Entropy of Reaction

ΔS°

Through Calorimetry….

When studying thermodynamics, the equation for free energy of a reaction, $\Delta G° = \Delta H° - T\Delta S°$, is often encountered. In this experiment, you will use this equation to estimate the minimum entropy change required to bring about a reaction. The enthalpy change, ΔH, and the initial temperature will be determined for a reaction. From these values and the equation for free energy, the minimum entropy change to bring about a *spontaneous reaction* will be estimated

Procedure…ish

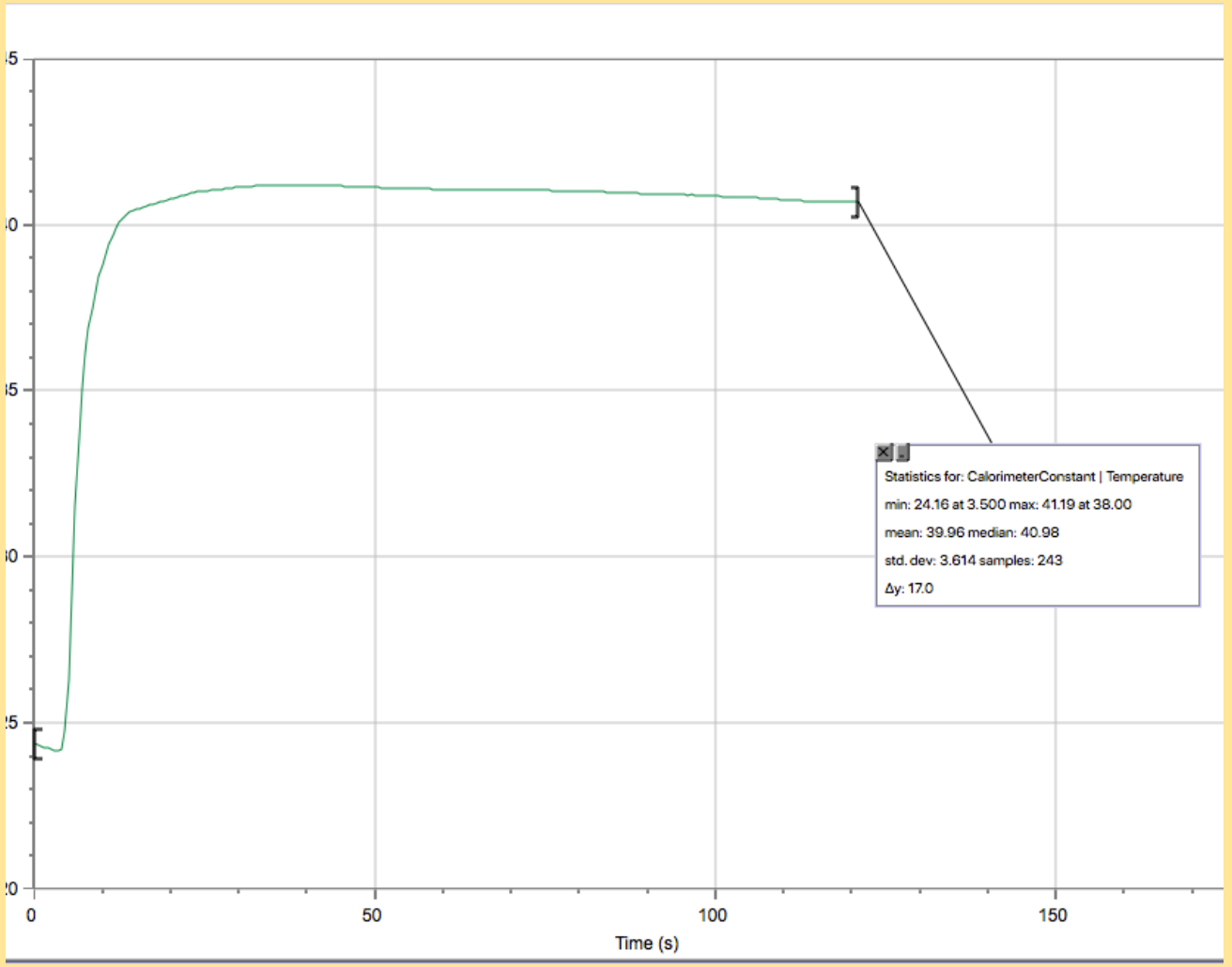
1. For each Reaction (each group will have different set of data to use)
    1. $NaNO_3$
    2. NH_4Cl
    3. NH_4NO_3
2. Each solution is 50.0 mL of of 1.00 M solution. You will need to calculate the mass needed to prepare this solution based on the sample you have – add an image of this calculation into the data table
3. Initial temperature will be taken prior to adding the second solution, about 5-10 seconds
4. Final temperature is determined when temperature reaches the highest or lowest point then changes direction
5. Everyone is given the same Calorimeter Constant Graph
6. The data you are using depends on the group # you are given
7. Assume the temperature of the reaction in happening at room temp or 25 C°

Some thinking…

1. The experiment is based on the fact of the minimum entropy to cause a reaction to occur…
2. Need to think about the dividing line of when a reaction can occur or not, is spontaneous or non-spontaneous…
3. Based on this, you can solve for $\Delta S°$ at 298 K
4. There is an assumption that must be made in order to solve this problem… that requires thinking. Do not ask me, I will not tell you this assumption. A big hint was given in #2 above

- Everyone will use this graph for their Calorimeter calculations
- Click HERE for the logger pro file

Calorimeter Constant Graph



Group number corresponds to what data you will use below

Group #	Data to Use	Mass of Solid T_1 (g)	Mass of Solid T_2 (g)
1	LINK ($NaNO_3$ KH)	4.2043	4.1497
2	LINK (NH_4Cl KH)	2.6739	2.6638
3	LINK (NH_4NO_3 KH)	4.0043	3.9903
4	LINK (NH_4NO_3 YL)	4.0843	4.0068
5	LINK ($NaNO_3$ YL)	4.2734	4.2576
6	LINK (NH_4NO_3 DS)	4.0074 (use T_2)	4.0046 (use T_3)
7	LINK (NH_4Cl YL)	2.6708	2.6503