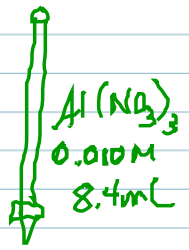
A 10.0mL sample of saturated $Ca(OH)_2$ is titrated with 0.010 M $Al(NO_3)_3$. It takes 8.4 mL of the $Al(NO_3)_3$ to reach the endpoint. What are the $[Ca^{2+}]$ and $[OH^-]$ in the saturated solution you started with? What is the K_{sp} of the $Ca(OH)_2$?



$Ca(OH)_{2\,(s)} \rightleftharpoons Ca^{2+}_{(aq)} + 2\,OH^-_{(aq)}$

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

$Ca(OH)_2$ 10.0mL →

$Ca^{2+}, OH^-, Al^{3+}, NO_3^-$

titration reaction $Al^{3+}_{(aq)} + 3\,OH^-_{(aq)} \rightarrow Al(OH)_{3\,(s)}$

$Al^{3+}: (0.010\,M)(0.0084\,L) = 8.4\times10^{-5}\,\text{mol}\,Al^{3+} \times \frac{3\,\text{mol}\,OH^-}{1\,\text{mol}\,Al^{3+}}$

$= \frac{2.52\times10^{-4}\,\text{mol}\,OH^-}{0.01\,L} = [OH^-] = 2.52\times10^{-2}\,M$

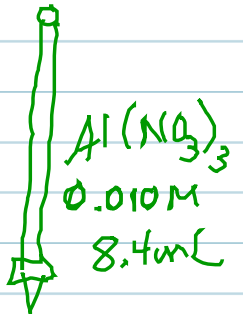
$[Ca^{2+}] = \frac{1}{2}[OH^-] = 1.26\times10^{-2}\,M$

$K_{sp} = (1.26\times10^{-2})(2.52\times10^{-2})^2$

$\boxed{K_{sp} = 8.0\times10^{-6}}$

$Ca(OH)_2$

A 10.0 mL sample of saturated $Ca(OH)_2$ is titrated with 0.010 M $Al(NO_3)_3$. It takes 8.4 mL of the $Al(NO_3)_3$ to reach the endpoint. What are the $[Ca^{2+}]$ and $[OH^-]$ in the saturated solution you started with? What is the K_{sp} of the $Ca(OH)_2$?



$Ca(OH)_{2(s)} \rightleftharpoons Ca^{2+}_{(aq)} + 2\,OH^-_{(aq)}$

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

$Ca(OH)_2$ 10.0 mL →

titration reaction $Al^{3+}_{(aq)} + 3\,OH^-_{(aq)} \rightarrow Al(OH)_{3(s)}$

$$Al^{3+}: (0.010\,M)(0.0084\,L) = 8.4\times10^{-5}\ \text{mol}\ Al^{3+} \times \frac{3\ \text{mol}\ OH^-}{1\ \text{mol}\ Al^{3+}}$$

$$= \frac{2.52\times10^{-4}\ \text{mol}\ OH^-}{0.01\,L} = [OH^-] = 2.52\times10^{-2}\,M$$

$$[Ca^{2+}] = \tfrac{1}{2}[OH^-] = 1.26\times10^{-2}\,M$$

$$K_{sp} = (1.26\times10^{-2})(2.52\times10^{-2})^2$$

$$\boxed{K_{sp} = 8.0\times10^{-6}}$$

$Ca(OH)_2$