

1.101 Introduction to Civil and Environmental Engineering Design
Laboratory Exercises, Sept 14, 15

Application of the glass electrode to measure the pH of water.

Because this project is about pH control, it will be necessary to measure pH, both to test the performance of the treatment device that is going to be designed, and to develop *design curves* that will help in the design process.

1. Referring to the document, Measuring pH, you will need to build a circuit for *conditioning* the sensor output. To this circuit you will then connect a display device, which in this case will be a voltmeter. You will then *calibrate* your sensor system, obtaining information necessary to convert any voltage reading you obtain with this system into knowledge of pH.
2. Next we will use your pH sensor to explore some aspects of the acidity of water, and of the acid neutralization process.
 - 2a. Measure and report on the pH of tap water from the laboratory sinks
 - 2b. Measure and report on the pH of the surrogate 'acidic well water' provided by the instructor. Then, carefully add 0.003 N sodium hydroxide solution in small aliquots. It is suggested to use a 250 mL beaker with 100ml 'well water', and to add aliquots in amounts of 0.5 to 1 mL at a time, until pH reaches about 8. Plot the curve of pH as a function of added sodium hydroxide solution, and estimate the mineral acidity of the well water.
 - 2c. After you are satisfied with your result in 2b, go back and re-calibrate you pH sensor. How close is it to your first calibration?
 - 2d. How could you use the results of the above experiment to help design a neutralization system based on injection of aqueous sodium hydroxide into the well water?