

7: Acid Base Titrations

1. Perform Exploratory Run (watch video first)
 - a. Using a volumetric pipette transfer 25 mL 0.1M Acetic Acid to a 250 mL Erlenmeyer flask
 - b. Add a few drops of phenolphthalein
 - c. Attach burette to a ring stand and fill with 0.1 M NaOH
 - d. Titrate to endpoint when solution turns pink and use this value when decided what volumes to take data at in the pH titration
2. Setting Up pH Titration
 - a. Using a volumetric pipette transfer 25 mL 0.1M Acetic Acid to a 500 mL beaker.
 - b. Add 50 mL water to make sure the pH probe will be fully submerged. If not, add more water and record total volume of water added
 - c. Add a few drops of phenolphthalein
 - d. Set up titration station like the demo station in the lab.
 - e. Make sure heat is OFF.
 - f. Carefully transfer 0.100 M NaOH to the burette
 - g. Gently turn on the magnetic stirrer and make sure it does not hit the sides of the beaker or the probe.
3. Check if sensor is calibrated in buffer solution
 - a. Place probe in buffer solution
 - b. In command line (The black box to the left of screen) you will see
 - i. Sudo python /home/Desktop/pH_lab/current_ph.py
 - ii. First time running it will sometime get error, just hit up arrow on keyboard then enter
 - c. If you need to calibrate then plug the probe into the lab quest and calibrate as normal
 - i. After calibrating before pressing ok, go to storage tab
 - ii. Select save calibration to sensor, then press ok twice when prompted
4. Obtain initial pH using program in Thonny editor
 - a. Press Green play button to start
 - b. Enter y to make your group's tab
 - c. Enter a name for your group
 - d. Look at the black box (current ph reading) and wait for the numbers to stabilize
 - e. When ready Enter volume of titrant (first will be zero) then press enter
5. Run Titration
 - a. Add appropriate amount of base (see image on back side of handout)
 - b. Record total volume base added in the Thonny shell (do not hit enter)
 - c. Observe the pH in command line and when it is stable, click enter in Thonny shell
 - d. Repeat above steps adding the next increment of base, while recording the total amount of base added in the Thonny shell.
 - e. Be sure to collect data at least 5 mL beyond the equivalence point
 - f. Check data on the data tab of lab report copy

Run program Stop program

```
File Edit View Run Tools Help
current_ph.py PH_Vernier_Insert.py
1 import datetime, time
2 import gspread
3 import subprocess
4 from google.auth.transport.requests import AuthorizedSession
5 from google.oauth2 import service_account
6
7 #googleAPI = 'IoT_Lab_Presentation.json' #use this line if .json file is in the same folder
8 googleAPI = '/home/pi/ph-ph-reading-c7688abd9d29.json' #path to the .json file
9 scope = ['https://www.googleapis.com/auth/drive']

Shell
Enter total volume base:1
[1.0, 0.04]
Google Sheet updated
.....
Enter total volume base:2
[2.0, 0.043]
Google Sheet updated
.....
Enter total volume base:2.4
[2.4, 0.042]
Google Sheet updated
.....
Enter total volume base:
```

Program runs here

Type here when prompted and press enter

If you ever get errors or scary red text don't panic! You didn't break anything, it's part of the fun of IoT. Just check in with instructor and start the program again

If during the exploratory run the solution turned pink at 10 mL, the following image shows prudent volumes to measure pH at. Be sure to get dropwise data around the equivalence point, and some data values around half that volume.

pH vs. V

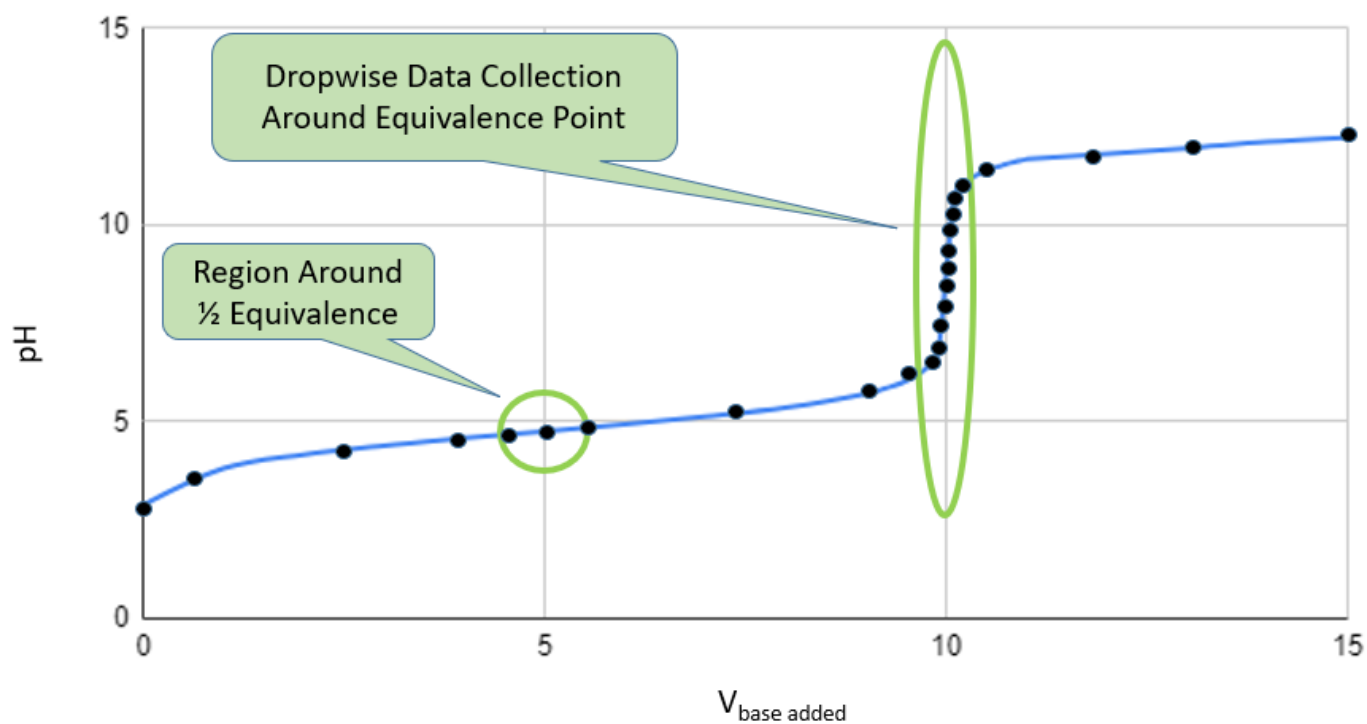


Figure 7.2.5: Dots represent pH readings. (Copyright; Belford CC-BY)