



**INDIAN SCHOOL MUSCAT**  
**SENIOR SECTION**  
**DEPARTMENT OF CHEMISTRY**  
**CLASS XII**  
**ELECTROCHEMISTRY**



- The products formed when an aqueous solution of NaBr is electrolysed in a cell having inert electrodes are:
  - Na and Br<sub>2</sub>
  - Na and O<sub>2</sub>
  - H<sub>2</sub>, Br<sub>2</sub> and NaOH
  - H<sub>2</sub> and O<sub>2</sub>
- Time required to deposit one millimole of aluminium metal by the passage of 9.65 amperes through aqueous solution of aluminium ion is
  - 30 s
  - 10 s
  - 30,000 s
  - 10,000 s
- The cell constant of a given cell is 0.47 cm<sup>-1</sup>. The resistance of a solution placed in this cell is measured to be 31.6 ohm. The conductivity of the solution in S cm<sup>-1</sup> is
  - 0.15
  - 1.5
  - 0.015
  - 150
- Assertion –Reason type questions:

In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer from the following choices.

  - Both assertion and reason are correct statements and the reason is a correct explanation for assertion.
  - Both assertion and reason are correct but reason is not a correct explanation for assertion.
  - Assertion is correct but reason is incorrect.
  - Assertion is wrong but reason is correct.
  - Assertion: Electrical conductivity of copper decreases with increase in temperature  
Reason: The electrical conductivity of metals is due to motion of electrons.
  - Assertion: Mercury cell does not give steady potential  
Reason: In the cell reaction, ions are not involved in the solution.
- Read the given passage and answer the questions that follow:

A Lead storage battery is the most important type of secondary cell having a lead anode and a grid of lead packed with PbO<sub>2</sub> as cathode. A 38% solution of sulphuric acid is used as electrolyte. (Density = 1.294 g mL<sup>-1</sup>) The battery holds 3.5 L of the acid. During the discharge of the battery, the density of H<sub>2</sub>SO<sub>4</sub> falls to 1.139 g mL<sup>-1</sup>. (20% H<sub>2</sub>SO<sub>4</sub> by mass)

  - Write the reaction taking place at the cathode when the battery is in use.
  - How much electricity in terms of Faraday is required to carry out the reduction of one mole of PbO<sub>2</sub>?
  - What is the molarity of sulphuric acid before discharge?
  - Lead storage battery is considered a secondary cell. Why?
  - Write the products of electrolysis when dilute sulphuric acid is electrolysed using Platinum electrodes.

6. What is meant by limiting molar conductivity?
7. The  $E^\circ$  values of Cu and Zn are 0.34V and  $-0.76V$  respectively. Which of the two is a stronger reducing agent?
8. Calculate the potential of hydrogen electrode in contact with a solution having pH value 10.
9. How many Faradays are required to produce 2.4g of Mg?
10. How much charge is needed to oxidize one mole of FeO to  $Fe_2O_3$ ?
11. Write Nerst equation and calculate the emf of following cell at 298 K:  
 $Mg_{(s)}|Mg^{2+}_{(0.001\ M)}||Cu^{2+}_{(0.0001\ M)}|Cu_{(s)}$ . Given  $E^\circ_{cell} = 2.71\ V$ .
12. Define and express the relationship between conductivity and molar conductivity for the solution of an electrolyte.
13. Electrolytic specific conductance of 0.25M solution of KCl at  $25^\circ C$  is  $2.56 \times 10^{-2} S/cm$ , calculate the molar conductance.
14. Describe the reactions which occur at the electrodes in a fuel cell that causes  $H_2$  and  $O_2$  to produce electricity.
15. How many hours does it take to reduce 3 moles of  $Fe^{3+}$  to  $Fe^{2+}$  with a current of 2amperes?
16. Account for the following:
  - a) Alkaline medium inhibits the rusting of iron.
  - b) Iron does not rust even if the zinc coating is broken in a galvanized iron pipe.
17. Calculate the time to deposit 1.5 g of silver at cathode when a current of 1.5 A was passed through the solution of  $AgNO_3$ . (Molar mass of Ag =  $108\ g\ mol^{-1}$ ,  $1\ F = 96500\ C\ mol^{-1}$ )
18. Three electrolytic cells A, B, C containing solutions of  $ZnSO_4$ ,  $AgNO_3$  and  $CuSO_4$ , 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?
19. Conductivity of 0.00241 M acetic acid is  $7.896 \times 10^{-5}\ S\ cm^{-1}$ . Calculate its molar conductivity and if  $\Lambda_m^0$  for acetic acid is  $390.5\ S\ cm^2\ mol^{-1}$ , what is its dissociation constant?
20. Calculate the equilibrium constant and  $\Delta G^0$  for the following reaction at  $25^\circ C$ .  
 $Ni_{(s)} + 2Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag_{(s)}$ ,  
 Given that the std electrode potential at  $25^\circ C$  is 1.05V. ( $1F = 96500\ C\ mol^{-1}$ )
21. What type of a battery is the lead storage battery? Write the anode and cathode reactions and the overall reaction occurring in a lead storage battery when the cell is in use.
22. A conductivity cell with cell constant  $3\ cm^{-1}$  is filled with 0.1M acetic acid solution. The

resistance is found to be 4000 ohms. Find

a] molar conductance of 0.1M acetic acid

b] Degree of dissociation of acetic acid given that  $\Lambda^0(\text{CH}_3\text{COOH}) = 400 \text{ S cm}^2 \text{ mol}^{-1}$ .

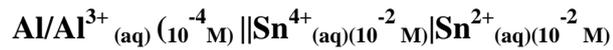
23. a) State Kohlrausch's law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch's law.

b) Calculate  $\Lambda_m^0$  for acetic acid.

Given that  $\Lambda_m^0(\text{HCl}) = 426 \text{ Scm}^2 \text{ mol}^{-1}$  and

$\Lambda_m^0(\text{CH}_3\text{COONa}) = 91 \text{ Scm}^2 \text{ mol}^{-1}$

24. Calculate  $E_{\text{cell}}$  and  $\Delta G$  for the following reaction. Given  $E_{\text{Cell}}^0 = 1.81 \text{ V}$



25 Explain the electrochemical theory of rusting.

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