Ksp ④ Predicting Precipitation ⑧

$\begin{cases} Q_{ip} > K_{sp} & \text{ppt can occur} \\ Q_{ip} < K_{sp} & \text{no ppt} \end{cases}$

① If 1.00mg Na_2CrO_4 is added to 225 mL of 0.00015 M $AgNO_3$, will ppt form?
$K_{sp} = 1.1 \times 10^{-12}$ find conc. of ion.

$1.00\,mg\,Na_2CrO_4 \times \frac{1\,g}{1000\,mg} \times \frac{1\,mol\,Na_2CrO_4}{162\,g\,Na_2CrO_4} \times \frac{1\,mol\,CrO_4^{2-}}{1\,mol\,Na_2CrO_4} = 6.17 \times 10^{-6}$ mols

$6.17 \times 10^{-6}\,mol / 0.225\,L = 2.74 \times 10^{-5}\,M\ [CrO_4^{2-}]$

$[Ag^+] = 0.00015\,M$

$Ag_2CrO_4 \rightleftharpoons 2Ag^+ + CrO_4^{2-}$

$Q_{ip} = [Ag^+]^2[CrO_4^{2-}]$

$= (1.5 \times 10^{-4})^2 (2.74 \times 10^{-5})$

$= 6.2 \times 10^{-13} < 1.1 \times 10^{-12}$

no ppt

② If 0.100L of 0.0015 $MgCl_2$ is added to 0.200L of 0.025 M NaF, will ppt of MgF_2 form?
K_{sp} 3.7×10^{-8}

$MgF_{2(s)} \rightleftharpoons Mg^{2+}_{(aq)} + 2F^-_{(aq)}$

total vol
0.100L
0.200L
0.3L

$[Mg^{2+}] = 0.100L \times \frac{0.0015\,mol}{1L} \times \frac{1\,mol\,Mg^{2+}}{1\,mol\,MgCl_2} \times \frac{1}{0.300L} = 5.0 \times 10^{-4}\,M$

$[F^-] = 0.200L \times \frac{0.025\,mol}{1L} \times \frac{1\,mol\,F^-}{1\,mol\,NaF} \times \frac{1}{0.300L} = 1.7 \times 10^{-2}\,M$

$Q_{ip} = [Mg^{2+}][F^-]^2 = (5.0 \times 10^{-4})(1.7 \times 10^{-2})^2$

$= 1.4 \times 10^{-7} > 3.7 \times 10^{-8}$ (Ksp)

ppt form