

## CH302 Equations and Constants to be Found on Exams

### CH302 EXAM 1: Equations and Constants (Chapters 12 – 14)

$$1 \text{ atm} = 1.013 \times 10^5 \text{ Pa} = 760 \text{ torr}$$

$$\text{Water spec. heat} = 4.18 \text{ J/g } ^\circ\text{C}$$

$$R = 0.082 \text{ l atm/K mol}$$

$$R = 1.987 \text{ cal/mol K}$$

$$R = 8.314 \text{ J/mol K}$$

$$N = 6.022 \times 10^{23}$$

$$K = PV$$

$$V = kT$$

$$V = kn$$

$$P_1 V_1 = P_2 V_2$$

$$V_1/T_2 = V_2/T_1$$

$$P_1 V_1/T_2 = P_2 V_2/T_1$$

$$V_1/n_2 = V_2/n_1$$

$$PV = nRT$$

$$n = g/MW$$

$$= g/ml$$

$$M = n/V$$

$$KE = 0.5 mv^2$$

$$V = (3RT/MW)^{0.5}$$

$$(P - n^2a/V^2)(V - nb) = nRT$$

$$\text{Relative rate} = (MW_1/MW_2)^{0.5}$$

$$F = q^+ q^- / d^2$$

$$H_{\text{soln}} = H_{\text{solv}} - H_{\text{lattice}}$$

$$m = \text{mole}_{\text{solute}}/\text{kg}_{\text{solvent}}$$

$$P_{\text{gas}} = kC_{\text{gas}}$$

$$P_{\text{solv}} = X_{\text{solv}} P^0_{\text{solv}}$$

$$T = K_b m$$

$$T = K_f m$$

$$= MRT$$

### CH302 EXAM 2 Equations and Constants (Chapters 15,16)

$$\text{Water spec. heat} = 4.18 \text{ J/g } ^\circ\text{C}$$

$$R = 0.082 \text{ l atm/ mol K}$$

$$R = 8.314 \text{ J/mol K}$$

$$R = 1.987 \text{ cal/mol K}$$

$$N = 6.02 \times 10^{23}$$

$$H = mC T$$

$$H_{\text{rxn}}^\circ = n H_f^\circ \text{ products} - n H_f^\circ \text{ reactants}$$

$$H_{\text{rxn}}^\circ = \text{B.E.}_{\text{reactants}} - \text{B.E.}_{\text{products}}$$

$$H = E + PV$$

$$E = E_{\text{products}} - E_{\text{reactants}} = q + w$$

$$E = q - P V$$

$$w = -P V$$

$$P V = nRT$$

$$H = E + nRT$$

$$S_{\text{rxn}}^\circ = n S_f^\circ \text{ products} - n S_f^\circ \text{ reactants}$$

$$G = H - T S \text{ (constant T, P)}$$

$$G_{\text{rxn}}^\circ = n G_f^\circ \text{ products} - n G_f^\circ \text{ reactants}$$

$$\text{rate} = -\frac{1}{a} \frac{d[A]}{dt}$$

$$\text{rate} = k[A]^x[B]^y$$

$$t_{1/2} = \frac{\ln 2}{ak} = \frac{0.693}{ak}$$

$$\ln \frac{a}{b} = \ln(a) - \ln(b)$$

$$\ln[A] = -akt + \ln[A_0]$$

$$[A] = -akt + [A_0]$$

$$\frac{1}{[A]} = akt + \frac{1}{[A_0]}$$

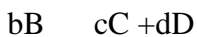
$$[A]$$

$$k = A \exp(-E_a/RT)$$

$$\ln \frac{k_1}{k_2} = (E_a/R)(1/T_1 - 1/T_2)$$

$$k_2$$

### CH302 EXAM 3: Equations and Constants (Chapters 17-20)



$$Q = [C]^c [D]^d / [A]^a [B]^b$$

$$K_c = [C]^c [D]^d / [A]^a [B]^b$$

$$K_p = P_C^c P_D^d / P_A^a P_B^b$$

$$K_p = K_c (RT)^{-n}$$

$$G^\circ = -RT \ln K$$

$$\ln (K_2/K_1) = (H^\circ/R) * (1/T_1 - 1/T_2)$$

$$K_w = K_a K_b$$

$$K_w = [H_3O^+][OH^-] = 1.0 \times 10^{-14}$$

$$pH + pOH = 14$$

$$pH = -\log[H_3O^+]$$

$$pOH = -\log[OH^-]$$

$$pK_a = -\log K_a$$

$$[H^+] = K_a (C_{HA}/C_{A^-})$$

$$[OH^-] = K_b (C_B/C_{BH^+})$$

$$[H^+] = (K_a C_{HA})^{0.5}$$

$$[OH^-] = (K_b C_B)^{0.5}$$

$$[H^+] = K_2 C_{HA} / (1 + (C_{HA} / K_1))$$



$$K_{sp} = [B]^b [C]^c$$

### CH 302 Electrochemistry (Chapter 21)

$$F = 96500 \text{ C per mole } e^-$$

$$1 \text{ Amp} = 1 \text{ Coulomb/second}$$

$$E = E^0 - (0.0592/n) \log Q$$

$$nFE_{cell}^0 = RT \ln K$$

$$E_{cell}^0 = RT \ln K / nF$$

$$\ln K = nFE_{cell}^0 / RT$$

$$G^0 = -RT \ln K$$

$$G^0 = -nFE_{cell}^0$$

$2H^+ + 2e^-$	$H_2(g)$	$E^0 = 0.0v$
$Cu^{2+} + 2e^-$	$Cu(s)$	$E^0 = 0.337v$
$Ag^+ + e^-$	$Ag(s)$	$E^0 = 0.798v$
$Cl_2 + 2e^-$	$2Cl^-$	$E^0 = 1.36v$
$2H_2O + 2e^-$	$H_2(g) + OH^-$	$E^0 = -0.8277v$
$Pd^{2+} + 2e^-$	$Pd(s)$	$E^0 = 0.987v$
$Au^{2+} + 2e^-$	$Au(s)$	$E^0 = 1.55v$

$$\text{spec. heat} = 4.18 \text{ J/g } ^\circ\text{C}$$

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$$R = 1.987 \text{ cal/mol K}$$

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$$H_{\text{rxn}}^\circ = n H_f^\circ \text{ products} - n H_f^\circ \text{ reactants}$$

$$H_{\text{rxn}}^\circ = \text{B.E. reactants} - \text{B.E. products}$$

$$H = E + PV$$

$$E = E_{\text{products}} - E_{\text{reactants}} = q + w$$

$$E = q - P V$$

$$w = - P V$$

$$P V = nRT$$

$$H = E + nRT$$

$$S_{\text{rxn}}^\circ = n S_f^\circ \text{ products} - n S_f^\circ \text{ reactants}$$

$$G = H - T S \text{ (constant T, P)}$$

$$G_{\text{rxn}}^\circ = n G_f^\circ \text{ products} - n G_f^\circ \text{ reactants}$$

$$\text{rate} = \frac{-1}{a} \frac{d[A]}{dt} = \frac{1}{c} \frac{d[C]}{dt}$$

$$\text{rate} = k[A]^x[B]^y$$

$$t_{1/2} = \frac{\ln 2}{ak} = \frac{0.693}{ak}$$

$$\ln \frac{a}{b} = \ln(a) - \ln(b)$$

$$\ln[A] = -akt + \ln[A_0]$$

$$[A] = -akt + [A_0]$$

$$\frac{1}{[A]} = \text{akt} + \frac{1}{[A_o]}$$

$$k = A \exp(-E_a/RT)$$

$$\ln \frac{k_1}{k_2} = (E_a/R)(1/T_1 - 1/T_2)$$

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

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

$$[ ] = n/V = P/RT$$

$$K_p = \frac{(P_C)^c (P_D)^d}{(P_A)^a (P_B)^b}$$

$$K_p = P_C (RT)^{-n}$$

$$G^\circ = -RT \ln K$$

$$\ln \frac{K_{T_2}}{K_{T_1}} = \frac{H^\circ}{R} \cdot \frac{1}{T_1} - \frac{1}{T_2}$$

## CH302 EXAM FORMULAS, CONSTANTS, and VALUES