

Investigation 8.A: The Limiting
Reactant Answer Key**Answers to Analysis Questions**

1. The $\text{CuCl}_2(\text{aq})$ was the limiting reactant because the blue colour of the original solution completely disappeared.
2. The $\text{Al}(\text{s})$ was present in excess because small pieces of $\text{Al}(\text{s})$ remained in the flask at the end of the reaction.
3. If you correctly calculated the prediction, your observations should match. $\text{CuCl}_2(\text{aq})$ was the limiting reactant and should be completely consumed in the reaction.

Answer to Conclusion Question

4. In the reaction between 0.25 g of $\text{Al}(\text{s})$ and 0.51 g of $\text{CuCl}_2(\text{aq})$, $\text{CuCl}_2(\text{aq})$ was determined to be the limiting reactant because the blue colour caused by the $\text{Cu}^{2+}(\text{aq})$ completely disappeared during the course of the reaction, while small pieces of $\text{Al}(\text{s})$ remained. These observations were supported by the stoichiometric calculations performed in the prediction. Based on the results of this exercise, stoichiometric calculations appear to be an effective way to predict limiting and excess reactants.

Answer to Extension Question

5. (a) The solid magnesium ribbon would be completely consumed (the metal would disappear) in the reaction if the magnesium were the limiting reactant. If the hydrochloric acid were limiting, small pieces of the magnesium would remain at the end of the reaction.

(b) Place the $\text{Mg}(\text{s})$ in the $\text{HCl}(\text{aq})$ and observe the reaction. If the bubbling, due to production of $\text{H}_2(\text{g})$, stops and there is $\text{Mg}(\text{s})$ remaining, then the $\text{HCl}(\text{aq})$ is the limiting reactant. If the $\text{Mg}(\text{s})$ is used up completely, then it is likely the limiting reactant, although the possibility exists that there may be stoichiometric quantities of both. A second test can be carried out to ensure that $\text{Mg}(\text{s})$ is the limiting reactant by adding a second piece of $\text{Mg}(\text{s})$ to the solution. If bubbles are produced, this confirms that there is $\text{HCl}(\text{aq})$ left from the previous reaction and $\text{Mg}(\text{s})$ is definitely the limiting reactant.