CHEM104 – Equation Bank

Module 1

$$rate = \Delta[reactant] / \Delta t$$

$$rate = k\,[A]^x\,[B]^y$$

$$\frac{rate_1}{rate_2} = \frac{k\,[A_1]^x\,[B_1]^y}{k\,[A_2]^x\,[B_2]^y}$$

$$\ln[A] - \ln[A]_0 = -\,k\,t \qquad\qquad 0.693 = k\,t_{1/2}$$

$$aA + bB \rightarrow cC + dD$$

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b} \qquad\qquad K_P = \frac{P^c\,P^d}{P^a\,P^b}$$

$$Q_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

Module 2

$$K_w = [H^+][OH^-]$$

$$pH = -\log_{10}[H^+] \qquad pOH = -\log_{10}[OH^-] \qquad pH + pOH = 14$$

$$[H^+] = \text{antilog}_{10}(-pH) \qquad [OH^-] = \text{antilog}_{10}(-pOH)$$

$$M_a \times \frac{mL_a}{1000} \times \frac{S_a}{S_b} = M_b \times \frac{mL_b}{1000}$$

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$$\frac{g_a}{MW_a} \times \frac{S_a}{S_b} = M_b \times \frac{mL_b}{1000}$$

$$M_a \times \frac{mL_a}{1000} \times \frac{S_a}{S_b} = \frac{g_b}{MW_b}$$

$$K_a = \frac{[H^+][A^-]}{[HA]} \qquad K_b = \frac{[OH^-][B^+]}{[BOH]}$$

$$\%\ \text{ionization} = \frac{[A^-]}{[HA]} \times 100 \qquad \%\ \text{ionization} = \frac{[B^+]}{[BOH]} \times 100$$

$$K_h = \frac{K_w}{K_b} \qquad K_h = \frac{K_w}{K_a}$$

$$pH = pK_a + \log\frac{[\text{base}]}{[\text{acid}]} \qquad pOH = pK_b + \log\frac{[\text{acid}]}{[\text{base}]}$$

$$pK_a = -\log K_a$$

Module 3

$$A_aB_{b(s)} \leftrightarrow aA^+{}_{(aq)} + bB^-{}_{(aq)} \qquad K_{sp} = [A^+]^a\,[B^-]^b$$

$$\Delta U = q + w$$

$$\Delta S^0 = \Sigma\, n\, S^0\ (\text{products}) - \Sigma\, m\, S^0\ (\text{reactants})$$

$$\Delta G^0 = \Delta H^0 - T\Delta S^0$$

$$\Delta G^0 = \Sigma\, n\, \Delta G_f^0\ (\text{products}) - \Sigma\, m\, \Delta G_f^0\ (\text{reactants})$$

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Module 4

$$E^0_{cell} = E^0_{cathode} - E^0_{anode}$$

$$E_{cell} = E^0_{cell} - (0.0592/n \times \log Q)$$

Module 6

$$\ln [N]_t - \ln [N]_0 = -k\,t$$

$$0.693 = k\,t_{1/2}$$

$$E = mc^2$$

$$c = 3.0 \times 10^8 \text{ m/s}$$