Using Graphical Analysis in Thermochemistry

You can use graphical analysis for the determination of temperature changes (Δt) in the evaluation of the calorimeter constant and the Δt for a neutralization reaction as illustrated below.

Calorimeter Constant

You first obtain the temperature versus time data for the hot water, the cold water, and the mixture of the two, as three **separate** data sets. You enter the data as **three separate data sets** in graphical analysis and plotted on the same graph as shown in Figure 1.

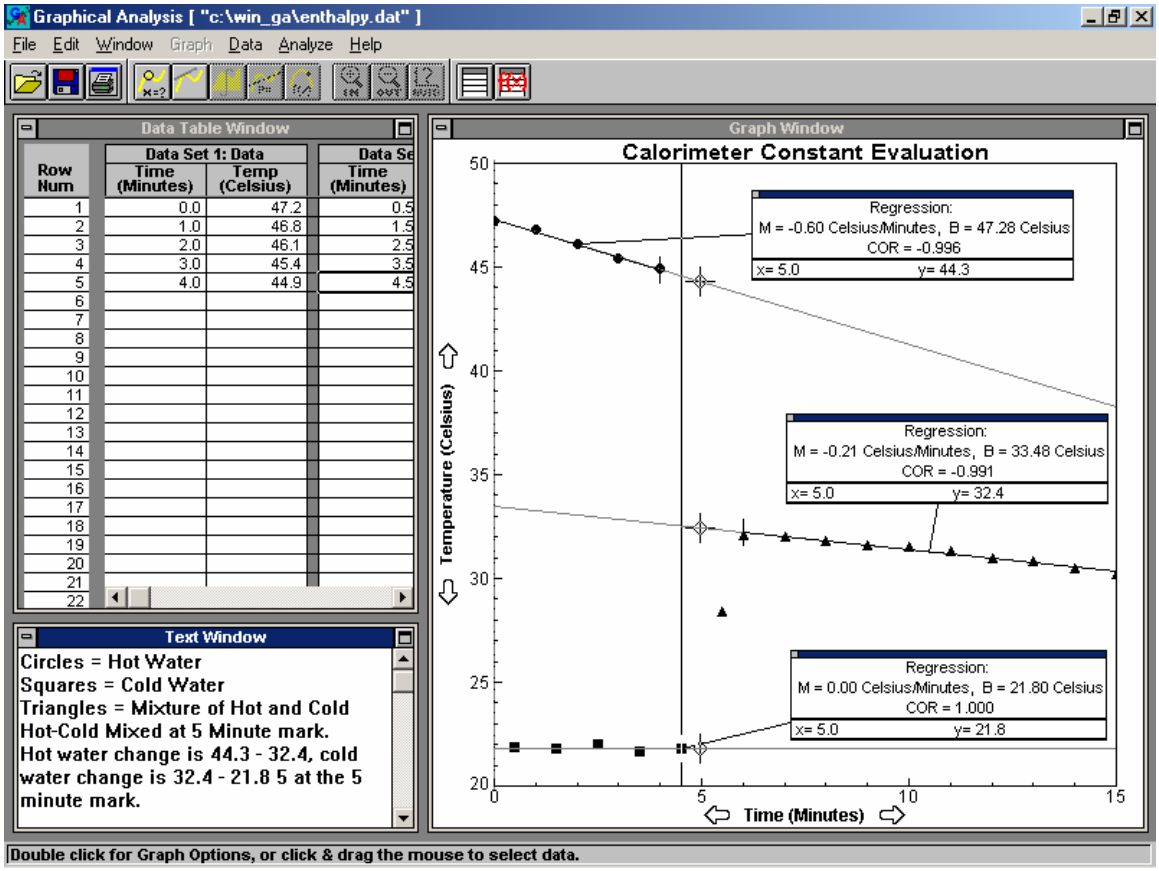

Figure 1

The regression line is obtained for each of the data sets as shown. Then you click on **Analyze** on the top menu and then click on **Interpolate.** Then you move the cursor within the graph and the **x** and **y** values are shown for each line. You move the cursor so that the **x value** (time) is 5.00 in both regression boxes. Now read the temperature (y – value) for the hot water, cold water, and mixture at the instant of mixing. You cannot save this information but must read it off the screen. Subtract the values of the hot water and mixture for Δt hot water and cold water and mixture for Δt cold water.

Enthalpy of Neutralization

For the enthalpy of neutralization you record temperature and time values for both the acid and the base as well as temperature and time values when the acid and base are mixed. In this case the data is entered in graphical analysis as **two data sets**. One data set is the acid and base temperature versus time data and the second data set being the mixture or solution data. They are both plotted on the same graph as shown in Figure 2.

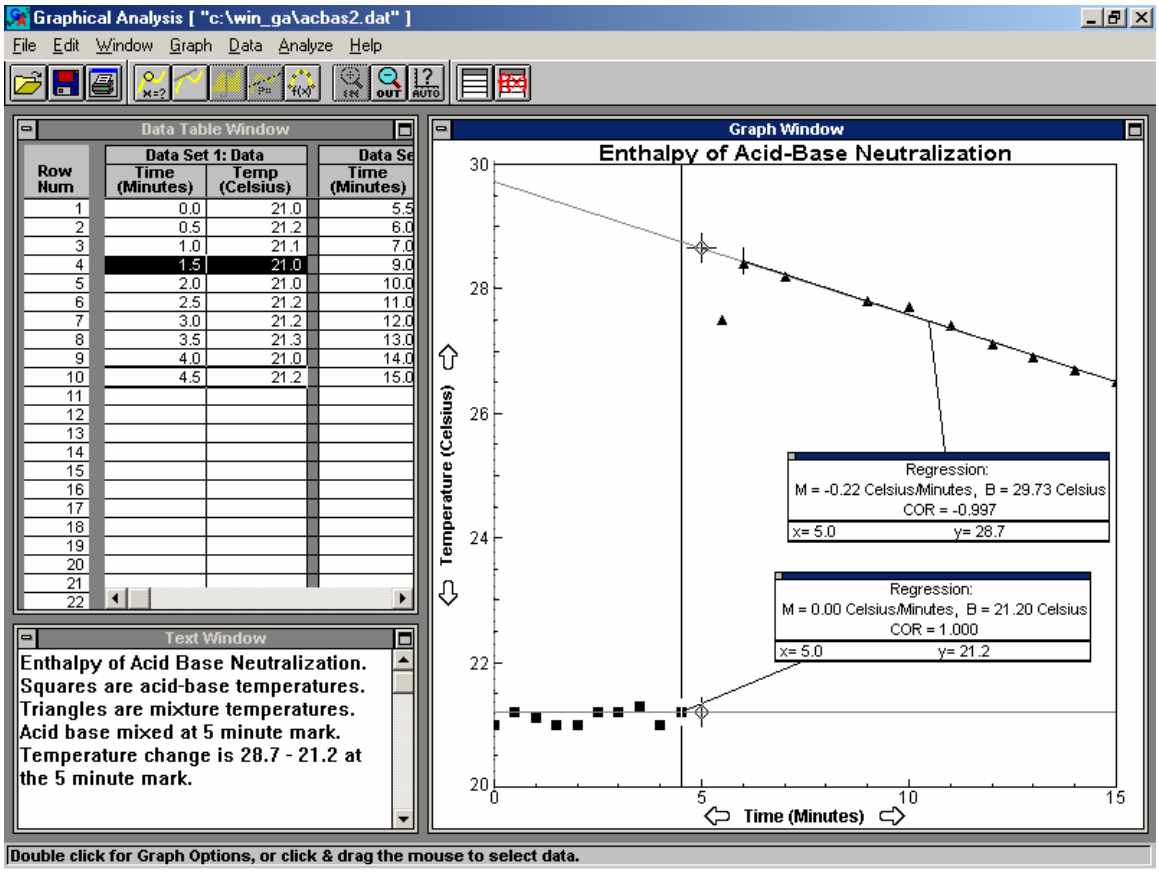

Figure 2

You obtain the regression line for both data sets as shown. You then click on the **Analyze** option and then click on the **Interpolate** option as with the previous graph. Then move the cursor along the graph so that the **x value** (time) reads 5.00 in both regression boxes. Now read the **y value** (temperature) for both data sets and subtract to obtain Δt for the neutralization reaction.