Prelab Assignment: Reaction Stoichiometry and the Formation of a Metal Ion Complex

1. The method of continuous variation was used to determine the stoichiometry for:

\[ x \text{ A (aq)} + y \text{ B (aq)} \rightarrow z \text{ P (aq)} \]

In this experiment, the molarity concentrations of reactants A and B are both \(1.50 \times 10^{-3} \text{ M}\). The amount of product was measured for a variety of mixtures of A and B, where the total mixture volume was always kept constant at 10.0 mL. The following plot was generated:

\[ y = -0.155x + 1.4912 \]
\[ y = 0.299x - 0.0456 \]

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a) Using the equations of the trendlines, perform a simultaneous equations calculation to determine the volume of A used to obtain the maximum amount of product (= the value of \(x\) at the point of intersection of the lines).

b) Determine the volume of B used to obtain the maximum amount of product (hint – what was the total volume of the mixture of A and B?).

c) Using these two volumes, determine the simplest whole number volume ratio of reactants (volume A : volume B) used to obtain the maximum amount of product. Note that this ratio yields the reaction stoichiometry, i.e., volume A : volume B \(\equiv x : y\).
2. In the experiment to be performed in this lab, what is the unbalanced reaction that will be studied?

3. What technique will be used in this experiment to determine the amount of product produced?

4. What special feature of the product makes this a good technique to use?