Day # 14   February 28th

CONCEPT: How do acids and bases affect the pH of water? What happens when there is both a weak acid and its conjugate acid in solution and an acid or base is added to it?

TOOLS: Today we are only going to review the tools we worked with on Friday. There is a new tool that we need to learn to deal effectively with the situation where there are conjugate acids and bases in solution but I want to wait until the next class to introduce that. Today I want us just to focus on the concept.

Housekeeping: Lab this week – begin next rotation. Come prepared. May be interesting to see if there are any differences after a week of not being messed with but also not being cleaned much.

Labs are due on Wednesday

Begin class with the following problems.

1. What is the pH of the following solution:
5 mL 3 M HNO$_3$ + 10 mL 1 M Ca(OH)$_2$ in 50 mL of water.

2. What is the pH of the following solution:
1 g of the salt CaCO$_3$ (yielding the weak base carbonate) is dissolved in 100 mL of water. The $K_b$ for carbonate is $1.7 \times 10^{-4}$.

Okay, what happens when you have a weak base and its conjugate weak acid together in solution?

Some examples: HCO$_3^−$ and CO$_3^{2−}$ or H$_2$CO$_3$ and HCO$_3^−$.

CH$_3$COO$^−$ and CH$_3$COOH?

Ask class to think about it.

Then do some demos:

Titrate a strong acid (0.08 M HCl) into an acetate buffer – stop when pH = 2
Titrate a strong base (0.08 M NaOH) into an acetate buffer – stop when pH = 11
How much acid does it take to get pH to 2 in non buffered situation?
How much base does it take to get pH to 11 in non buffered situation?
See if students can understand the reason why a buffer requires so much more acid or base to change its pH.

\[ \text{PH} = \text{pKa} + \log \frac{[A^-]}{[HA]} \]