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Written By Varsha Last Modified 22-07-2022 Chapter 3 Chemistry Class 12 NCERT Solutions: Class 12 Chemistry chapter 3 NCERT solutions covers Electrochemistry and its applications in the real world. Students will learn about topics like electrochemical cells, galvanic cells and electrolytic cells after completion of this chapter. Chemistry Class 12 NCERT Chapter 3 Solutions provided on this page will help students in covering this chapter better. Students must carefully study and go through the NCERT solution for Class 12 Chemistry chapter 3 and try to enhance their problem-solving skills to ace the final exams. Every question in the NCERT solutions for Class 12 chemistry chapter 3 is explained in detail with the help of diagrams to make it easily interpretable for the students. Students who will appear for the CBSE Class 12 examination 2022-23 can download the Class 12 chapter 3 Chemistry NCERT solutions for free. NCERT Solutions Class 12 Chemistry Chapter 3: Free PDFs Students can also get the NCERT solutions for Class 12 Chemistry in PDF format to study in offline mode as well. With the help of this NCERT solutions, candidates will not only be able to prepare for their board exams but also crack the competitive engineering and medical entrance exams. These solutions work as the best Chemistry notes for 12th Class chapter 3 and help them learn and revise the concepts easily. DOWNLOAD CBSE CLASS 12 CHEMISTRY CHAPTER 3 NCERT SOLUTIONS PDF Here are a few questions and solutions which the students can refer as they prepare for their exams: Q.1. 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. Solution: A metal which is placed above the electrochemical series displaced the metal which is lower in the series. A metal of stronger reducing power (placed above the electrochemical series) displaces another metal of weaker reducing power (placed below the electrochemical series) from its salt solution. The order of the increasing reducing power of the given metals is $\text{Cu} > \text{Zn} > \text{Fe} > \text{Al}$. Q.2. The conductivity of sodium chloride at 298 K has been determined at different concentrations and the results are given below: Concentration/M 0.001 0.010 0.020 0.050 0.100 $10^2 \times \kappa = 1.237$ 11.85 23.15 55.53 106.74 Calculate Λ_m for all concentrations and draw a plot between Λ_m and $C^{1/2}$. Find the value of Λ_m^0 . Solution: Given, Experiment I: Molarity, $M = 0.001 = 1 \times 10^{-3} \text{ mol/l}$ or $C^{1/2} = 0.001^{1/2} = 0.0316$ $10^2 \times \kappa = 1.237$ $\kappa = 1.237 \times 10^{-2} \text{ S m}^{-1}$ $\kappa = 1.237 \times 10^{-4} \text{ S cm}^{-1}$ Molar conductivity formula is, $\Lambda_m = \kappa \times 1000 / C = 1.237 \times 10^{-4} / 0.001 = 123.7 \text{ S cm}^2 \text{ mol}^{-1}$. Given, Experiment II: $\kappa = 11.85 \times 10^{-2} \text{ S m}^{-1}$, $M = 0.010 \text{ M}$ Then, $\kappa = 11.85 \times 10^{-4} \text{ S cm}^{-1}$, $C^{1/2} = 0.1$ Molar conductivity formula is, $\Lambda_m = \kappa \times 1000 / C = 11.85 \times 10^{-4} / 0.010 = 118.5 \text{ S cm}^2 \text{ mol}^{-1}$. Given, Experiment III: $\kappa = 23.15 \times 10^{-2} \text{ S m}^{-1}$, $C = 0.020 \text{ M}$ Then, $\kappa = 23.15 \times 10^{-4} \text{ S cm}^{-1}$, $C^{1/2} = 0.1414$ Molar conductivity formula is, $\Lambda_m = \kappa \times 1000 / C = 23.15 \times 10^{-4} / 0.020 = 115.8 \text{ S cm}^2 \text{ mol}^{-1}$. Given, Experiment IV: $\kappa = 55.53 \times 10^{-2} \text{ S m}^{-1}$, $C = 0.050 \text{ M}$ $\kappa = 55.53 \times 10^{-4} \text{ S cm}^{-1}$, $C^{1/2} = 0.224$ $\Lambda_m = 55.53 \times 10^{-4} / 0.050 = 111.1 \text{ S cm}^2 \text{ mol}^{-1}$. Given, Experiment V: $\kappa = 106.74 \times 10^{-2} \text{ S m}^{-1}$, $C = 0.100 \text{ M}$ $\kappa = 106.74 \times 10^{-4} \text{ S cm}^{-1}$, $C^{1/2} = 0.316$ $\Lambda_m = 106.74 \times 10^{-4} / 0.1 = 106.7 \text{ S cm}^2 \text{ mol}^{-1}$ Λ_m^0 can be obtained on extrapolation to zero concentration along Y-axis. It is $= 124.0 \text{ S cm}^2 \text{ mol}^{-1}$. Q.3. Conductivity of 0.00241 M acetic acid is $7.896 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its molar conductivity. If Λ_m^0 for acetic acid is $390.5 \text{ S cm}^2 \text{ mol}^{-1}$, what is its dissociation constant? Solution: Given, $\kappa = 7.896 \times 10^{-5} \text{ S cm}^{-1}$ $C = 0.00241 \text{ mol L}^{-1}$ Then, molar conductivity, $\Lambda_m = \kappa \times 1000 / C = 7.896 \times 10^{-5} \times 1000 / 0.00241 = 32.76 \text{ S cm}^2 \text{ mol}^{-1}$ Again, Λ_m^0 for acetic acid $= 390.5 \text{ S cm}^2 \text{ mol}^{-1}$ Now, degree of dissociation (α) $= \Lambda_m / \Lambda_m^0 = 32.76 / 390.5 = 0.084$ Let assume HA is weak acid and it undergoes dissociate. Dissociation constant for acid (K_a) $= \frac{[\text{H}^+][\text{A}^-]}{[\text{HA}]}$ $= \frac{c\alpha \times c\alpha}{c(1-\alpha)} = \frac{0.00241 \times 0.084^2}{0.00241(1-0.084)} = 1.86 \times 10^{-5}$ mol L⁻¹ NCERT Class 12 Electrochemistry Important Questions The important questions for Class 12 Electrochemistry are as follows: Cell 'A' has $E_{\text{cell}} = 2 \text{ V}$ and Cell 'B' has $E_{\text{cell}} = 1.1 \text{ V}$ which of the two cells 'A' or 'B' will act as an electrolytic cell. Which electrode reactions will occur in this cell? If cell 'A' has $E_{\text{cell}} = 0.5 \text{ V}$ and cell 'B' has $E_{\text{cell}} = 1.1 \text{ V}$ then what will be the reactions at anode and cathode? Is silver plate the anode or cathode? What will happen if salt bridge is removed? When will the cell stop functioning? How will concentration of Zn^{2+} ions and Ag^+ ions be affected when the cell functions? How will the concentration of Zn^{2+} ions and Ag^+ ions be affected after the cell becomes 'dead'? Can absolute electrode potential of an electrode be measured? Under what condition is $E_{\text{cell}} = 0$ or $\Delta_r G = 0$? Aqueous copper sulphate solution and aqueous silver nitrate solution are electrolysed by 1 ampere current for 10 minutes in separate electrolytic cells. Will the mass of copper and silver deposited on the cathode be same or different? Explain your answer. Depict the galvanic cell in which the cell reaction is $\text{Cu} + 2\text{Ag}^+ \rightarrow 2\text{Ag} + \text{Cu}^{2+}$ Value of standard electrode potential for the oxidation of Cl^- ions is more positive than that of water, even then in the electrolysis of aqueous sodium chloride, why is Cl^- oxidised at anode instead of water? What is electrode potential? Consider the following diagram in which an electrochemical cell is coupled to an electrolytic cell. What will be the polarity of electrodes 'A' and 'B' in the electrolytic cell? Why is alternating current used for measuring resistance of an electrolytic solution? A galvanic cell has electrical potential of 1.1 V. If an opposing potential of 1.1 V is applied to this cell, what will happen to the cell reaction and current flowing through the cell? How will the pH of brine (aq. NaCl solution) be affected when it is electrolysed? Unlike dry cell, the mercury cell has a constant cell potential throughout its useful life. Why? Solutions of two electrolytes 'A' and 'B' are diluted. The Λ_m of 'B' increases 1.5 times while that of A increases 25 times. Which of the two is a strong electrolyte? Justify your answer. When acidulated water (dil. H_2SO_4 solution) is electrolysed, will the pH of the solution be affected? Justify your answer. In an aqueous solution how does specific conductivity of electrolytes change with addition of water? Which reference electrode is used to measure the electrode potential of other electrodes? Consider a cell given below $\text{Cu} | \text{Cu}^{2+} || \text{Cl}_2 | \text{Pt}$ Write the reactions that occur at anode and cathode. Write the Nernst equation for the cell reaction in the Daniel cell. How will the E_{cell} be affected when concentration of Zn^{2+} ions is increased? What advantages do the fuel cells have over primary and secondary batteries? Write the cell reaction of a lead storage battery when it is discharged. How does the density of the electrolyte change when the battery is discharged? Why on dilution the Λ_m of CH_3COOH increases drastically, while that of CH_3COONa increases gradually? What is the relationship between Gibbs free energy of the cell reaction in a galvanic cell and the emf of the cell? When will the maximum work be obtained from a galvanic cell? Electrochemistry is the study of electricity production from chemical reactions and the use of electrical energy to bring about non-spontaneous chemical transformations. The theoretical and practical topics of this chapter are extremely important. You will also know the types of electrochemical cells. A galvanic cell will release the chemical energy when a spontaneous redox reaction is converted into electrical work, whereas in an electrolytic cell, electrical energy is used to carry out a non-spontaneous redox reaction. Some important concepts such as Gibbs energy and equilibrium constant will be introduced to the students in this chapter. The list of topics and sub-topics that will be taught under Electrochemistry Class 12 are tabulated below: Exercise Number Topics EX 3.1 Electrochemical Cells EX 3.2 Galvanic Cells EX 3.2.1 Measurement of Electrode Potential EX 3.3 Nernst Equation EX 3.3.1 Equilibrium Constant from Nernst Equation EX 3.3.2 Electrochemical Cell and Gibbs Energy of the Reaction EX 3.4 Conductance of Electrolytic Solutions EX 3.4.1 Measurement of the Conductivity of Ionic Solutions EX 3.4.2 Variation of Conductivity and Molar Conductivity with Concentration EX 3.5 Electrolytic Cells and Electrolysis EX 3.5.1 Products of Electrolysis EX 3.6 Batteries EX 3.6.1 Primary Batteries EX 3.6.2 Secondary Batteries EX 3.7 Fuel Cells EX 3.8 Corrosion FAQs on Chapter 3 Chemistry Class 12 NCERT Solutions Q.1: From where can I download NCERT Class 12 Chemistry chapter 3 solutions? Ans: You can download the NCERT solutions for Electrochemistry from Embibe. Q.2: Where can I solve Electrochemistry practice questions? Ans: You can solve CBSE Class 12 Chemistry chapter 3 questions for free on Embibe. Q.3: How many exercises are there in Class 12 solutions for Chemistry chapter 3? Ans: There are a total of 8 exercises with sub-units. Q.4: What is corrosion in Class 12th Chemistry? Ans: Corrosion is the term used to describe the process of the surface of metal objects getting covered by oxides (or) other salts of the metal. In corrosion, the metal is oxidised by losing electrons to oxygen, forming oxides. Corrosion is essentially an electrochemical process. Q.5: What is galvanic cell in Chemistry? Ans: Galvanic cells, also known as voltaic cells, are electrochemical cells in which spontaneous oxidation-reduction reactions produce electrical energy. The reaction may be split into two half-reactions. Half-reactions separate the oxidation from the reduction, so each can be considered individually.

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