III. Kohlrausch's law and its applications

21. The limiting molar conductivities of HCl, CH_3COONa and NaCl are respectively 425, 90 and 125 mho cm^2 mol^{-1} at 25°C. The molar conductivity of 0·1 M CH_3COOH solution is 7·8 mho cm^2 mol^{-1} at the same temperature. The degree of dissociation of 0·1 M acetic acid solution at the same temperature is

(*a*) 0·10 (*b*) 0·02

(*c*) 0·15 (*d*) 0·03

(*e*) 0·20

(Kerala PET 2011, AIPMT Prelim 2012)

22. Ionic mobility of Ag^+ is ($\lambda_{Ag^+} = 5\times10^{-4}$ ohm^{-1} cm^2 eq^{-1})

(*a*) $5{\cdot}2 \times 10^{-9}$ (*b*) $2{\cdot}4 \times 10^{-9}$

(*c*) $1{\cdot}52 \times 10^{-9}$ (*d*) $8{\cdot}25 \times 10^{-9}$

23. Degree of dissociation of pure water is $1{\cdot}9 \times 10^{-9}$. Molar ionic conductances of H^+ and OH^- ions at infinite dilution are 200 S cm^2 mol^{-1} and 350 S cm^2 mol^{-1} respectively. Molar conductance of water is

(*a*) $3{\cdot}8 \times 10^{-7}$ S cm^2 mol^{-1}

(*b*) $5{\cdot}7 \times 10^{-7}$ S cm^2 mol^{-1}

(*c*) $9{\cdot}5 \times 10^{-7}$ S cm^2 mol^{-1}

(*d*) $1{\cdot}045 \times 10^{-6}$ S cm^2 mol^{-1}

24. $\wedge^\circ_{eq}$ for $BaCl_2$, H_2SO_4 and HCl are x_1, x_2 and x_3 S cm^2 eq^{-1} respectively. If conductivity of saturated $BaSO_4$ solution is y S cm^{-1}, then K_{sp} for $BaSO_4$ is

(*a*) $\dfrac{10^6\, y^2}{2(x_1 + x_2 - 2x_3)}$ (*b*) $\dfrac{10^9\, y^3}{8(x_1 + x_2 - 2x_3)^3}$

(*c*) $\dfrac{10^3\, y}{2(x_1 + x_2 - 2x_3)}$ (*d*) $\dfrac{10^6\, y^2}{4(x_1 + x_2 - 2x_3)^2}$

25. Equivalent conductivity at infinite dilution for sodium potassium oxalate, $(COO^-)_2Na^+K^+$, will be (given, molar conductivities of oxalate, K^+ and Na^+ ions at infinite dilution are 148·2, 50·1, 73·5 S cm^2 mol^{-1} respectively)

(*a*) 271·8 S cm^2 eq^{-1} (*b*) 67·95 S cm^2 eq^{-1}

(*c*) 543·6 S cm^2 eq^{-1} (*d*) 135·9 S cm^2 eq^{-1}

(West Bengal JEE Engg. 2013)

IV. Galvanic cells

26. The reaction taking place in the cell

Pt | $H_2(g)$ (1 atm) | HCl (1·0 M) | AgCl | Ag is

(*a*) $AgCl + (1/2)\, H_2 \longrightarrow Ag + H^+ + Cl^-$

(*b*) $Ag + H^+ + Cl^- \longrightarrow AgCl + (1/2)\, H_2$

(*c*) $2\,Ag^+ + H_2 \longrightarrow 2\,Ag + 2\,H^+$

(*d*) $2\,Ag + 2\,H^+ \longrightarrow 2\,Ag^+ + H_2$

(IAS Prelim 2010)

V. Electrode potential, cell potential, electrochemical series and its applications

27. When measured against a standard calomel electrode, an electrode is found to have a standard reduction potential of 0·100 V. If standard reduction potential of calomel electrode is + 0·244 V and it acts as anode, the standard electrode potential of the same electrode against standard hydrogen electrode will be

(*a*) − 0·144 V (*b*) + 0·100 V

(*c*) − 0·344 V (*d*) − 0·100 V

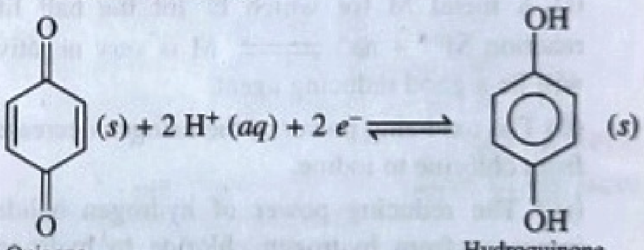
28. Which has maximum potential for the half cell reaction : $2\,H^+ + 2e^- \longrightarrow H_2$?

(*a*) 1·0 M HCl (*b*) 1·0 M NaOH

(*c*) Pure water

(*d*) A solution with pH = 4

29. Quinhydrone electrode is sometimes used to find the pH of a solution. It is based on the following electrode reaction :



Quinone Hydroquinone

Its standard electrode potential is 0·70 V. If in a particular solution, the electrode potential is found to be 0·58 V, the pH of the solution is

(*a*) 2 (*b*) 4

(*c*) 6 (*d*) 8

30. Given $E^\circ_{Cr^{3+}/Cr} = -0{\cdot}74\,V$, $E^\circ_{MnO_4^-/Mn^{2+}} = 1{\cdot}51\,V$

$E^\circ_{Cr_2O_7^{2-}/Cr^{3+}} = 1{\cdot}33\,V$, $E^\circ_{Cl/Cl^-} = 1{\cdot}36\,V$

Based on the data given above, strongest oxidizing agent will be