

CHEM 322: Coordination Chemistry

Topic: Color of Complexes

Name: _____ Roll No. _____ Submission date: _____

What happened to my green solution?

A student was given two vials, and each contained a chromium salt. The vial labeled $\text{CrCl}_3 \cdot 6 \text{H}_2\text{O}$ contained a dark green solid and the one labeled $\text{Cr}(\text{NO}_3)_3 \cdot 9 \text{H}_2\text{O}$ contained a purple solid. She made aqueous solutions of these solids, and the colors of these solutions were the same as the solids (see image below).



Initial appearance of aqueous solutions (0.05 M) of $\text{Cr}(\text{NO}_3)_3 \cdot 9 \text{H}_2\text{O}$ (left) and $\text{CrCl}_3 \cdot 6 \text{H}_2\text{O}$ (right)

After preparing these solutions, she had to leave the lab and the solutions remained sitting on the bench for 24 hours. When she returned the next day, she found that the aqueous solution of CrCl_3 had changed color and was now purple like the solution containing $\text{Cr}(\text{NO}_3)_3 \cdot 9 \text{H}_2\text{O}$ (see image below).



The appearance of the same aqueous solutions (0.05 M) of $\text{Cr}(\text{NO}_3)_3 \cdot 9 \text{H}_2\text{O}$ (left) and $\text{CrCl}_3 \cdot 6 \text{H}_2\text{O}$ (right) after 24 hours

Based on this observation, please describe what happened in the solution. Write out reactions that describe the changes that took place in the $\text{CrCl}_3 \cdot 6 \text{H}_2\text{O}$ solution over the course of 24 hours.