

Entropy of Rx Feedback Rubric

Sections	Descriptions	Self-Assessment
Title	<ul style="list-style-type: none"> • Descriptive • Include the reaction(s) as formula or words <ul style="list-style-type: none"> ○ If include H₂O, must have H⁺ and OH⁻ on the other side as ions or part of aqueous compounds ○ If words, must include products • Does not include the words “quantitative” or “qualitative” 	
Data Table	<ul style="list-style-type: none"> • All quantitative data presented at numbers • Units must be included with number or stated in row 	
Discussion Questions	<ul style="list-style-type: none"> • All answered • All questions rephrased as part of the question • Significant detail to support the answers 	
Calculations	<p><u>One trial needs to be shown for the following:</u></p> <ul style="list-style-type: none"> • Calculation of mass of solid needed • Calculation for Temperature Change • Calculation for Heat of Reaction, q • Calculation for Enthalpy of Reaction • Calculation for Entropy of Reaction • Calculation for Calorimeter Constant • Calculation for Average Entropy of Reactions 	

Discussion Questions – The highlighted ones were graded.

All were graded for completion, detail, thought AND accuracy

All were graded for completion, detail, and thought

1. Answers vary depending on which solid you had.
 - a. If used water, must include hydrogen and hydroxide ions or as part of compounds in the products
2. Yes. Looking at the reaction written for Q1, a solid going to ions is an increase in Entropy. Forward direction of reaction is favored. Regardless of the enthalpy of the reaction, the reaction is Entropy driven
3. Varies based on the solid you had. If temperature decreased, then ΔH° is endothermic. If temperature increased, then ΔH° is exothermic. Since we cannot measure the system directly, we know that any change in temperature with the water must be the opposite of the system.
4. The algebraic sign of ΔS° must be positive. In order for a spontaneous reaction to occur:
 - a. Solid going to more favorable state, in this case, solid to ions (more of Q1, cannot use here as the question states in relation to Q3)
 - b. ΔG° must be < 0 . If ΔH° is (-), then ΔS° must be (+) to keep $\Delta G^\circ < 0$, which is spontaneous
 - c. ΔG° must be < 0 . If ΔH° is (+), then ΔS° must be (+) and larger than ΔH°
5. $\text{J mol}^{-1} \text{K}^{-1}$
6. To be exothermic, a release of energy is associated with becoming a lower energetic state (more stable). A spontaneous reaction occurs without any outside influence and moving towards a state of lower energy, therefore an exothermic reaction giving off energy leading to a lower state of energy is common place with spontaneous reactions. Conversely, and endothermic reaction, a gain of energy is not associated with a spontaneous reaction because a spontaneous reaction releases free energy. How can something both gain energy, but have a net release of energy at the same time? Entropy is the key. An entropy driven reaction can be spontaneous at the same time as gaining energy endothermically. From the Gibbs Helmholtz equation we can see the relationship with Entropy and Enthalpy with regard to Free Energy