CHAPTER - 2

Electrochemistry

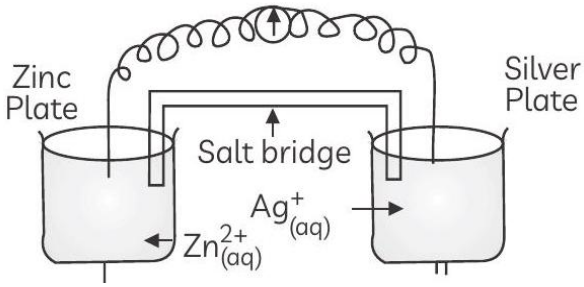
1. ELECTROCHEMICAL CELLS AND ELECTRODE POTENTIAL

Case Based Qs [4 - 5 marks]

Read the following passages and answer the questions that follow:

1. Oxidation-reduction reactions are commonly known as redox reactions. They involve transfer of electrons from one species to another. In a spontaneous reaction, energy is released which can be used to do useful work. The reaction is split into two half reactions. Two different containers are used and a wire is used to drive the electrons from one side to the other and a Voltaic/Galvanic cell is created. It is an electrochemical cell that uses spontaneous redox reactions to generate electricity. A salt bridge also connects to the half cells. The reading of the voltmeter gives the cell voltage or cell potential or electromotive force. If E^{o}_{cell} is positive, the reaction is spontaneous and if it is negative, the reaction is non-spontaneous and is referred to as electrolytic cell. Electrolysis refers to the decomposition of a substance by an electric current. One mole of electric charge when passed through a cell it will discharge half a mole of a divalent metal ion such as Cu^{2+}. This was first formulated by Faraday in the form of laws of electrolysis.

   The conductance of material is the property of materials due to which a material allows the flow of ions through itself and thus conducts electricity. Conductivity is represented by κ and it depends upon nature and concentration of electrolyte temperature etc. A more common term molar conductivity of a solution at a given concentration is conductance of the volume of solution containing one mole of electrolyte kept between two electrodes, with the unit area of cross-section and distance of unit length. Limiting molar conductivity of weak electrolytes cannot be obtained graphically.



   (A) Is silver plate act as anode or cathode?

   (B) What will happen if the salt bridge is removed?

   (C) When does electrochemical cell behaves like an electrolytic cell?

   (D) (i) What will happen to the concentration of Zn^{2+} and $Ag^{+}$when $E_{cell} = 0$

   (ii) Why does conductivity of a solution decreases with dilution?

OR

The molar conductivity of a 1.5M solution of an electrolyte is found to be 138.9 s cm^2 mol^{-1}. Calculate the conductivity of this solution.

[CBSE Term-2 2020]

Very Short & Short Qs [1 - 3 marks]

2. Write electrode reactions and calculate the E_{cell} of the following cell at 298 K :

$Ni_{(s)}|Ni^{2+}(0.001M) \parallel Ag^{+}(0.1M)|Ag_{(s)}$

[Given: E° for $Ni^{2+}|Ni = 0.25$ V, $Ag^{+}|Ag = 0.80$ V]

[Delhi Gov. SQP Term-2 2022]

3. Represent the cell in which the following reaction takes place. The value of E° for the cell is 1.260 V. What is the value of E_{cell} ?

$2Al_{(s)} + 3Cd^{2+}{}_{(0.1M)} \rightarrow 3Cd_{(s)} + 2Al^{3+}(0.01M)$

[CBSE SQP Term-2 2022]

4. Give two points of difference between the electrolytic cell and electrochemical cell.

[CBSE 2020]

5. Calculate ΔG° for the reaction.

$$Zn_{(s)} + Cu^{2+}{}_{(aq)} \rightarrow Zn^{2+}{}_{(aq)} + Cu_{(s)}$$

Given: E° for $Zn^{2+}/Zn = -0.76$ V and

$$E^{\circ} \text{ for } Cu^{2+}/Cu = +0.34 \text{ V}$$
$$R = 8.314 \text{ J } K^{-1} \text{ mol}^{-1},$$
$$F = 96500 C mol^{-1},$$

[CBSE 2020]

6. Calculate the maximum work and log K_c for the given reaction at 298 K :

$$Ni_{(s)} + 2Ag^{+}_{(aq)} \rightarrow Ni^{2+}{}_{(aq)} + 2Ag_{(s)}$$

Given:

$$E^{\circ}_{Ni^{2}+}/Ni = -0.25 \text{ V} E^{\circ}_{Ag^{+}/Ag} = +0.80 \text{ V}$$
$$1 \text{ F} = 96500 C mol^{-1}$$

[CBSE 2020]

7. Calculate e.m.f. of the following cell:

   $Zn_{(s)}|Zn^{2+}(0.1M)||Ag^{+}(0.01M)|Ag_{(s)}$

   Given: E° for $Zn^{2+}/Zn = -0.76$ V, E° for $Ag^{+}/Ag = +0.80$ V

   [Given: $\log 10 = 1$]

   [CBSE 2020]

8. Define electrochemical cell. What happens if external potential applied becomes greater than E°_{Cell} of electrochemical cell?

   [CBSE 2019, 16]

9. Calculate the equilibrium constant for the reaction:

$$Cd^{2+}{}_{(aq)} + Zn_{(s)} \rightarrow Zn^{2+}{}_{(aq)} + Cd_{(s)}$$

   [CBSE 2019]

   If $E^{\circ}_{Cd^{2+}/Cd} = -0.403$ V; $E^{\circ}_{Zn^{2+}/Zn} = -0.763$ V

10. E°_{cell} for the given redox reaction is 2.71 V

    $Mg_{(s)} + Cu^{2+}(0.01M) \rightarrow Mg^{2+}(0.001M) + Cu_{(s)}$

    Calculate E_{cell} for the reaction. Write the direction of flow of current when an external opposite potential applied is:

    (i) less than 2.71 V and

    (ii) greater than 2.71 V

    [CBSE 2019]

11. Write the cell reaction and calculate the e.m.f. of the following cell at 298 K :

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

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

    [CBSE 2018]

12. For the reaction.

    $2AgCl_{(s)} + H_{2(g)}(1\text{ atm}) \rightarrow 2Ag_{(s)} + 2H^{+}(0.1M) + 2Cl^{-}(0.1M), \Delta G^{\circ} = -43600$ J at 25°C.
    Calculate the e.m.f of the cell. [$[\log 10^{-n} = -n]$

[CBSE 2018]

13. Calculate e.m.f of the following cell at 298K:

$2Cr_{(s)} + 3Fe^{2+}(0.1M) \rightarrow 2Cr^{3+}(0.01M) + 3Fe_{(s)}$

Given: $E_{Cr^{3+}/Cr} = -0.74V E_{Fe^{2+}/Fe} = -0.44$ V

[CBSE 2016]

14. Calculate E_{cell} for the following reaction at 298K.

$2Al_{(s)} + 3Cu^{+2}(0.01M) \rightarrow 2Al^{+3}(0.01M) + 3Cu_{(s)}$; Given: $E^{\circ}_{cell} = 1.98$ V

[CBSE 2016]

15. Calculate $\Delta_r G^{\circ}$ for the reaction:

$Mg_{(s)} + Cu^{2+}_{(aq)} \rightarrow Mg^{2+}_{(aq)} + Cu_{(s)}$

Given: $E^{\circ}_{cell} = +2.71$ V, 1 F $= 96500 C mol^{-1}$

[CBSE 2014]

16. Calculate emf of the following cell at 298K: $Mg_{(s)}|Mg^{2+}(0.1M) \parallel Cu^{2+}(0.01M)|Cu_{(s)}$ [Given $E^{\circ}_{cell} = +2.71$ V, 1 Faraday $= 96500$ C mol^{-1}].

[CBSE 2014]

17. Estimate the minimum potential difference needed to reduce Al_2O_3 at $500^{\circ}C$. The free energy change for the decomposition reaction:

$\frac{2}{3}Al_2O_3 \rightarrow \frac{4}{3}Al + O_2$ is $\Delta G = +960$ kJ,

$F = 96500 C mol^{-1}$

[CBSE 2014]

18. Equilibrium constant (K_c) for the given reaction is 10 . Calculate $E^{\circ}_{cell.}$

$$A_{(s)} + B^{2+}_{(aq)} \rightleftharpoons A^{2+}_{(aq)} + B_{(s)}$$

[CBSE 2014]

2. CONDUCTIVITY OF ELECTROLYTIC SOLUTIONS

Objective Qs [1 mark]

19. Which of the following solutions will have the highest conductivity at 298 K ?

(a) $0.01 M HCl$ solution

(b) $0.1 M HCl$ solution

(c) $0.01 M CH_3COOH$ solution

(d) $0.1 M CH_3COOH$ solution

[CBSE SQP 2023]

20. Which of the following solutions of KCl will have the highest value of molar conductivity?
(a) $0.01 M$
(b) $1 M$
(c) $0.5 M$
(d) $0.1 M$

[CBSE 2023]

In the following question (Q. No. 21) a statement of assertion (A) followed by a statement of reason (R) is given. Choose the correct answer out of the following choices.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true, but (R) is false.

(d) (A) is false, but (R) is true.

21. Assertion (A): Conductivity decreases with decrease in concentration of electrolyte.

Reason (R): Number of ions per unit volume that carry the current in a solution decreases on dilution.

[CBSE 2023]

22. Which of the following option will be the limiting molar conductivity of CH_3COOH if the limiting molar conductivity of CH_3COONa is $91 Scm^2\ mol^{-1}$? Limiting molar conductivity for individual ions are given in the following table.

S. No.	Ions	Limiting molar conductivity/Scm^2 mol^{-1}
(1)	H^+	349.6
(2)	Na^+	50.1
(3)	K^+	73.5
(4)	OH^-	199.1

(a) 350 s cm^2 mol^{-1}

(b) 375.3 s cm^2 mol^{-1}

(c) 390.5 s cm^2 mol^{-1}

(d) 340.4 s cm^2 mol^{-1}

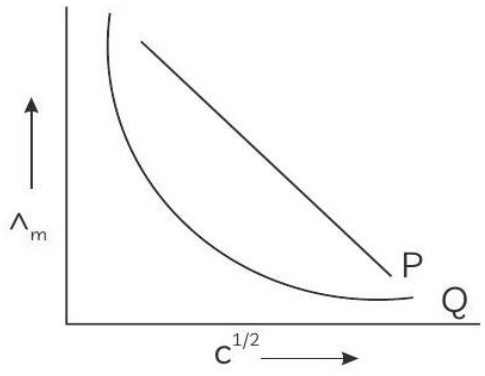
[CBSE SQP 2020]

Very Short & Short Qs [1-3 marks]

23. 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. Graphically show the behavior of ' A ' and 'B'.

[CBSE SQP Term-2 2022]

24. In the plot of molar conductivity (Λ_m) vs square root of concentration $\left(c^{1/2}\right)$ following curve is obtained for two electrolytes A and B :



Answer the following:

(i) Predict the nature of electrolytes A and B.

(ii) What happens on extrapolation of Λ_m to concentration approaching zero for electrolytes A and B?

[CBSE 2019]

25. "Conductivity is a measurement of the ability of an aqueous solution to transfer an electrical current. The current is carried by ions, and therefore, the conductivity increases with the concentration of ions present in solution, their mobility, and temperature of the water. Conductivity measurements are related to ionic strength." It is observed that on dilution, conductivity of CH_3COOH decreases. Support this statement by giving proper explanation.

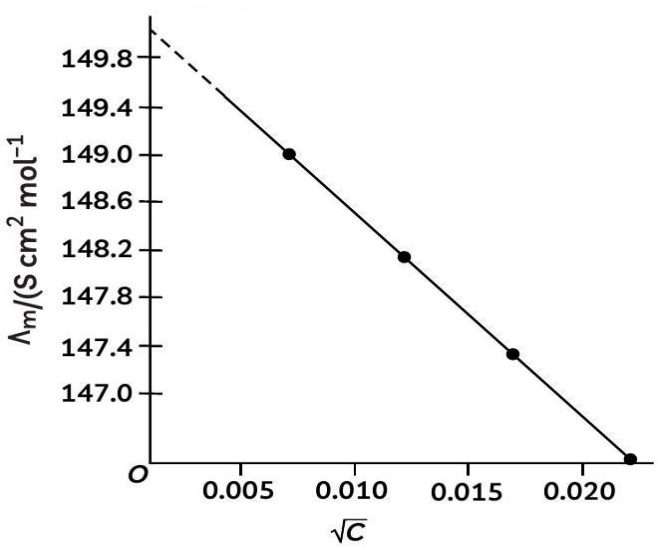
    [Mod. CBSE 2018]

26. Give reason:

    Conductivity of CH_3COOH decreases on dilution.

    [CBSE 2018]

27. Consider the graph:



    Observe the graph and identify and define the chemical term when concentration approaches zero. Why conductivity of an electrolyte solution decreases with the decrease in concentration?

    [Mod. CBSE 2015]

28. Define the term degree of dissociation. Write an expression that relates the molar conductivity of a weak electrolyte to its degree of dissociation.

    [CBSE 2015]

29. Define conductivity and molar conductivity for the solution of an electrolyte. Discuss their variation with concentration.

    [CBSE 2015]

30. Define the term degree of dissociation. Write an expression that relates the molar conductivity of a weak electrolyte to its degree of dissociation.

[CBSE 2015]

31. State Kohlrausch law of independent migration of ions. Why does the conductivity of a solution decrease with dilution?

    [CBSE 2014]

32. Define the terms conductivity and molar conductivity for the solution of an electrolyte. Comment on their variation with temperature.

    [CBSE 2014]

Long Qs [4 - 5 marks]

33. (A) Can we construct an electrochemical cell with two half-cells composed of $ZnSO_4$ solution and zinc electrodes? Explain your answer.

    (B) Calculate the λ_m° for Cl^-ion from the data given below: $\lambda_m^\circ MgCl_2 = 258.6$ S cm^2 mol^{-1} and $\lambda_m^0 Mg^{2+} = 106$ S cm^2 mol^{-1}

    (C) The cell constant of a conductivity cell is 0.146 cm^{-1}. What is the conductivity of 0.01M solution of an electrolyte at 298 K, if the resistance of the cell is 1000 Ohm?

    [CBSE SQP 2023]

34. (A) Conductivity of 2×10^{-3}M methanoic acid is 8×10^{-5} S cm^{-1}. Calculate its molar conductivity and degree of dissociation if Λ°_m for methanoic acid is 404 S cm^2 mol^{-1}.

    (B) Calculate the $\Delta_r G$ and log K_c, for the given reaction at 298 K :

    $Ni_{(s)} + 2Ag^+_{(aq)} \rightleftharpoons Ni^{2+}{}_{(aq)} + 2Ag_{(s)}$

    Given: $E^\circ_{Ni^{+2}/Ni} = -0.25$ V, $E^\circ_{Ag^+/Ag} = +0.80$ V

    1 F $= 96500$Cmol^{-1}

    [CBSE 2023]

35. (A) Why does the cell voltage of a mercury cell remain constant during its lifetime?

    (B) Write the reaction occurring at anode and cathode and the products of electrolysis of aq. KCl.

    (C) What is the pH of HCl solution when the hydrogen gas electrode shows a potential of -0.59 V at standard temperature and pressure?

    [CBSE SQP 2022]

36. (A) Molar conductivity of substance ' A ' is 5.9×10^3 S/m and ' B ' is 1×10^{-16} s/m. Which of the two is most likely to be copper metal and why?

(B) What is the quantity of electricity in Coulombs required to produce 4.8 g of Mg from molten $MgCl_2$? How much Ca will be produced if the same amount of electricity was passed through molten $CaCl_2$? (Atomic mass of $Mg = 24u$, atomic mass of $Ca = 40u$).

(C) What is the standard free energy change for the following reaction at room temperature? Is the reaction spontaneous?

$$Sn_{(s)} + 2Cu^{2+}{}_{(aq)} \rightarrow Sn^{2+}{}_{(aq)} 2Cu_{(s)}$$

[CBSE SQP 2022]

37. Molar conductivity of acetic acid solution is $39.0 Scm^2\ mol^{-1}$. If limiting molar conductivities of $NaCl, HCl$ and CH_3COONa are 126.4, 425.9 and 91.0 s $cm^2\ mol^{-1}$ respectively.

(A) Calculate limiting molar conductivity of acetic acid.

(B) How much acetic acid is present in unionized form for given solution?

[Delhi Gov. SQP Term-2 2022]

38. (A) Calculate the degree of dissociation of $0.0024M$ acetic acid if conductivity of this solution is 8.0×10^{-5} S cm^{-1}.

$$\lambda^{\circ}_{H^+} = 349.6 \text{ S cm}^2 \text{ mol}^{-1};$$
$$\lambda^{\circ}_{CH_3CoO^-} = 40.9 \text{ s cm}^{-1}$$

(B) Solutions of two electrolytes 'A' and ' B ' are diluted. The limiting molar conductivity of 'B' increases to a smaller extent while that of ' A ' increases to a much larger extent comparatively. Which of the two is a strong electrolyte?

[CBSE SQP 2019]

39. Calculate the degree of dissociation (α) of acetic acid if its molar conductivity is 39.05 $Scm^2\ mol^{-1}$. Given: $\lambda^0_{(H^+)} = 349.6$ S $cm^2\ mol^{-1}$ and $\lambda^{\circ}{}_{(CH_3COO^-)} = 40.9$ S $cm^2\ mol^{-1}$. [CBSE 2017]

Numerical Type Qs [1 - 3 marks]

40. The conductivity of 0.20 mol L^{-1} solution of KCl is 2.48×10^{-2} S cm^{-1}. Calculate its molar conductivity and degree of dissociation (α).

Given: $\lambda^0{}_{(K^+)} = 73.5$ S $cm^2\ mol^{-1}$ and $\lambda^{\circ}{}_{(Cl^-)} = 76.5$ S $cm^2\ mol^{-1}$.

[CBSE 2015]

41. Resistance of a conductivity cell filled with 0.1 mol L^{-1}KCl solution is 100Ω. If the resistance of the same cell when filled with 0.02 mol L^{-1}KCl solution is 520Ω, calculate the conductivity and molar conductivity of 0.02 mol L^{-1}KCl solution is $1.29 \times 10^{-2}\Omega^{-1}$ cm^{-1}.

[CBSE 2014]

3. ELECTROLYTIC CELL AND ELECTROLYSIS

Very Short & Short Qs [1 - 3 marks]

42. How many coulombs are required for the oxidation of 1 mol of H_2O_2 to O_2 ?

    [CBSE 2020]

43. Give reason:

    On the basis of E° values, O_2 gas should be liberated at anode but Cl_2 gas is liberated at anode in the electrolysis of aqueous NaCl.

    [CBSE 2020]

44. How much charge in terms of Faraday is required to reduce one mole of MnO_4^- to Mn^{2+} ?

    [CBSE 2020]

45. How many coulombs of electricity are required for the oxidation of 1 mole of H_2O to O_2 ?

    [CBSE 2020]

46. Following reactions occur at cathode during electrolysis of aqueous silver chloride solution:

$$Ag^+_{(aq)} + e^- \rightarrow Ag_{(s)}, E^\circ = +0.80\ V$$

$$H^+_{(aq)} + e^- \rightarrow \frac{1}{2}H_{2(g)}, E^\circ = 0.00\ V$$

    On the basis of standard reduction potential (E° value), which reaction is feasible at cathode and why?

    [CBSE 2017, 15]

47. How much charge is required for the reduction of 1 mol of Zn^{2+} to Zn ?

    [Mod. CBSE 2015]

48. Faraday's laws of electrolysis have quantitative relationships based on the electrochemical research published by Michael Faraday in 1833. State the Faraday's first Law of electrolysis.

    [Mod. CBSE 2015]

49. Following reactions occur at cathode during the electrolysis of aqueous copper (II) chloride solution:

$$Cu^{2+}{}_{(aq)} + 2e^- \rightarrow Cu_{(s)}, E^\circ = +0.34\ V$$

$$H^+(aq) + e^- \rightarrow \frac{1}{2}H_{2(s)}, E^\circ = 0.00\ V$$

On the basis of their standard reduction electrode potential ($E°$) values, which reaction is feasible at the cathode and why?

[CBSE 2015]

Numerical Type Qs [1 - 3 marks]

50. Chromium metal is electroplated using an acidic solution containing CrO_3 according to the following equations:

$$CrO_{3(aq)} + 6H^+ + 6e^- \rightarrow Cr_{(s)} + 3H_2O$$

Calculate how many grams of chromium will be electroplated by 24,000 coulombs. How long will it take to electroplate 1.5 g chromium using 12.5 A current?

[Atomic mass of $Cr = 52$ g mol^{-1}, 1 F $= 96500$ $Cmol^{-1}$]

[CBSE 2019]

51. A steady current of 2 amperes was passed through two electrolytic cells X and Y connected in series containing electrolytes $FeSO_4$ and $ZnSO_4$ until 2.8 g of Fe deposited at the cathode of cell X. How long did the current flow? Calculate the mass of Zn deposited at the cathode of cell Y. (Molar mass : Fe $= 56$ g mol^{-1}, Zn $= 65.3$ g mol^{-1}, 1 F $= 96500($ $mol^{-1})$

[CBSE 2019]

52. Calculate the mass of Ag deposited at cathode when a current of 2 ampere was passed through a solution of $AgNO_3$ for 15 minutes.

[Given: Molar mass of Ag $= 108$ g mol^{-1}, F $= 96500Cmol^{-1}$]

[CBSE 2017]

53. (A) The cell in which the following reaction occurs:

$$2Fe^{3+}_{(aq)} + 2I^-_{(aq)} \longrightarrow 2Fe^{2+}_{(aq)} + I_{2(s)}$$

has $E^\circ_{cell} = 0.236$ V at 298 K. Calculate the standard Gibbs energy of the cell reaction. (Given: 1 F $= 96500Cmol^{-1}$)

(B) How many electrons flow through a metallic wire if a current of 0.5 A is passed for 2 hours? (Given: 1F = $96500Cmol^{-1}$)

[CBSE 2017]

54. State Faraday's first Law of electrolysis. How much charge in terms of Faraday is required for the reduction of 1 mol of Cu^{2+} to Cu ?

[CBSE 2014]

55. A solution of $Ni(NO_3)_2$ is electrolysed between platinum electrodes using a current of 5 amperes for 20 minutes. What mass of Ni is deposited at the cathode? [CBSE 2014]

4. COMMERCIAL CELLS/ BATTERIES

Case Based [4 - 5 marks]

56. The lead-acid battery represents the oldest rechargeable battery technology. Lead acid batteries can be found in a wide variety of applications including small-scale power storage such as UPS systems, ignition power sources for automobiles, along with large, grid-scale power systems. The spongy lead act as the anode and lead dioxide as the cathode. Aqueous sulphuric acid is used as an electrolyte. The half-reactions during discharging of lead storage cells are:

Anode: $Pb_{(s)} + SO_4^{2-}{}_{(aq)} \rightarrow PbSO_{4(s)} + 2e^-$

Cathode: $PbO_{2(s)} + 4H^+{}_{(aq)} + SO_4^{2-}(aq) + 2e^-$

$$\rightarrow PbSO_{4(s)} + 2H_2O$$

There is no safe way of disposal and these batteries end - up in landfills. Lead and sulphuric acid are extremely hazardous and pollute soil, water as well as air. Irrespective of the environmental challenges it poses, lead acid batteries have remained an important source of energy.

Designing green and sustainable battery systems as alternatives to conventional means remains relevant. Fuel cells are seen as the future source of energy. Hydrogen is considered a green fuel. Problem with fuel cells at present is the storage of hydrogen. Currently, ammonia and methanol are being used as a source of hydrogen for fuel cell. These are obtained industrially, so add to the environmental issues.
If the problem of storage of hydrogen is overcome, is it still a "green fuel?" Despite being the most abundant element in the Universe, hydrogen does not exist on its own so needs to be extracted from the water using electrolysis or separated from carbon fossil fuels. Both of these processes require a significant amount of energy which is currently more than that gained from the hydrogen itself. In addition, this extraction typically requires the use of fossil fuels. More research is being conducted in this field to solve these problems. Despite the problem of no good means to extract Hydrogen, it is a uniquely abundant and renewable source of energy, perfect for our future zero-carbon needs.

Answer the following questions:

(A) How many coulombs have been transferred from anode to cathode in order to consume one mole of sulphuric acid during the discharging of lead storage cell?

(B) How much work can be extracted by using lead storage cell if each cell delivers about 2.0 V of voltage? ($1\ F = 96500C$)

(C) Do you agree with the statement"Hydrogen is a green fuel."? Give your comments for and against this statement and justify your views.

OR

Imagine you are a member of an agency funding scientific research. Which of the following projects will you fund and why?

(i) Safe recycling of lead batteries

(ii) Extraction of hydrogen

[CBSE SQP 2023]

Very Short & Short Qs [1-3 marks]

57. Give reasons:

(A) Mercury cell delivers a constant potential during its life time.

(B) In the experimental determination of electrolytic conductance, Direct Current (DC) is not used.

OR

Define fuel cell with an example. What advantages do the fuel cells have over primary and secondary batteries?

[CBSE 2023]

58. Corrosion is an electrochemical phenomenon. The oxygen in moist air reacts as follows:

$$O_{2(g)} + 2H_2O_{(\eta)} + 4e^- \rightarrow 4OH^-_{(aq)}$$

Write down the possible reactions for corrosion of zinc occurring at anode, cathode, and overall reaction to form a white layer of zinc hydroxide.

[CBSE SQP 2022]

59. Name the type of cell which was used in Apollo space programme.

[CBSE 2020, 19]

60. Give two advantages of fuel cells.

[CBSE 2020, 18]

61. "Fuel cells work like batteries, but they do not run down or need recharging. A fuel cell consists of a negative electrode (or anode) and a positive electrode (or cathode), sandwiched around an electrolyte." Define fuel cells by writing its working in a sentence.

[Mod. CBSE 2018, 17, 15, 14]

62. Define fuel cell and write its two advantages.

    [CBSE 2018]

63. Write the name of the cell which is generally used in hearing aids. Write the reactions taking place at the anode and the cathode of this cell.

    [CBSE 2017]

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

    [CBSE 2017]

65. Using the E° values of A and B, predict which is better for coating the surface of iron to prevent corrosion and why?

$$\left[E^0_{(Fe^{2+}/Fe)} = 0.44\ V\right]$$
$$E^\circ_{(A^{2+}/A)} = -2.37\ V; E^\circ_{(B^{2+}/B)} = 0.14\ V$$

    [CBSE 2016]

66. "The storage battery, secondary battery, or charge accumulator is a cell or combination of cells in which the cell reactions are reversible." Give a brief insight about the secondary batteries.

    [Mod. CBSE 2015]

67. What type of battery is mercury cell? Why it is more advantageous than dry cell?

    [CBSE 2015]