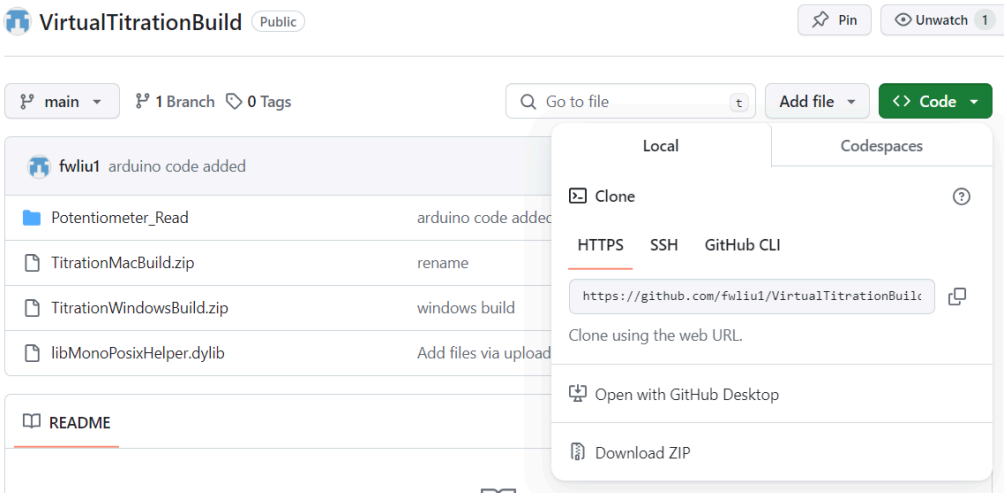
Windows Users Installation

1. Visit the project github
https://github.com/fwliu1/VirtualTitrationBuild

2. Click on the green <> code button.
- Either you can git clone the project from https: INSTRUCTIONS HERE
    - Not familiar with command line? Visit HERE
    - You will most likely need to “cd Desktop” to navigate to the directory to install the project there.
- Or Click “Download ZIP”



3. Unzip the folder VirtualTitrationBuild
4. Click TitrationWindowsBuild -> unzip
5. Click SWISH Chem 2024 Short Form
6. Click “SWISH Chemistry V2.exe” to open the experience

7. Connect your burette to the computer

Mac Users Set Installation

1. Visit the project github
https://github.com/fwliu1/VirtualTitrationBuild

2. Click on the green <> code button.
- git clone the project from https: INSTRUCTIONS HERE
    - Not familiar with command line? Visit HERE
    - You will most likely need to “cd Desktop” to navigate to the directory to install the project there.

- Download ZIP does NOT work. The project will open and install however, the app can't connect to the arduino. Been QA tested.

3. Unzip the TitrationMacBuild
4. Rename the "ShortForm 3/2/2024" to "ShortForm"
5. These directions must be followed after a Mac version of the titration experiment is downloaded. If they are not, the build will not be able to find the name of the Arduino port. These directions will show you how to add a library of functions to the build that will allow the Arduino port to be found.
    1. Open the terminal
    2. Navigate to the VirtualTitrationBuild folder in the terminal.
       This below is an example, this may vary depending on your file path. Copy paste code into your terminal.
        1. cd Desktop
        2. cd VirtualTitrationBuild-main
    3. You are going to copy the libMonoPosixHelper.dylib file to the MacOS folder of the build, which lies in the Contents folder. You will do this with the following terminal commands. Make sure your terminal is inside the virtual titration folder. Then copy paste this code into the terminal
        - cp libMonoPosixHelper.dylib "ShortForm.app"/Contents/MacOS
            - Don't forget the quotation marks

Your App should be ready to go! Double Click "Short Form" to open the project and continue. Connect your burette to the computer.

Following Instructions are the same for Windows and Mac Users

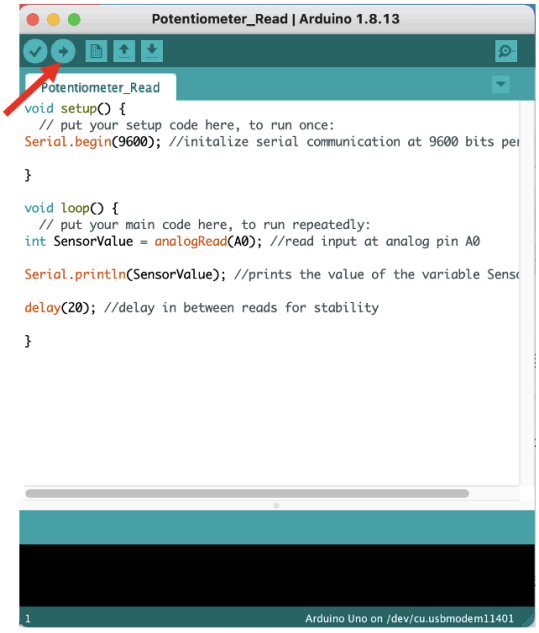
Connecting the Arduino to the computer

1. If the computer you are using does not have the Arduino IDE, you can download it at this link for either Windows or Mac: https://www.arduino.cc/en/software. If the computer already has the Arduino IDE, skip this step.

Downloading the potentiometer script to the board

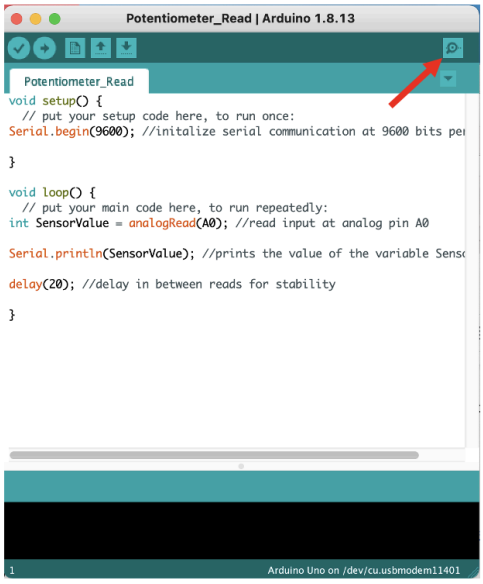
1. The arduino file should be inside the github folder you downloaded. Open the “Potentiometer_Read” Folder and then click the .ino file there.
2. Click the checkmark at the top-left corner of the script to verify the code

3. Click the right-pointing arrow next to the checkmark to upload the script to the board.



4. You can verify that the script is working by clicking the hourglass icon on the top-right corner of the script. Make sure the Ardunio is plugged into the computer, and the

potentiometer is set up in the circuit described earlier in this document.



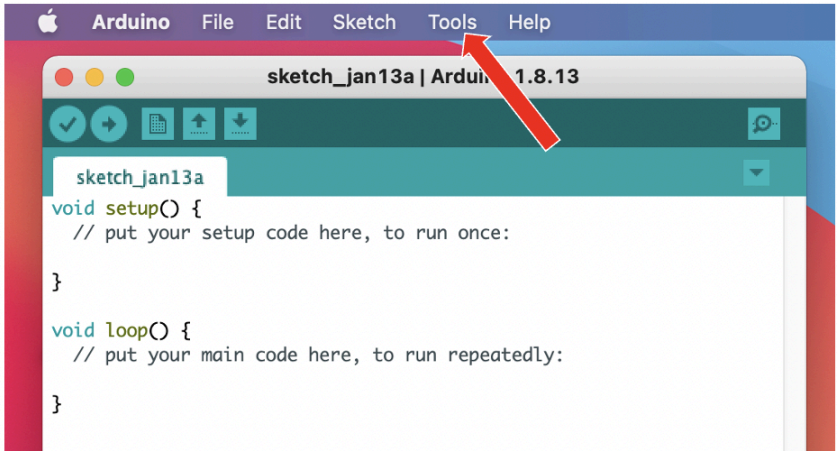
a. As you turn the potentiometer clockwise from its leftmost position to its rightmost position, you should see integers vary from about 10 at its leftmost position to exactly 1023 when fully turned.
b. Note that the values when the potentiometer is turned completely counterclockwise (its leftmost position), the values may vary from 6 to 10, but so long as the values are below 15, the potentiometer is acceptable for use.
c. **If the values at the leftmost position reach or exceed 15, do not use this potentiometer.**
d. To conduct a full test of the potentiometer to determine if it should be kept, click here.

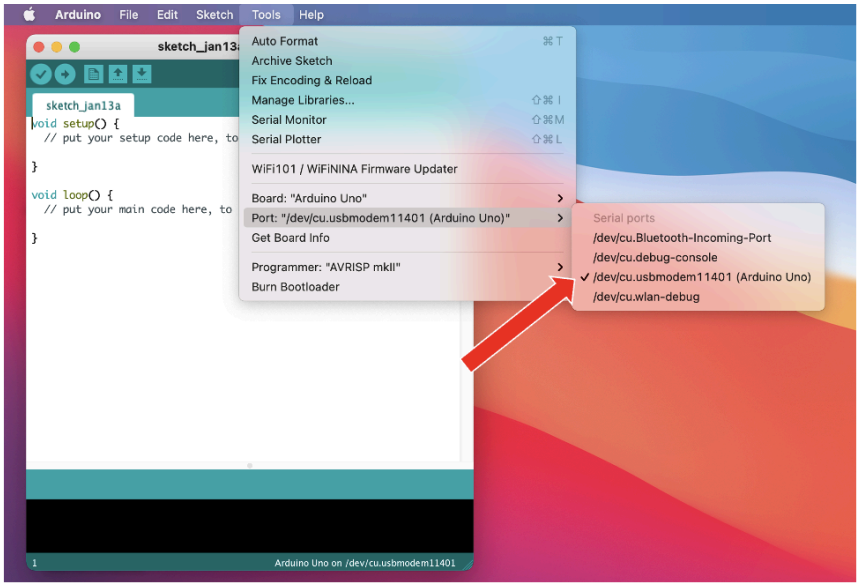
Identifying the port name of the board

Mac and Windows - Should follow the same process

1. While the Ardunio is plugged in and the Arduino IDE is open, go to the very top of your screen, not on the script, and click **Tools**

2. Hover your mouse cursor over **Port:**. A small window will appear that shows your portname with a checkmark to the left of the name.

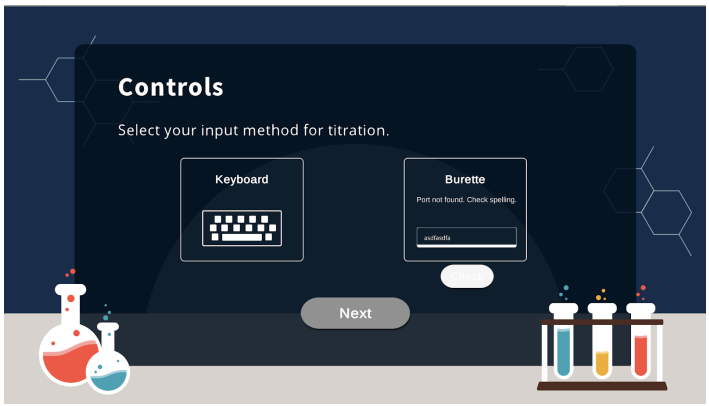




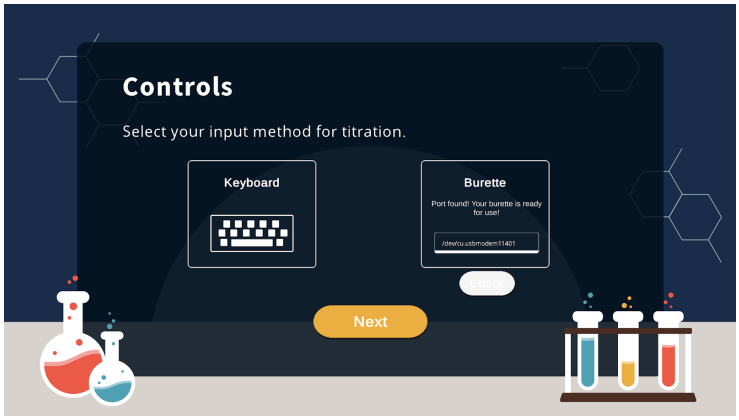
In this example from the mac, the name of the port is /dev/cu.usbmodem11401 for Mac
On the windows, the name of the port might be COM9
You might see a (Arduino Uno) at the end of the port name. Don't include this in the port name when you type it in below.

Opening the Virtual Titration Experiment

1. Open the Virtual Titration build, click start
2. You will be taken to the Burette or Keyboard menu
3. Inside of the **Burette** box, type in the name of the Arduino port into the rectangle, and click **Check**. If the port name is incorrect, you will see the message, ""Port not found. Check spelling."



4. If the port name is correct, you will see the message, "Port found! Your burette is ready for use."



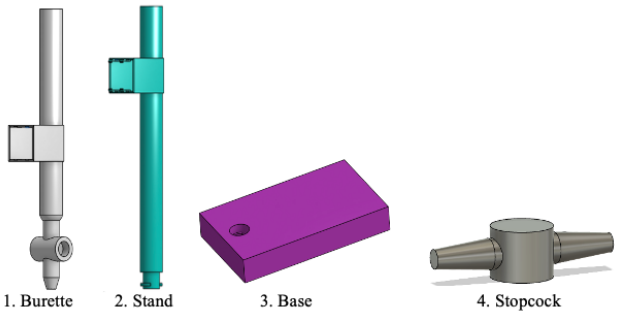
5. Click the **Next** button to begin the experiment!

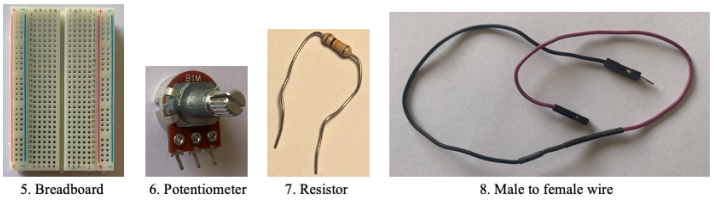
In case there are issues with your Burette, here are some instructions to try and fix it:

Assembling the Burrette 3D Parts

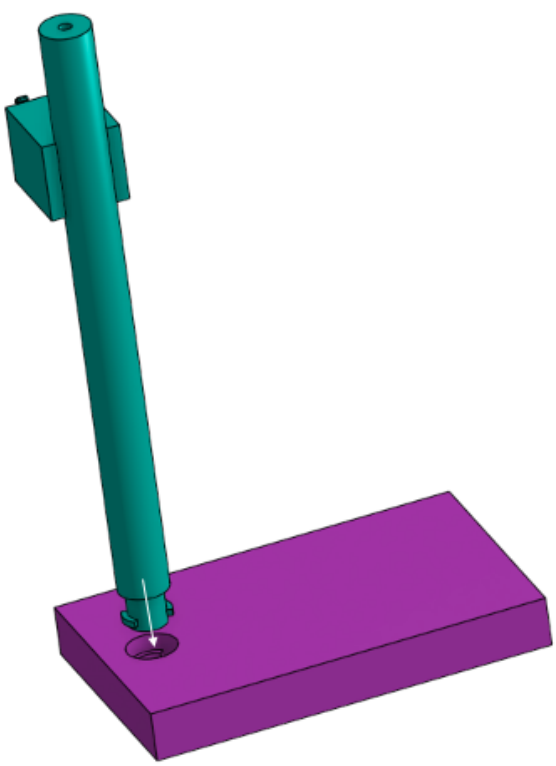
These are the pieces of the intervention

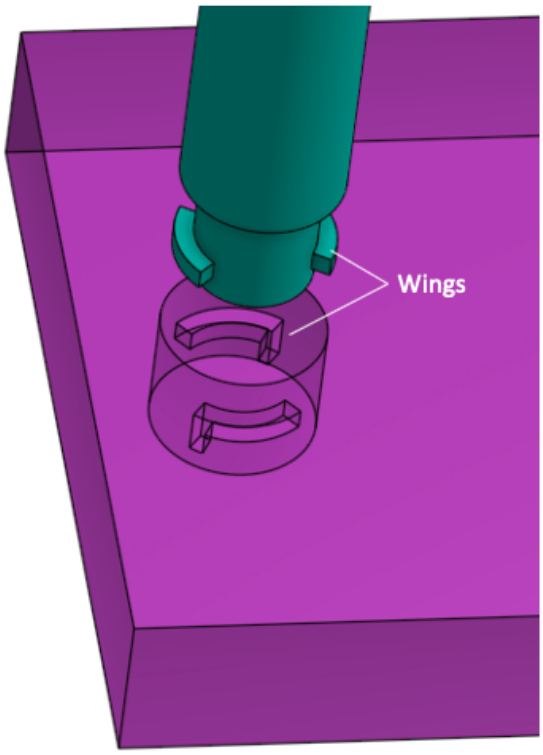
1. Burette
2. Stand
3. Platform
4. Dial
5. Breadboard
6. [Potentiometer]
7. 10k Resistor
8. Male to female wires (3)
9. Male to male wire (1)
10. Arduino Uno
11. USB cable type B



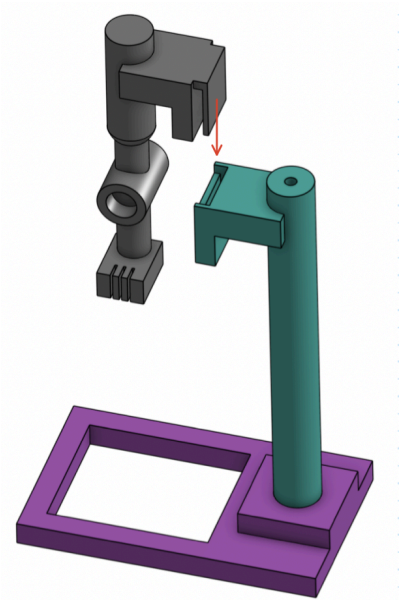


1. Connect the stand to the base by inserting the narrower end of the stand into the hole of the base as shown in the following pictures, where the wings of the stand and the base hole are 90 degrees apart from one another. Once inserted, twist the stand clockwise until you cannot rotate it any further.





2. Connect the burette to the stand by sliding the burette into the stand as shown below:



3. Connect the potentiometer to the burette by inserting the flat side of the potentiometer into the circular hold of the burette until it cannot be further inserted. The fit should be snug.

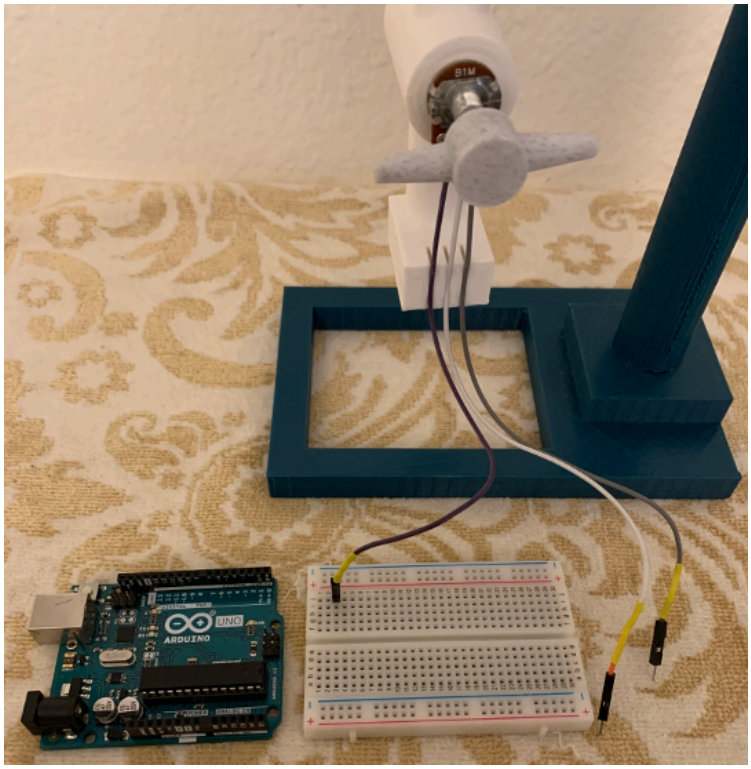
4. Turn the potentiometer shaft as far counterclockwise as it will allow. Next, attach the stopcock to the potentiometer with the arms in the horizontal position.

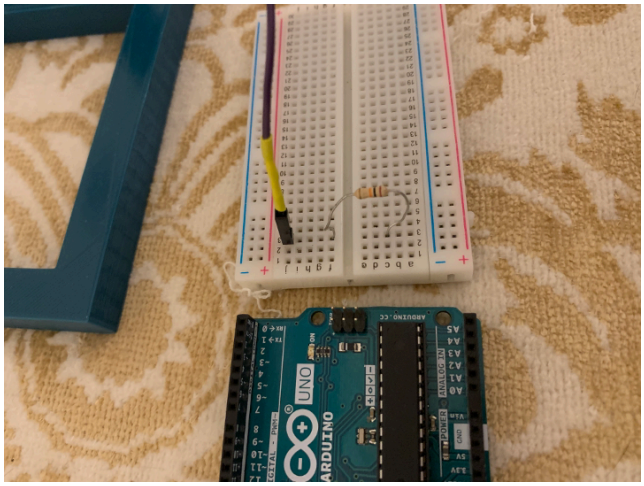
Assembling the Burette Arduino Circuit

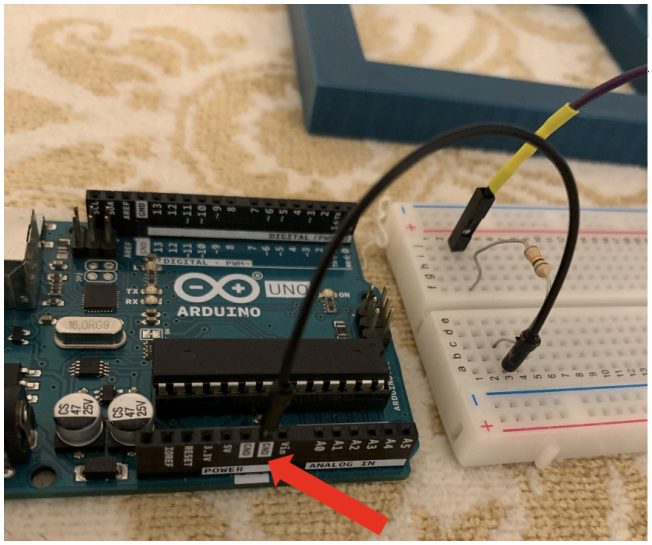
The leftmost potentiometer wire (stopcock facing you):

1. With the stopcock of the burette facing you, connect male end of the leftmost wire of the potentiometer to a row on the breadboard.
2. Insert one leg of the resistor into another hole of the same row, on the same side of the breadboard.
3. Connect the second leg of the resistor to a different row of the breadboard.
4. Using a male-to-male wire, insert one end of the male wire to the same row of the breadboard as the second resistor leg (the one in Step 3).
5. Insert the other end of the male-to-male wire into a GND port of the Arduino

The above steps are shown below as images:

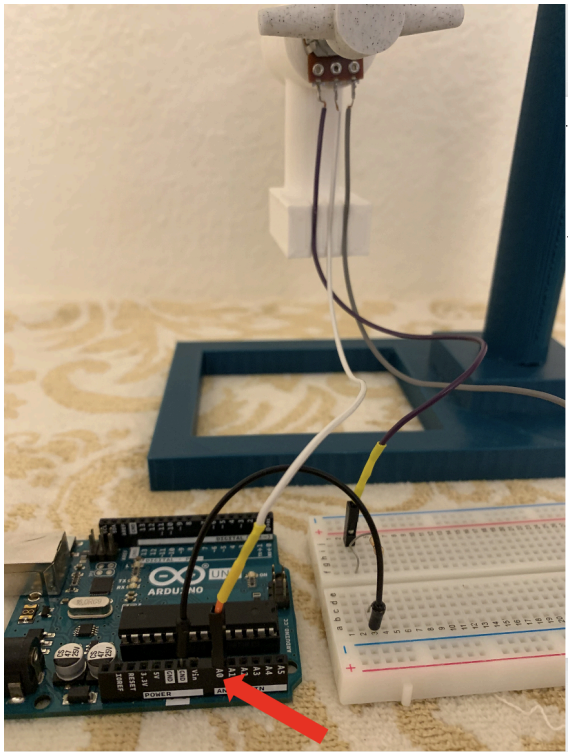






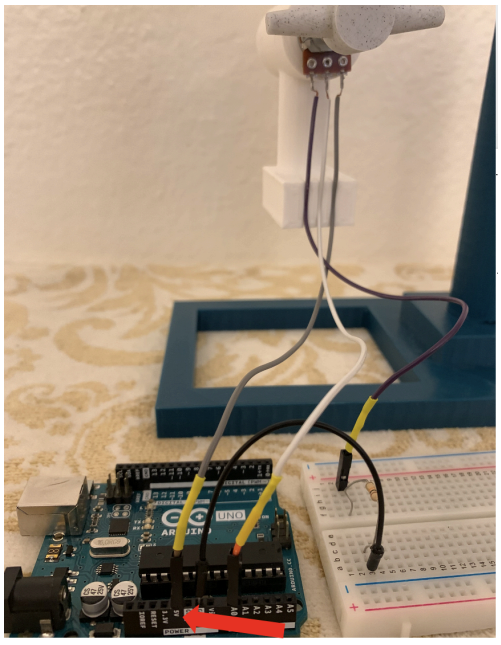
The middle potentiometer wire (stopcock facing you):

1. Connect the male end of the middle potentiometer wire to the A0 port of the Arduino.



The rightmost potentiometer wire (stopcock facing you):

2. Connect the male end of the rightmost potentiometer wire to the 5V port of the Arduino.



The circuit is completed. Connect the Ardunio to the computer using a USB C cord.