1. Unpack the colorimeter and LabQuest. Inside the colorimeter box you will find a set of 12 cuvettes and their caps. Have these handy along with the samples you will be taking readings on, and tissues and distilled water for cleaning cuvettes.

2. Use the white modular plug to plug the colorimeter into Channel 1 on the LabQuest. Channel 1 is at the top left side of the LabQuest and is clearly marked.

3. Plug the adapter into the LabQuest using the small round port on the right side next to the audio ports. Plug the device into a wall outlet. It also runs on batteries, but if you use the adapter, you won't have to worry about the battery status over the course of the experiment.

4. A stylus is provided to make touching the screen more efficient. The stylus is attached to the LabQuest. Your fingers will also work.

5. Press the power button in the upper left portion of the LabQuest, right above the screen. Wait a few seconds and the screen should display a live reading from the colorimeter. You'll be using the absorbance data, highlighted in the red area of the screen. It may take up to 30 seconds for the live screen to show up, but if it doesn't come up, the LabQuest may not recognize that the colorimeter is attached. Make sure the modular plug is securely in the correct port (see picture above). You may need to unplug and plug it back in.

6. Once the LabQuest detects the attached colorimeter, it will display the “File Sensor” window with a live reading. You may have to tell it to discard old information if it wasn't properly shut down at the end of its last use or if students have been exploring. A warning window will appear. Simply press “discard” and this will bring you back to the File Sensor display.

7. If the colorimeter file is accidently closed, use the stylus to select the “Home” button on the screen. Select “LabQuest App” and the screen will reappear in a few seconds.

8. The needle meter tab in the upper left corner of the screen displays the colorimeter readings, so if you accidentally navigate away from the live reading, just use the stylus to re-select the reading.

9. **Taking a Reading.** Any time you use a beam of light to measure absorbance, there is a possibility that other things besides cells may be measured - for example, the media may show some absorbance. In order to eliminate the effect of the medium (in this case Neff), you need to calibrate the colorimeter with a blank tube containing Neff medium with no cells in it.

10. Make sure the wavelength on the colorimeter is set to 635 nm. If it isn't, use the right/left arrows above the CAL button to get the proper wavelength. 635 nm is the wavelength used to make the standard curve.

The ASSET Program (Advancing Secondary Science Education through Tetrahymena) at Cornell University is funded by NIH SEPA.
ASSET: How to Use a Colorimeter and LabQuest

11. Transfer 2mL of Neff to a clean cuvette labeled “Blank”. Place a cuvette cap securely in place. For comparison of cells growing in different media, you’ll need a separate blank for each medium concentration used. You can label the top of each cuvette with a Sharpie marker. The ink will come off with a little alcohol when you’re done with the experiment.

12. Use a Kim Wipe or tissue to wipe the outside of the cuvettes and handle them near the top edges or on the ribbed sides. Fingerprints will affect absorbance readings. Carefully open the colorimeter by lifting gently on the release. Place the blank cuvette in the colorimeter, lining the clear sides up with the white arrow. Close the lid securely. The arrow indicates the path of the light. Two sides of the cuvette are clear and two are ribbed. The light must go through the CLEAR SIDES.

13. Press down and hold the CAL button until the red light starts to blink. When the blinking stops, you’re ready to go. The reading on the LabQuest should be at or close to 0.000.

14. Open the colorimeter and remove the blank. Invert the sample cuvette several times to mix the contents and insert it into the slot. Close the lid and watch the display on the LabQuest. The numbers will fluctuate, partly because the Tetrahymena are swimming around and redistributing themselves. In order to standardize the data collection, watch for the highest reading within the first 5-10 seconds. Typically, the number will rise a little, reach a maximum, and then start to decline. If you leave the cuvette in the colorimeter for a while, eventually the reading will stabilize, but the cells won’t be evenly distributed, so don’t worry about waiting for a stable reading.

15. Record your results and repeat Steps 13-14 two more times. You now have three readings, which you should AVERAGE and enter in the data table. If one reading seems out of line, read the sample again and use your judgment about whether to use the out-of-line measurement in your average. A single very divergent reading will skew your results. If it truly seems to be an error, it should not be used.

16. After completing your readings, empty the cuvettes into the waste beaker and rinse them thoroughly with distilled water. Tap the clean cuvette gently on a clean paper towel to remove excess water and leave it on a paper towel to dry. Rinse the cap and dry in the same way.

17. To shut everything down, use the stylus to tap the File drop down menu and choose “Quit”. Then hold down the power button until the screen disappears. Unplug and repack everything. Be sure to repack the cuvettes and lids - they are easily lost. Although the Vernier information calls the cuvettes “disposable,” we re-use them, so be sure to repack them and their lids.