**Final Project Paper**

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Approved by Quinn

Originally, I had a lot of fun ideas for this code. Currently the finished product can graph your progress as a titration is run. So, as a strong base or acid is added through a burette, pH or pOH can be calculated and graphed, with the previous values being kept (that was tricky to code for sure)! When running a titration with a strong acid-base reaction, you can have the ability to graph it and enter data as you continue. It was challenging figuring out how to enter data individually, then to keep the previous data on the graph as you keep entering new data. Quinn was very helpful in getting the GUI set up, as that was very challenging for me to get started. Most of the time I was just re-watching previous lectures and trying to apply those concepts to my code, it was at this point I wished I had two monitors so I could work and watch more efficiently.

Concerning the code itself and many ideas I had, and I may still go through with finishing in the future, there are good amount for titrations! The titration program was going to not only plot data for strong acid strong base reactions, but it was also going to include weak-acid strong base reactions. Weak-acid and strong-base reactions had to unfortunately not be included in the code for this project, due to its complex computation. Firstly, for weak acid Ka would need to be specified, with many calculations following it, involving the classic ICE table and Henderson-Hasselbalch equation. When speaking with Quinn about this addition, she suggested that this concept be attempted in the future, but for the means of this final project, the strong-acid and strong-base graph would suffice. My biggest concern for only having strong acid-base titrations was the simplicity of the graph’s final shape. Realistically, all titration graphs have the same shape, but with strong-acid base titrations the equilibrium point will always lie at a pH of 7, which is simple to code. The appeal of weak-acid strong-base reactions is that the pH at equilibrium must be calculated.

Another concern of mine was getting each input value to hold its value as it was entered into the GUI. Again, Quinn and previous lectures really helped me with getting this concept to work. The nice thing about the GUI is that when you input the independent value and the constant variables, not only is the pH calculated and graphed with its base Volume, when you input another number, the previous data are kept, and you can continue graphing and titrating!

The design of the code has a graph in the middle with four input buttons lined along the top that are labeled, and two “push to plot” buttons. The plot button that will most likely be used the most will be the pH plot. Truthfully, the only reason why the pOH plot button exists is because there was not much else I could think of for the second callback function (I’m sorry!). I’m sure there exists a practical use for pOH graphing, but most of the time in chemistry, you will work with pH.

Going forward in the future, I would like to implement more to this code! I would like to add the weak-acid strong-base titrations. There are several additions and calculations that need to be worked out before hand, but I’m sure I can get it to work! Next, something that would be tricky to accomplish, would be diprotic and polyprotic acids. These types of acids have two or more equilibrium points, which each require their own specific types of calculations. There are endless other things that could be added to this code just from Quantitative Chemistry, but that will be if I have the patience to work out the code.

The titration program is a great starting point for getting introduced to applied code. As a chemical engineering major, I know something like this in general chemistry two would have been amazing! Even going forward with my major, simple calculations that are easy to code but take a while to do on paper are common. This project has helped with making me more comfortable with applying complex concepts and coding them to make solving problems simple! I appreciate all the help that Quinn and the TA’s have given me, as every concept within this class was new to me. Thank you all!