(22) At low I^- concentrations the solubility of PbI_2 is determined by the common ion effect

$$PbI_{2(s)} \rightleftharpoons Pb^{2+} + I^-$$

↑ the presence of I^- causes the equilibrium to shift to the left (lower solubility)

At higher I^- concentrations the solubility of PbI_2 is determined by the formation of complex ions

$$Pb^{2+} + I^- \rightleftharpoons PbI^+$$

↑ the presence of I^- leads to the formation of PbI^+ and draws more Pb^{2+} into solution from $PbI_{2(s)}$ (increasing solubility)

(23) a. BF_3

b. $As F_5$

(25) $Zn(OH)_{2(s)} \rightleftharpoons Zn^{2+} + 2OH^-$ $\quad [Zn^{2+}][OH^-]^2 = 3.0\times10^{-16}$ ~~3.2×10^{-7}~~

$Zn^{2+} + OH^- \rightleftharpoons Zn(OH)^+$ $\quad \dfrac{[Zn(OH)^+]}{[Zn^{2+}][OH^-]} = 2.5\times10^4$

$Zn^{2+} + 3OH^- \rightleftharpoons Zn(OH)_3^-$ $\quad \dfrac{[Zn(OH)_3^-]}{[Zn^{2+}][OH^-]^3} = 7.2\times10^{15}$

$Zn^{2+} + 4OH^- \rightleftharpoons Zn(OH)_4^{2-}$ $\quad \dfrac{[Zn(OH)_4^{2-}]}{[Zn^{2+}][OH^-]^4} = 2.8\times10^{15}$

$$[Zn^{2+}] = \frac{3.0\times10^{-16}}{(3.2\times10^{-7})^2} = \boxed{2.9\times10^{-3}\,M} = [Zn^{2+}]$$

$$[ZnOH^+] = 2.5\times10^{4}(2.9\times10^{-3})(3.2\times10^{-7}) = \boxed{2.3\times10^{-5}\,M}$$

$$[Zn(OH)_3^-] = 7.2\times10^{15}(2.9\times10^{-3})(3.2\times10^{-7})^3 = \boxed{6.8\times10^{-7}\,M}$$

$$[Zn(OH)_4^{2-}] = 2.8\times10^{15}(2.9\times10^{-3})(3.2\times10^{-7})^4 = \boxed{8.5\times10^{-14}\,M}$$