like Zn-Cu)? 1**

**Q2: Consult the table of standard electrode potentials and suggest three substances that can oxidise ferrous ions under suitable conditions. 3**

**Q3: Given the standard electrode potentials, 3**

**K+/K = –2.93V, Ag+/Ag = 0.80V,**

**Hg2+/Hg = 0.79V**

**Mg2+/Mg = –2.37 V, Cr3+/Cr = – 0.74V**

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

**Q4: Calculate the potential of hydrogen electrode in contact with a solution whose pH is 10. 2**

**Q5: Calculate the emf of the cell in which the following reaction takes place: 2**

**Ni(s) + 2Ag+ (0.002 M) Ni2+ (0.160 M) + 2Ag(s)**

**Given that (cell) E0 (cell)= 1.05 V**

**Q6: The cell in which the following reaction occurs: 3**

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**has *E0(cell)* = 0.236 V at 298 K.**

**Calculate the standard Gibbs energy and the equilibrium constant of the cell reaction.**

**Q7: Calculate the standard cell potentials of galvanic cell in which the following reactions take place: 3**

**(i) 2Cr(s) + 3Cd2+(aq) 2Cr3+(aq) + 3Cd**

**(ii) Fe2+(aq) + Ag+(aq) Fe3+(aq) + Ag(s)**

**Calculate the r*G*⊖and equilibrium constant of the reactions.**

**Q8: Write the Nernst equation and emf of the following cells at 298 K: 3**

**(i) Mg(s)|Mg2+(0.001M)||Cu2+(0.0001 M)|Cu(s)**

**(ii) Fe(s)|Fe2+(0.001M)||H+(1M)|H2(g)(1bar)| Pt(s)**

**(iii) Sn(s)|Sn2+(0.050 M)||H+(0.020 M)|H2(g) (1 bar)|Pt(s)**

**(iv) Pt(s)|Br2(*l*)|Br–(0.010 M)||H+(0.030 M)| H2(g) (1 bar)|Pt(s).**

**Q9: In the button cells widely used in watches and other devices, the following reactions takes place: 3**

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***Determine E0  and* r*G*⊖ *for the reaction.***

**Q10: The conductivity of 0.20 M solution of KCl at 298 K is 0.0248 S cm–1. Calculate its molar conductivity. 2**

**Q11: The resistance of a conductivity cell containing 0.001M KCl solution at 298K is 1500 . What is the cell constant if conductivity of 0.001M KCl solution at 298 K is 0.146 × 10-3  S cm–1. 3**

**Q12: The conductivity of sodium chloride at 298 K has been determined at different concentrations and the results are given below: 3**

**Concentration/M 0.001 0.010 0.020 0.050 0.100**

**102 × /S m–1 1.237 11.85 23.15 55.53 106.74**

**Calculate Λ for all concentrations and draw a plot between Λ and c½. Find the value of .**

**Q 13: Suggest a way to determine the mvalue of water. 3**

**Q14: Λm for NaCl, HCl and NaAc are 126.4, 425.9 and 91.0 S cm2mol-1 respectively. Calculate the Λ0m for HAc. 3**

**Q15: The molar conductivity of 0.025 mol L–1 methanoic acid is 46.1 S cm2 mol–1. Calculate its degree of dissociation and dissociation constant. Given (H+) = 349.6 S cm2 mol–1 and (HCOO–) = 54.6 S cm2 mol–1.**

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**Q16: Conductivity of 0.00241 M acetic acid is 7.896 × 10–5 S cm–1. Calculate its molar conductivity. If mfor acetic acid is 390.5 S cm2 mol–1. What is its dissociation constant? 3**

**Q17: How much charge is required for the following reductions: 3**

**(i) 1 mol of Al3+ to Al?**

**(ii) 1 mol of Cu2+ to Cu?**

**(iii) 1 mol of MnO4 - to Mn2+?**

**Q18: How much electricity in terms of Faraday is required to produce**

**(i) 20.0 g of Ca from molten CaCl2?**

**(ii) 40.0 g of Al from molten Al2O3? 2**

**Q19: How much electricity is required in coulomb for the oxidation of**

**(i) 1 mol of H2O to O2?**

**(ii) 1 mol of FeO to Fe2O3? 2**

**Q20: Consider the reaction: Cr2O7 -2 + 14H+ + 6e– 2Cr+3 + 7H2O 3**

**What is the quantity of electricity in coulombs needed to reduce 1 mol of Cr2O7-2?**

**Q21: A solution of Ni(NO3)2 is electrolysed between platinum electrodes using a current of 5 amperes for 20 minutes. What mass of Ni is deposited at the cathode? 3**

**Q22: Three electrolytic cells A,B,C containing solutions of ZnSO4, AgNO3 and CuSO4, respectively are connected in series. A steady current of 1.5 amperes was passed through them until 1.45 g of silver deposited at the cathode of cell B. How long did the current flow? What mass of copper and zinc were deposited? 3**

**Q23: Using the standard electrode potentials given in Table 3.1, predict if the reaction between the following is feasible: 3**

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**Q24: Predict the products of electrolysis in the following:** 1 each

**(i)An aqueous solution of AgNO3 with silver electrodes.**

**(ii) An aqueous solution of AgNO3 with platinum electrodes.**

**(iii) A dilute solution of H2SO4 with platinum electrodes.**

**(iv) An aqueous solution of CuCl2 with platinum electrodes.**

**HOTS**

**Q1: Suggest two materials other than hydrogen that can be used as fuels in fuel cells. 1**

**Q2: A dry cell kept for long time becomes dead if its not used. Why? 2**

**Q3: Two dry cells A and B were made. In cell A, ZnCl2 was used wheras it was not used in cell B. After some time, it was observed that the seal of cell B was cracked. What could be the reason for it? 2**

**VBQ**

**Q1. Gaurav’s father wants to buy a new car. They found various options in the market. Gaurav persuades his father to buy a hybrid car running both on electricity and petrol. 3**

1. **Mention the values associated with it**
2. **Name the battery used for running the car**
3. **Write the reactions taking place at anode and cathode of battery**

**Q2: Aryan and his neighbour Sunil got their garden fenced with iron rods. Sunil was painting the rods to protect them but Aryan argued it’s a waste of time and rods are quite strong. 3**

1. **Whose option is correct ? what values are promoted here?**
2. **Why do car owners living near the sea wash their cars regularly?**
3. **What are the others ways to prevent corrosion?**