2) Ex : What conc. of OH^- is req. to achieve max. seperation of Cr^{3+} & Sn^{2+} from a soln. where both are 0.10M?

$$Cr(OH)_3(s) \rightleftharpoons Cr^{3+}(aq) + 3\,OH^-(aq)$$

$$K_{sp} = 1.6 \times 10^{-30}$$

$$Sn(OH)_2(s) \rightleftharpoons Sn^{2+}(aq) + 2\,OH^-(aq)$$

$$K_{sp} = 5.4 \times 10^{-27}$$

Can not tell which will ppt. first based on K_{sp} unless form of eqn. is same & conc. are same

a) Calc $[OH^-]$ req. to ppt. each cation

$$K = [Cr^{3+}][OH^-]^3 = 1.6 \times 10^{-30}$$

$$(0.10M)[OH^-]^3 = 1.6 \times 10^{-30}$$

$$[OH^-] = 2.5 \times 10^{-10} M$$

$$[Sn^{2+}][OH^-]^2 = 5.4 \times 10^{-27}$$

$$(0.10)[OH^-]^2 = 5.4 \times 10^{-27}$$

$$[OH^-] = 2.3 \times 10^{-13} M$$

smaller

b) Which cation ppt first?

$Sn(OH)_2$ ppt 1st

c) What is max $[OH^-]$ which can be added w/o ppt $Cr(OH)_3$?

$[OH^-] \leq 2.5 \times 10^{-10} M$

only $Sn(OH)_2$ ppt until

$[OH^-] > 2.5 \times 10^{-10} M$

d) What is $[Sn^{2+}]$ when $Cr(OH)_3$ starts to ppt?

$[Sn^{2+}][OH^-]^2 = K_{sp}$

$[Sn^{2+}](2.5 \times 10^{-10})^2 = 5.4 \times 10^{-27}$

$[Sn^{2+}] = 8.5 \times 10^{-8} M$

e) How Effective is the Separation?

What % Sn^{2+} remains?

$$\%\ Sn^{2+}\ \text{remaining} = \frac{8.5 \times 10^{-8} M}{0.10 M} \times 100$$

$$= 8.5 \times 10^{-5}\ \%$$