

AP Chemistry Review Questions

Integrating Content, Inquiry and Reasoning

1. Calculate the value of % T for an absorbance value $A = 1.5$. Using this result, explain why absorbance measurements > 1 may not be accurate.
2. Spectrophotometric studies can be conducted on any colored compound. The transition metal group of the periodic table exhibits a wide array of different colored compounds. The complex ion tetraamminecopper(II) contains four ammonia molecules covalently bonded to a copper(II) ion. In aqueous solutions, Cu^{2+} ions will bond to four water molecules in a square planar geometry. The solution is a light blue color. The water molecules can be displaced by ammonia molecules, which form more stable complex bases than water. The appearance of the intense dark blue-violet color of the $[\text{Cu}(\text{NH}_3)_4]^{2+}$ ion is often used as a positive test to verify the presence of Cu^{2+} ions.
 - a. Write a balanced chemical equation for the reaction of copper(II) sulfate and concentrated ammonia to produce tetraamminecopper(II) sulfate.
 - b. $[\text{Cu}(\text{NH}_3)_4]^{2+}$ solutions exhibit a deep blue-violet color. How can you use spectrophotometry to confirm that this reaction has occurred and that the product formed is in fact tetraamminecopper(II) sulfate? Would you expect the wavelength of maximum absorbance (λ_{max}) for $[\text{Cu}(\text{NH}_3)_4]^{2+}$ to be greater than or less than λ_{max} for $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$? Explain.
3. The electron transitions responsible for the colors of transition metal ions involve $d \rightarrow d$ transitions. Why are zinc ions colorless in aqueous solution?