Selection of Chemical Reactions for Use in Practice Problems

Prepared by Dr. Matthew Rowley, March 29, 2024

Unless stated otherwise, all values are at $T = 298K$

$C_3H_8(g) + 5\,O_2(g) \rightleftharpoons 3\,CO_2(g) + 4\,H_2O(g)$

$\Delta H^\circ_{rxn} = -2044\,\frac{kJ}{mol}$ | |

$2\,KClO_3(s) \rightleftharpoons 2\,KCl(s) + 3\,O_2(g)$

$\Delta H^\circ_{rxn} = -77.6\,\frac{kJ}{mol}$ | $\Delta S^\circ_{rxn} = 494.6\,\frac{J}{mol\,K}$ | $\Delta G^\circ_{rxn} = -225\,\frac{kJ}{mol}$ | $K = 2.76 \times 10^{39}$

$S_8(s) + 8\,O_2(g) \rightleftharpoons 8\,SO_2(g)$

$\Delta H^\circ_{rxn} = -2,374\,\frac{kJ}{mol}$ | $\Delta S^\circ_{rxn} = 312.2\,\frac{J}{mol\,K}$ | $\Delta G^\circ_{rxn} = -2,467\,\frac{kJ}{mol}$ | $K = 2.76 \times 10^{432}$

$N_2O_4(g) + O_3(g) \rightleftharpoons N_2O_5(g) + O_2(g) \quad \Delta H_{rxn} = -140.5\,\frac{kJ}{mol}$

$C(s) + H_2O(g) \rightleftharpoons CO(g) + H_2(g) \quad \Delta H_{rxn} = 131.3\,\frac{kJ}{mol} \quad K_C = 5.63 \times 10^{-4}$

$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

$\Delta H^\circ_{rxn} = 87.9\,\frac{kJ}{mol}$ | $\Delta S^\circ_{rxn} = 170.2\,\frac{J}{mol\,K}$ | $\Delta G^\circ_{rxn} = 37.2\,\frac{kJ}{mol}$ | $K = 3.01 \times 10^{-7}$

$H_2(g) + Br_2(g) \rightleftharpoons 2\,HBr(g) \quad \Delta H_{rxn} = -72.6\,\frac{kJ}{mol} \quad K_C = 62.5$

$H_2(g) + I_2(g) \rightleftharpoons 2\,HI(g)$

$\Delta H^\circ_{rxn} = -9.4\,\frac{kJ}{mol}$ | $\Delta S^\circ_{rxn} = 21.8\,\frac{J}{mol\,K}$ | $\Delta G^\circ_{rxn} = -15.9\,\frac{kJ}{mol}$ | $K = 613$

$Cl_2(g) + Br_2(g) \rightleftharpoons 2\,BrCl(g) \quad K_C = 7.20$

$3\,H_2(g) + N_2(g) \rightleftharpoons 2\,NH_3(g) \quad K_{C,300\,K} = 2.7 \times 10^8$

$CO(g) + H_2O(g) \rightleftharpoons H_2(g) + CO_2(g) \quad K_C = 5.80$