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S-II (3)

$$Sn^{2+} + H_2\overset{-1}{O_2} \longrightarrow Sn^{4+} + H_2\overset{-2}{O}$$

$n_f = 2$ $\quad$ $n_f = 2$ $\quad$ $\boxed{x \text{ moles}}$

$n_f = 2$ $\quad H_2O_2 \to H_2O$

$n_f = 2$ $\quad H_2O_2 \to O_2$

Disproportion $\quad H_2O_2 \longrightarrow H_2O + \frac{1}{2}O_2$

$\frac{2\times 2}{2+2} = (n_f = 1)$ $\quad$ y mol $\quad\quad \frac{y}{2}$

88.2 ml 1M Sn^{2+}

$$n_{H_2O_2} = \frac{20}{34}$$

$$\boxed{x \times 2 = \frac{88.2 \times 1}{1000} \times 2}$$

$$x + y = \frac{20}{34}$$

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5

$$\underset{n_f=5}{KIO_3} + \underset{n_f=1}{5KI} + 6HCl \longrightarrow \underset{n_f=5/3}{3I_2} + 6KCl + 3H_2O$$

$$I_2 + \underbrace{Na_2S_2O_3} \longrightarrow Na_2S_4O_6 + I^-$$

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O-I

(41) $K_2Cr_2O_7 + N_2H_4 \longrightarrow$

$KMnO_4 + N_2H_4 \longrightarrow$

eq of $K_2Cr_2O_7$ = eq of $KMnO_4$

(42) CuS $\quad Fe\overset{-1}{S}_2 \longrightarrow Fe^{3+} + \overset{+4}{S}O_2$

$n_f = 6$ $\quad n_f = 11$

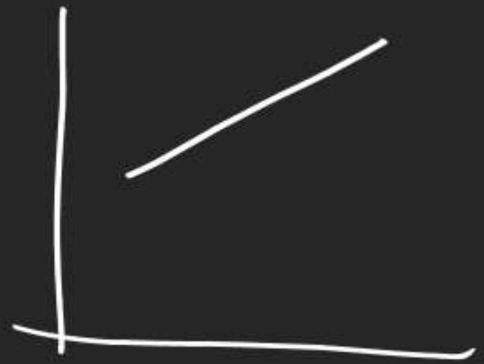
(46)

$KIO_3 + KI \longrightarrow I_2$

(45)

V

$y = 5x + 3$



$y = 2x + 5$

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(49)

$$\underline{Na}\,\underline{Al}(OH)_2CO_3 + HCl \longrightarrow NaCl + AlCl_3 + CO_2 + H_2O$$

(50)

$$3H_2O + \underbrace{CHCl_2COOH}_{n_f = 6} \longrightarrow 2CO_2 + H_2O + Cl_2 + 6H^+ + 6e^-$$

$$600 \text{ meq} = n \times 6$$

$$100 \text{ mmol} = n$$

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eq of Na_2CO_3 = eq of H_2SO_4

$$\frac{1.06}{106} \times 2 = \frac{25}{1000} \times N$$

$$\boxed{\overset{-2}{MgO}} \longrightarrow Mg + \overset{0}{O_2}$$

$n_f = 2$ $\quad$ $n_f = 2$ $\quad$ $n_f = 4$

55

Eq wt of oxide = eq wt of Cation + Eq of anion

Eq wt of MgO $= \dfrac{24+16}{2}$

$= 20$

$$M + O_2 \longrightarrow \text{oxide}$$

eq of metal $= \dfrac{x \text{ gm}}{E} = \dfrac{y}{E+8}$

= Eq wt of Mg + Eq wt of Oxygen

$= \dfrac{24}{2} + \dfrac{16}{2}$

$= 12 + 8$

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Eq wt of Cl^- $= 35.5$

Eq wt O^{2-} $= 8$

$2I^- \longrightarrow I_2$ (2)

$ClO_3^- \longrightarrow Cl^-$ (6)

$\cancel{6H^+ +}$ $6I^- + ClO_3^- \longrightarrow 3I_2 + Cl^- + 3H_2O$

$\cancel{6HSO_4^-}$ $+ 6H_2SO_4$ $\qquad + 6HSO_4^-$

(21) $KMnO_4 + Na_2\overset{+2}{S_2}O_3 \longrightarrow Mn^{2+} + \overset{+6}{S}O_4^{2-}$

4

x mol

$$8 \times 3 = x \times 4$$

(23) $S_8 + HNO_3 \longrightarrow H_2SO_4 + NO_2 + H_2O$

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(4) Types of Keq

(i) K_c

$$aA(g) \rightarrow bB(g)$$

$$K_c = \frac{[B]^b}{[A]^a} \qquad \left(mol/lit\right)^{b-a} \text{ or } \left(mol/m^3\right)^{b-a}$$

$$\boxed{b - a = \Delta n_g}$$

(2) K_p

$$aA(g) \longrightarrow bB(g)$$

$$K_p = \frac{(P_B)^b}{(P_A)^a} \qquad \left[\begin{array}{c}(atm)^{\Delta n_g} \\ (Pa)^{\Delta n_g}\end{array}\right] \text{ Units of } K_p$$

$$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$$

$$\Delta n_g = 2-1-3 = -2$$

$$C(s) + \frac{1}{2}O_2(g) \rightarrow CO(g)$$

$$\Delta n_g = 1 - \frac{1}{2} = \frac{1}{2}$$

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$$aA(g) \longrightarrow bB(g)$$

$$K_p = \frac{(P_B)^b}{(P_A)^a} = \frac{\{[B]RT\}^b}{\{[A]RT\}^a}$$

$$P = \frac{n}{V}RT$$

$$P = CRT$$

$$P_A = [A]RT$$

$$P_B = [B]RT$$

$$K_p = \frac{[B]^b}{[A]^a}(RT)^{\Delta n_g}$$

$$K_c = \frac{[B]^b}{[A]^a}$$

$$\boxed{K_p = K_c(RT)^{\Delta n_g}}$$

atm $\quad$ (mol/lit) $\quad$ 0.0821 atm.lit/mol/K

Pa $\quad$ (mol/m³) $\quad$ 8.314 J/mol/K

$$K_p = K_c(RT)^{\Delta n_g}$$

$RT > 1$ $\quad$ $\Delta n_g > 0$ $\quad$ $K_p > K_c$

$\Delta n_g < 0$ $\quad$ $K_p < K_c$

$$RT = 1$$

$$T = \frac{1}{R} = \frac{1}{0.0821} \approx 12K$$

$RT = 1$ $\quad$ $K_p = K_c$

$\Delta n_g = 0$ $\quad$ $K_p = K_c$

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(III) K_{pc}

$$HCl(g) + \underbrace{H_2O(l)}_{\text{Solvent}} \longrightarrow H^+(aq) + Cl^-(aq)$$

$$K_{pc} = \frac{[H^+][Cl^-]}{P_{HCl}}$$

$$K_c = \frac{[H^+][Cl^-]}{[HCl]}$$

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(IV) K_c^o (standard equilibrium const)

$$aA(g) \longrightarrow bB(g)$$

M = molarity = mol/lit

$$K_c^o = \frac{\left\{[B]/1M\right\}^b}{\left\{[A]/1M\right\}^a}$$

Unitless

(V) K_p^o

$$K_p^o = \frac{\left[P_B/1\text{bar}\right]^b}{\left[P_A/1\text{bar}\right]^a}$$

Unitless

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Application of Keq :→

① To predict extent of Rxn :→

$$A \longrightarrow B \quad \underline{K_c = 10^3}$$

1001

$$K_c = \frac{[B]}{[A]} = 1000$$

A large value of Keq ($>10^3$) indicates large extent of Rxn ($\sim 100\%$)

A small " " " ($<10^{-3}$) indicates small extent of Rxn ($\sim 0\%$)

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② To predict net dirⁿ of rxn :→

$A \rightarrow B \quad K_1$

$$\boxed{\begin{matrix} r_A \\ r_B \end{matrix}}$$

$$Q = \frac{[B]}{[A]}$$

Rxn quotient

$Q = K_{eq}$ Rxn is at eqlbᵐ

$Q < K_{eq}$ forward

$Q > K_{eq}$ backward