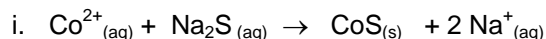


## $K_{sp}$ Problems - Set IV – Titrations

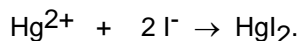
1. An ace chemistry student does a titration to determine the concentration of  $\text{Co}^{2+}$  in a solution. She finds that 10.7 ml of the  $\text{Co}^{2+}$  solution requires 15.2 ml of 0.01 M  $\text{Na}_2\text{S}$  to reach the endpoint of the titration. The reaction is:



- b. How many moles of  $\text{Na}_2\text{S}$  was used in the titration ? (0.000152mol)
- c. What is the molarity of the  $\text{Co}^{2+}$  solution ? (0.014M)
- d. Assume that the  $\text{Co}^{2+}$  solution was a saturated solution of  $\text{CoCO}_3$ , determine the  $K_{sp}$  value of cobalt carbonate. Start by writing a equilibrium equation that represents the saturated solution. ( $1.96 \times 10^{-4}$ )
2. A 20.0mL of lead solution ( $\text{Pb}^{2+}$ ) of unknown concentration was titrated using 0.005M  $\text{Cl}^-$ . The ace chemistry student finds that it takes 12.2 ml of the  $\text{Cl}^-$  solution to reach the endpoint of the titration. The reaction is:  
 $\text{Pb}^{2+} + 2\text{Cl}^- \rightarrow \text{PbCl}_2$

- a. Calculate the molarity of the lead solution. (answer:  $1.5 \times 10^{-3}$  M)
- b. Assume the unknown lead solution was a saturated solution of lead iodide,  $\text{PbI}_2$ . Calculate the  $K_{sp}$  of lead iodide. (answer :  $1.4 \times 10^{-8}$ )

3. An ace chemistry student does a titration to determine the concentration of mercury ions,  $\text{Hg}^{2+}$ , in a sample of lake water. She places a 15.0 ml sample of the lake water in a small flask and adds three drops of an indicator. She finds that it takes 7.5 ml of a 0.000005 M  $\text{I}^-$  solution to reach the endpoint of the titration. The reaction involved is



- a. Calculate the molarity of the  $\text{Hg}^{2+}$  lake water. (ans.  $1.25 \times 10^{-6}$  M)
- b. Assume that the lake water was a saturated solution of  $\text{HgS}$ , what is the  $K_{sp}$  of  $\text{HgS}$ ? ( $1.56 \times 10^{-12}$ )