

Tutorial 1

Chemistry 3

Ex 1:

Molarity · mol/l

$$C = \frac{m}{V} : \frac{m}{M \cdot V}$$

$$C = \frac{159,54}{159,54 \times 1} : 1 \text{ mol/l}$$

Normality ·

$$N = \frac{m}{V} : \frac{\alpha \cdot m}{V} = 2 \frac{m}{V} :$$

$$N = 2 \times C = 2 N .$$

$$C_m : \frac{\alpha}{V} = \frac{159,54}{1} = 159,54 \text{ g/l}$$

Molarity · $\frac{m_{\text{solid}}}{m_{\text{solut}} \text{ kg}}$

$$1,172 \text{ g / cm}^3 = 1,172 \text{ g / ml} \\ = 1,172 \text{ kg / l}$$

$$m_{\text{solutor}} = m_{\text{solut}} + m_{\text{solid}}$$

$$m_{\text{solut}} = 1172 - 159,54$$

$$= 1012,64 \text{ g}$$

$$\text{molarity: } \frac{1}{1,012,64} = 0,988 \text{ mol/kg}$$

molal fraction ·

$$\pi_i = \frac{m_i}{m_T}$$

$$m_{H_2O} = \frac{m_{H_2O}}{m_T} \cdot 100\% = \frac{1012,64}{1172} \cdot 100\% = 87,35 \text{ mol}$$

$$\pi = \frac{1}{87,35} = 0,011$$

$$C = \frac{m}{V} = \frac{0,03}{0,011} = 0,015 \text{ mol/l}$$

$$C = \frac{m}{M \cdot V} \Rightarrow m = C \cdot M \cdot V$$

$$m = 0,015 \times 74 \cdot 0,08 \times 60 \cdot 10^{-3} \\ = 0,066 \text{ g}$$

Ex 2:

	C (mol/l)	anion	cation
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<chem>CuSO4</chem>	0.08	0.08	0.08
<chem>BaCl2</chem>	0.12	0.32	0.12
<chem>K2SO4</chem>	0.05	0.05	0.1
<chem>Na2PO4</chem>	0.24	0.24	0.72
<chem>AlCl3</chem>	0.057	0.17	0.057

Ex 3:

1) The operation: dissolution

$$1) C_m = \frac{m}{V} = \frac{56 \times 6}{1} = 336 \text{ g/l}$$

$$2) M_n = 12 \times 12 + 22 \times 1 = 11.16 \\ = 342 \text{ g/mol}$$

$$C = \frac{m}{V} = \frac{m}{M \cdot V} = \frac{336}{342} = 0,98 \text{ mol/l}$$

4) Second operation: dilution

$$3) \frac{3}{4} \times 1 \text{ l} : 0,75 \text{ l} \rightarrow \\ 1 - 0,75 = 0,25 \text{ l}$$

$$N_1 \cdot V_1 = N_2 \cdot V_2$$

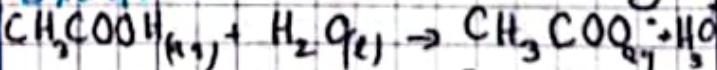
$$C_1 \cdot V_1 = C_2 \cdot V_2 \Rightarrow C_2 = \frac{C_1 \cdot V_1}{V_2}$$

$$C_2 = \frac{0,98 \times 0,25}{0,25} = 0,0245 \text{ mol/l}$$

$$C_m = C \cdot \frac{1}{m}$$

$$= 0,0245 \times 342 = 8,379 \text{ g/l}$$

Ex 4:



$$K_a = \frac{[\text{H}_3\text{O}^+][\text{CH}_3\text{COO}^-]}{[\text{CH}_3\text{COOH}]}$$

$$[\text{CH}_3\text{COOH}] = \frac{10^{-3}}{2} = 10^{-3} \text{ mol/l}$$

$$K_a = \frac{[\text{H}_3\text{O}^+]^2}{[\text{CH}_3\text{COOH}]} \cdot [\text{H}_3\text{O}^+] = \sqrt{K_a \cdot [\text{CH}_3\text{COOH}]}$$

$$= \sqrt{1,8 \times 10^{-5} \times 10^{-3}}$$

$$= 1,34 \times 10^{-4} \text{ mol/l}$$

$$\alpha_1 = \frac{x}{C} \times 100 = 13,4\%$$