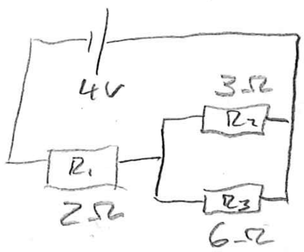
Elektro, Øving 3, Vegard G. Jervell

Oppg. 1)



$$I = \frac{U}{R}, \quad R = 2\Omega + \left(\frac{1}{3\Omega} + \frac{1}{6\Omega}\right)^{-1}$$

$$R = 2\Omega + 2\Omega$$

$$I = \frac{4V}{4\Omega} = 1A$$

$$U_1 = -IR_1 = -2V$$

$$U_2 = U_3 = -I\left(\frac{1}{R_2} + \frac{1}{R_3}\right)^{-1} = -2V$$

Fordi parallell

Oppg. 4)

Ved likevekt er $dG = 0$

$$\sum_i \mu_i dn_i + \underbrace{Vdp + SdT}_{=0,\ \text{Fordi konst } p \text{ og } T} = 0$$

$$\sum_i \mu_i dn_i = 0$$

$$\sum_i \mu_i \nu_i dn = 0$$

$$\sum_i \mu_i \nu_i = 0 \quad \square$$

Oppg. 5) Katode : $M \rightarrow M^{z+} + ze^-$

Anode : $2H^+ + 2e^- \rightarrow H_2$

Oppg. 6) Konveksjon , trykkgradienter

Diffusjon , konsentrasjonsgradienter

Migrasjon , El. felt

viktig faktor fordi transport kan være begrensende

Oppg. 7) $C = \frac{Q}{U} \rightarrow Q = CU$, $C = \frac{A\varepsilon}{l}$

$\frac{Q_1}{Q_2} = \frac{\varepsilon_1 U_1}{\varepsilon_2 U_2} = 0,797$

Vann-kondensatoren holder litt mer ladning

Oppg. 9a) $\lambda_{Ac^-} = 4,09 \cdot 10^{-3} Sm^2mol^{-1}$, $\lambda_{Na^+} = 5,088 \cdot 10^{-3} Sm^2mol^{-1}$

$\Lambda = \sum C_i \lambda_i = 91,78 \, mSm^{-1}$, $C_i = 0,01 \; \forall i$

9b) $i = \kappa X$, $I = \frac{\Delta E}{R}$, $X = \frac{\Delta E}{l}$, $i = \frac{I}{A}$

$\kappa X = \frac{I}{A} = \frac{\Delta E}{AR}$

$\kappa\left(\frac{\Delta E}{l}\right) = \frac{\Delta E}{AR} \rightarrow R = \frac{l}{A\kappa}$, $\kappa = C\Lambda$

9b) $\kappa = 9,178 \, mSm^{-1}$

9c) $R = 1,089 \, k\Omega$

9d) $t_{Ac^-} = \frac{C_{Ac} z_{Ac} F u_{Ac}}{\sum C_j z_j F u_j} = \frac{\nu_{Ac} \lambda_{Ac}}{\Lambda} = 0,44 \, m^3/mol$

$t_{Na^+} = 0,55 \, m^3/mol$

Oppg 10a) $\kappa = c\sum \nu_i \lambda_i$, Spezier: H_3O^+, OH^-

$C = 10^{-7}$ mol/L

$\lambda_+ = 350\ Scm^2 mol^{-1}$

$C = 10^{-10}$ mol/mL

$\lambda_- = 198\ Scm^2 mol^{-1}$

$\kappa = 5{,}48 \cdot 10^{-8}\ Scm^{-1}$

$t_i = \frac{\nu \lambda_i}{\Lambda} \rightarrow H_3O^+$ har høyest $\lambda \rightarrow$ Høyest t

10b) I) $K_H = \frac{[H_2CO_3]}{P_{CO_2}}$

II) $K_{a_1} = \frac{[HCO_3^-][H_3O^+]}{[H_2CO_3]}$

III) $K_{a_2} = \frac{[CO_3^{2-}][H_3O^+]}{[HCO_3^-]}$

IV) $[H_3O^+] = [OH^-] + [HCO_3^-] + 2[CO_3^{2-}]$

Antar $[OH^-] \ll [H_3O^+]$

$[H_2CO_3] = 0{,}012\ mol/m^3$

II $K_{a_1}[H_2CO_3] \approx [HCO_3^-]^2 + 2[CO_3^{2-}][HCO_3^-]$

III) $K_{a_2}[HCO_3^-] \approx [CO_3^{2-}][HCO_3^-] + 2[CO_3^{2-}]^2$

Ikke-lineært likningssystem

4 likn., 4 ukj. -> løsbart, bruk python

10c) rent vann: $\rho = \frac{1}{\kappa} = 1{,}825 \cdot 10^{7}\ \Omega m^{-1}$

Oppg 11) $y'' + y' - 2y = 0$, $y = ce^{\lambda x}$; $y(0) = 1 \rightarrow c = 1$

$\lambda^2 e^{\lambda x} + \lambda e^{\lambda x} - 2e^{\lambda x} = 0$

$\lambda^2 + \lambda - 2 = 0 \rightarrow \underline{\lambda = -2}$, $\lambda = 1$

$\lim_{x \to \infty} y = 0 \rightarrow y = e^{-2x}$