

## Post-Duel Discussion Questions & Answers

- Question:** Were there any differences in sparklers between the two sides?

**Answer:** Color and burn rate, depending on how well students mixed the sparkler paste.
- Question:** What was happening to the iron, aluminum and magnesium powders as the sparkler burned?

**Answer:** They oxidized. The oxygen produced from the nitrate reacted with the powdered metals. Additionally, the overall reaction heat accelerates the oxidation.
- Question:** What type of reaction was occurring?

**Answer:** Oxidation-reduction reactions.
- Question:** How were the metal particles ejected from the rod?

**Answer:** Nitrogen and oxygen produced by the nitrate reaction.
- Question:** Based on your handout, are the nitrate reactions spontaneous? Are they exothermic or endothermic?

**Answer:** Yes, both nitrate reactions are spontaneous. Both are exothermic.
- Question:** Why did we have to use a flame to start the reaction if the potassium nitrate reaction is spontaneous?

**Answer:** The kinetics for decomposition is very slow unless heat is applied to drive the reaction. Additionally, increase heat is needed to drive barium nitrate decomposition.
- Question:** From what you learned, if you made another sparkler, what modifications would you make to its chemistry? And, why?
- Question:** How interesting was this activity? Will you remember this activity in a year?