**Discussion**

The discussion is used to explain your results. Ask yourself provocative questions such as: Do the results make sense, is there some data missing? Did you obtain a result different from your expectations?

Sometimes the data you obtain in an experiment is straight-forward and self-explanatory. In these cases, your discussion may be brief. However, most of the time, you will need to explain to the reader why you obtained a particular result, especially if your result is different than expected.

Think of the discussion as a conclusion to the labs Objective and Introduction. If you understand the objective clearly along with the theoretical background and some comments about the method to be used, then discuss your results in this context. If you had questions concerning the Introduction, answer those questions here.

The discussion should also include error analysis (when appropriate): explain sources of error and how errors impact your results. Be sure to discuss only the connections between error analysis and your actual data and observations.

**Discussion**

The transitioning of the color indicators at given pH’s indicated the approximate pKa of those acid base indicators. For Methyl red, the intermediate color is light pink at pH 5 because it is the transitional color from hot pink at pH 3 to yellow at pH 7. Since pKa = pH, Ka =10-pH and therefore Ka for Methyl red is 10­-5. Congo red, Methyl orange, and Cresol red intermediate colors and pKa are determined using the same manner. For the cabbage juice indicator, we prepare buffers in pH =2-6, and pH=8-12. The colors of cabbage juice indicators distinctively sort out acidic buffers and basic buffers. For acidic solutions, the colors change from bright neon pink at pH =2 to light purple at pH=6; for basic solutions, the colors change from light blue at pH= 8 to bright lime green pH =12. The intermediate light pink color for acidic solutions appears at pH =4 while the teal of turquoise intermediate color appears at pH=10 for basic solution. The cabbage juice indicator is a polyprotic acid because it has two Ka values (Ka1 =10-4, Ka2=10-10). The cabbage juice indicator also has the widest pH range; it covers from pH=2 to pH=12. Methyl red, methyl orange, and Congo red are indicators for acidic solution because their pH range lies in between 2 and 7. Cresol red has an intermediate color at pH=7, so it is good for weak acid/base. Possible errors is that there is a subjective viewing of when the colors blend between the two extremes seen at the very basic and acidic pH’s

For the part of determination of Ka with Spectronic 20, phenolphthalein HIn is assumed to completely dissociate into In- at pH=11; therefore, it must have the highest absorbance which turn out to be true (0.616 at pH 11 is the highest). As pH increases, absorbance increases as well. For instance, the absorbance for the solution at pH 9 is .092 with whereas the absorbance at pH 10 is .504. These observations follows beer’s law, as concentration increases absorbance increases.

From the graph of absorbance versus wavelength on page 4, the maximum absorbance is measured at 504 nm. The absorbance keeps increasing until it reaches its maximum value then starts dropping as the concentration of HIn decreases. The percent error of the value pK for phenolphthalein is calculated to be 1.83 %. Possible errors in this method is that at pH of 11 the assumption is made that the HIn indicator is completely dissociated and thus the value can be use as if it was the undissociated acid in the calculations. The other possibility for error was that when determining maximum wavelength for absorption manually the value may have been slightly off from its true maximum.