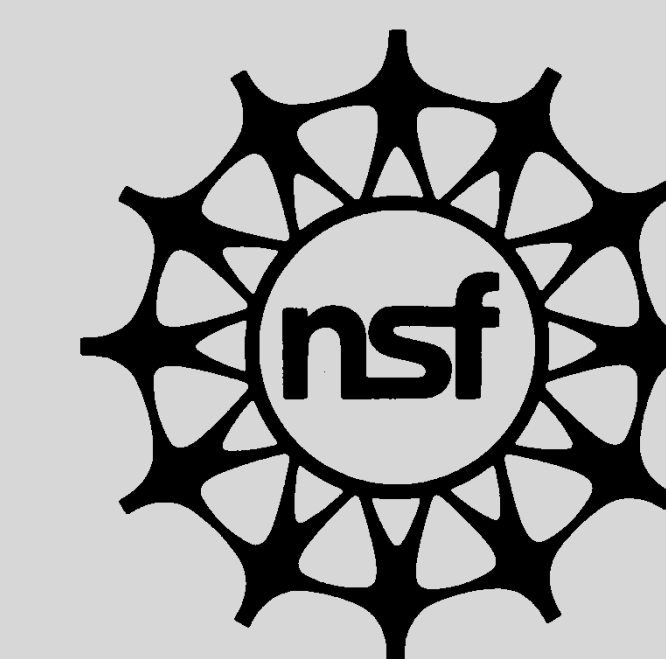


# Developing Acid/Base Lab Activities Using Ward's DataHub

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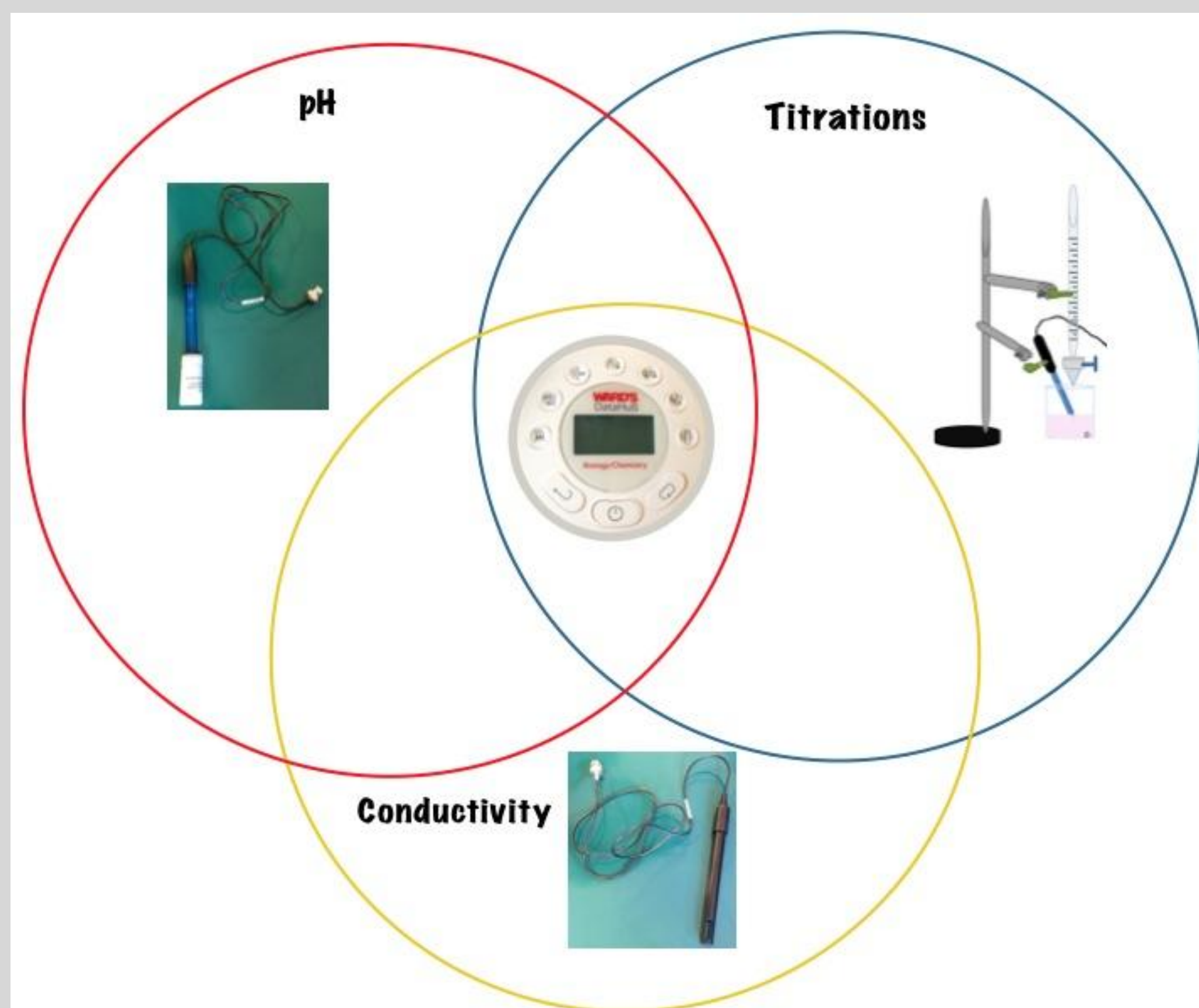


## Purpose

The curriculum development project for laboratory activities focused on the topic of acids and bases, pH, and conductivity.

The purpose of these activities is two fold. First, to relate concepts learned in the lab to “real life” situations, and to clarify topics related to NYS Regents curriculum.

**Figure 1. Venn diagram demonstrating the multiuse of the Ward's Datahub with new labs created for pH, titration and conductivity experiments**



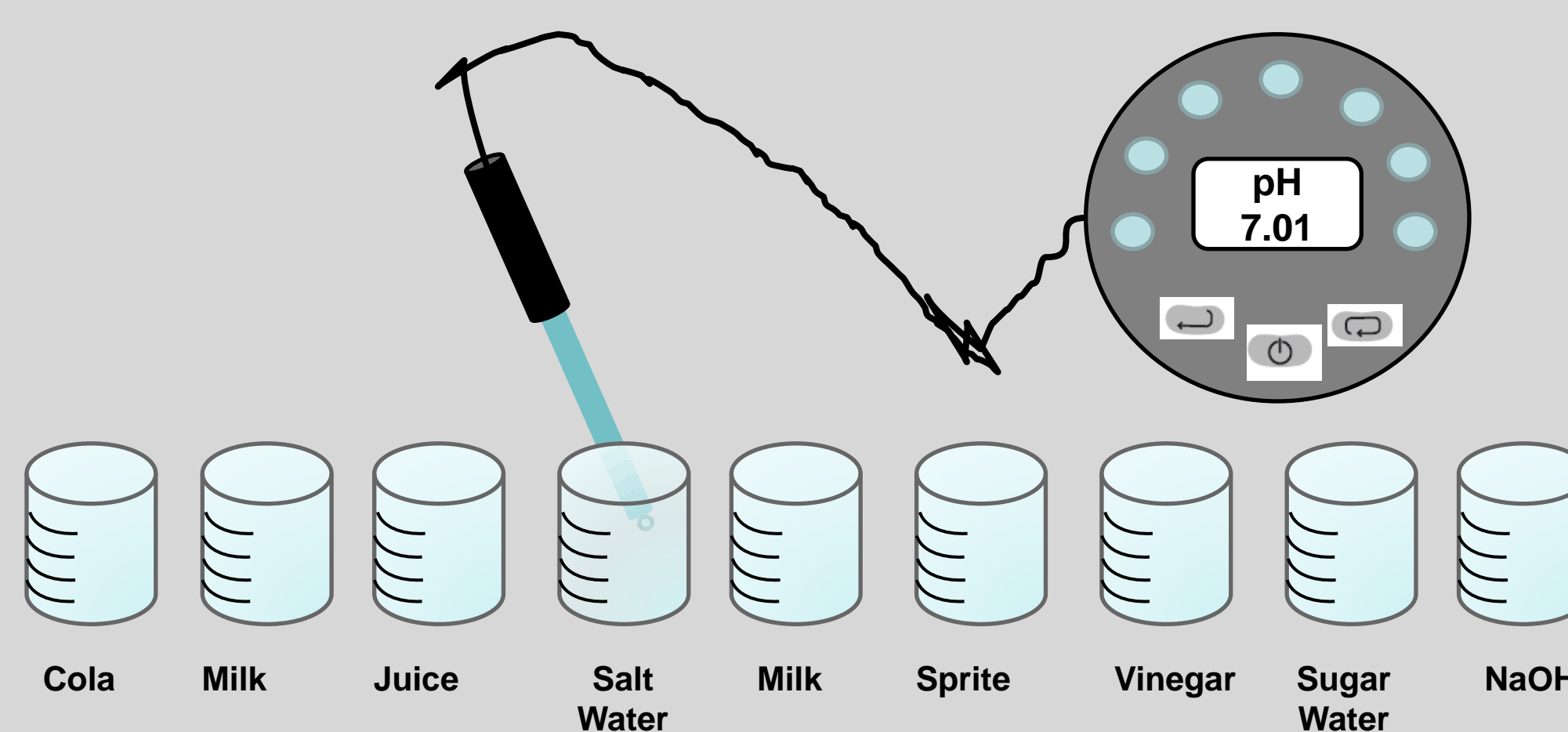
## Developed Experiments

**1. Measuring the pH of Common Drinks** - Students explore the degree of acidity present in several common substances. Analysis of data allows students to correlate H<sup>+</sup> concentration of the pH of a given sample.

**2. Conductivity** – After completion of the pH lab, conductivity of solutions will be correlated to ion concentration, allowing students to analyze data graphically

## pH and Conductivity of Common Solutions

Several common solutions were chosen to measure their respective pH and their conductivity. The intent is to allow students to become familiarized with the DataHub, and to make inferences on the solution's pH and corresponding conductivity.

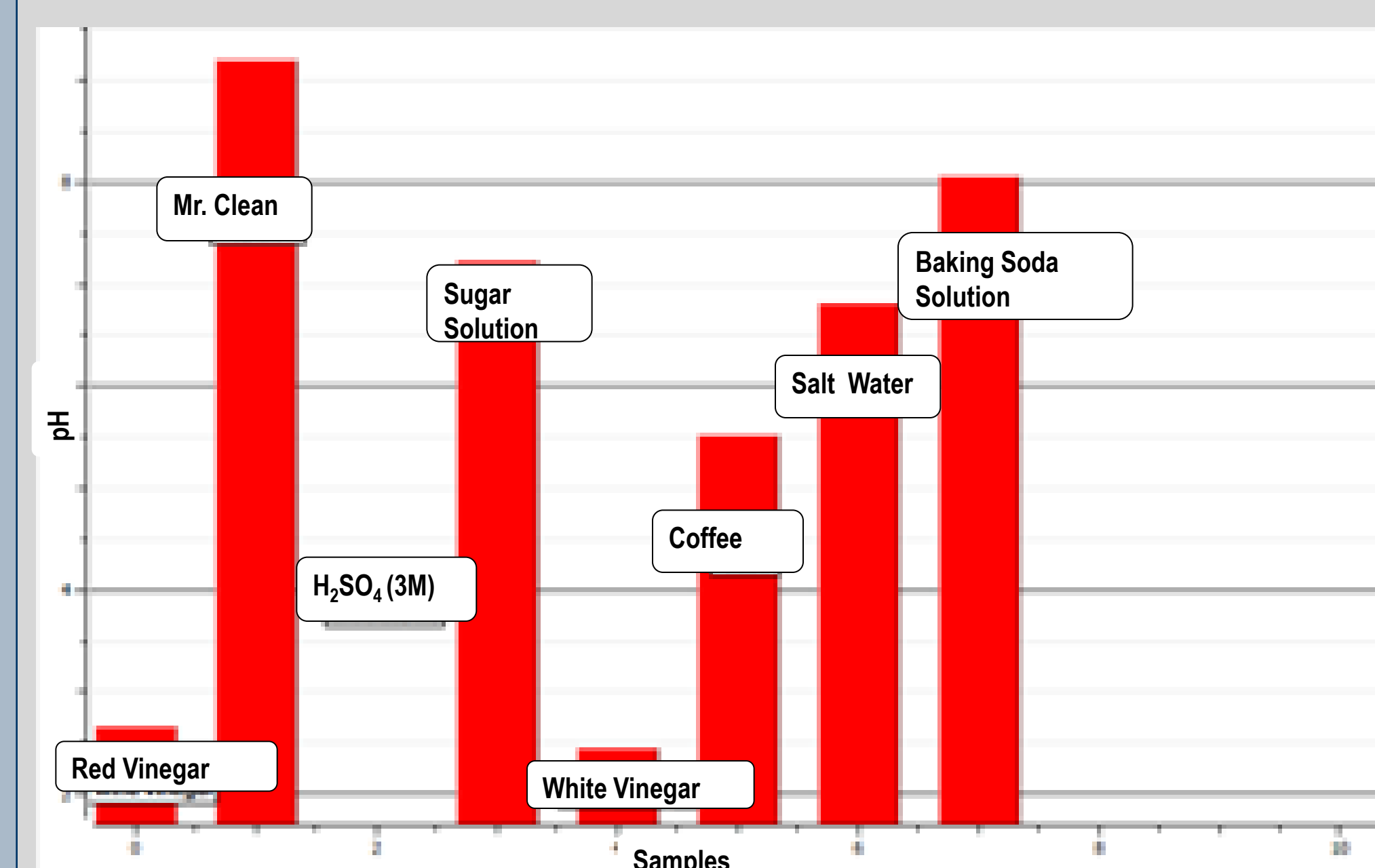


**Figure 2. Laboratory setup for measuring pH and conductivity of common solutions**



**Image 1. Perka Kresic performing pH and conductivity measurements using DataHub**

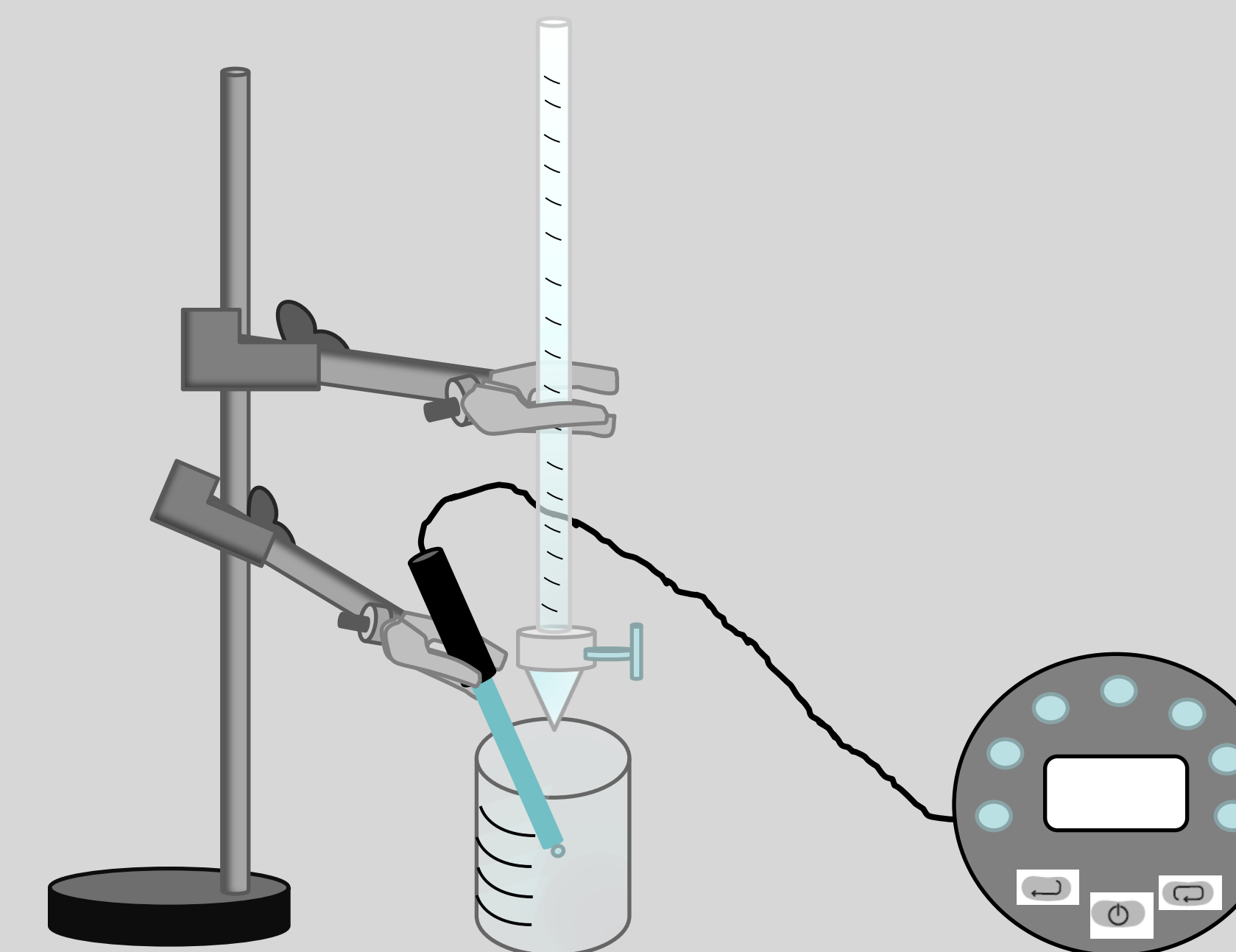
## Results From Measuring pH of Common Solutions



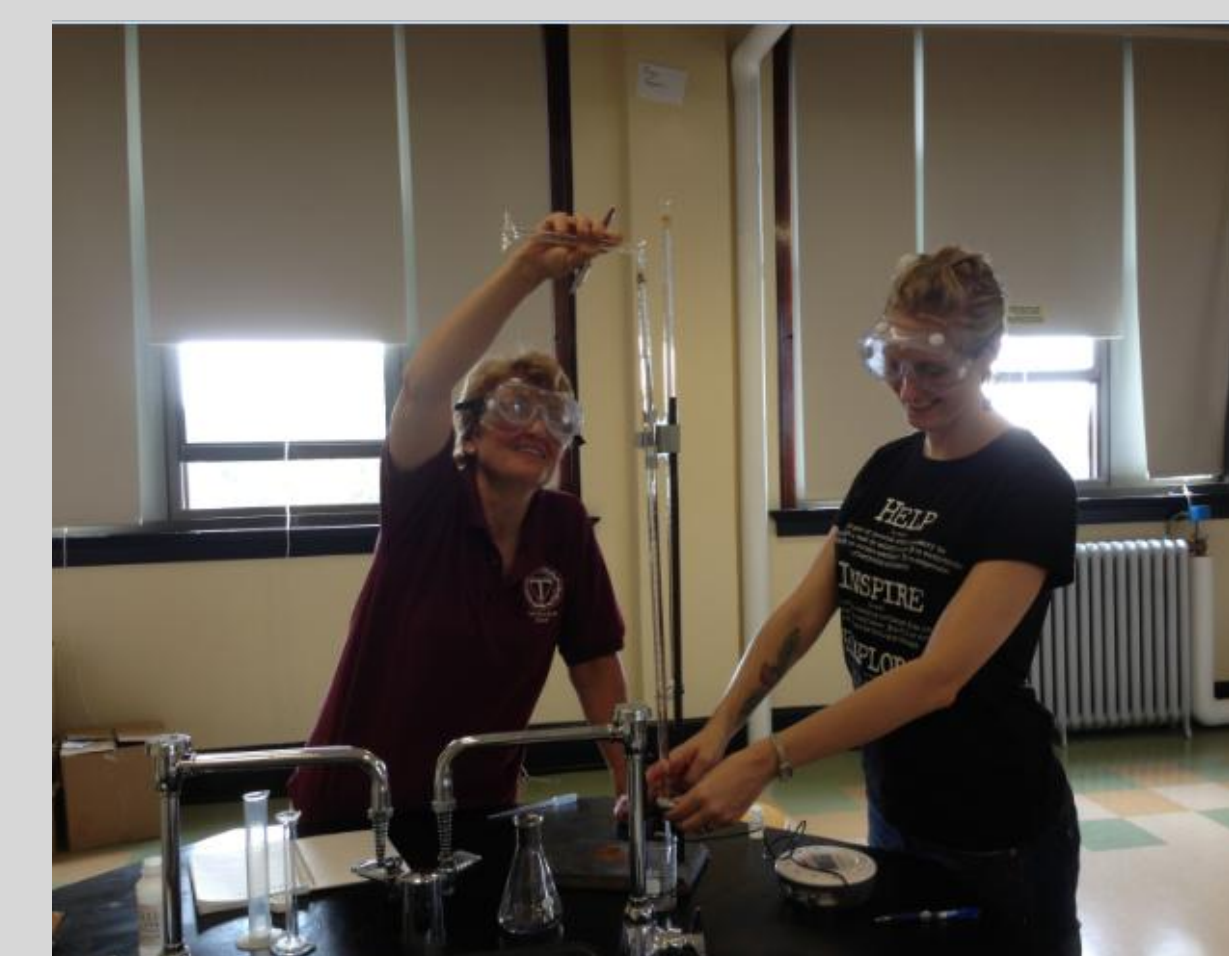
**Graph 1. Measured pH for each common solution**

## pH and Conductivity Titrations Experiments

Once students are familiarized with the DataHub, they will then perform a more advanced experiment, titration of acid and bases. Using the Datahub, students will have the ability to visualize in real time, the effects a base has on an acid as it is being added. Students will be able to easily determine the concentration of H<sup>+</sup> ion in solution as they are performing the experiment.

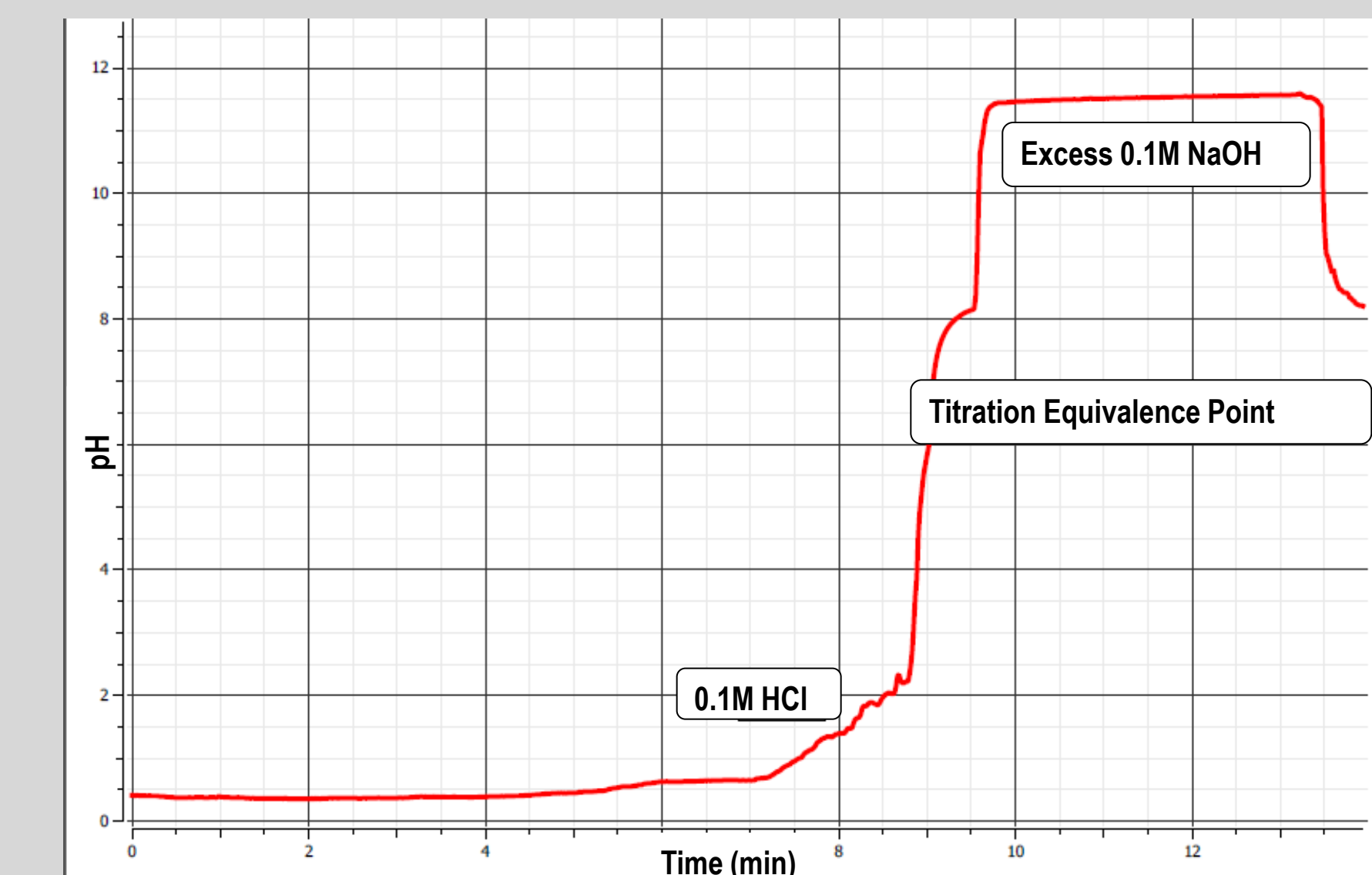


**Figure 3. Laboratory setup for measuring pH and conductivity during titration experiment**

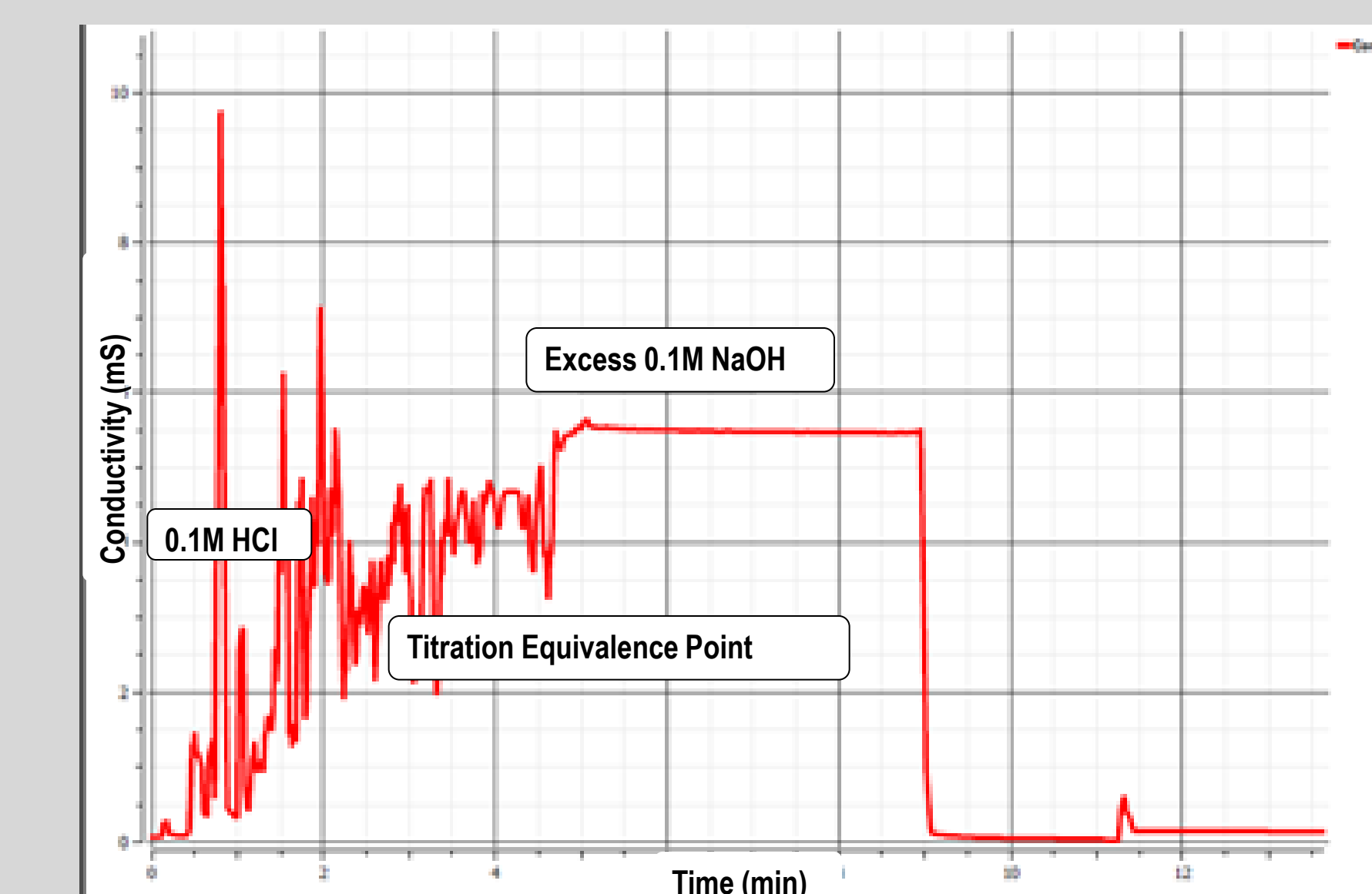


**Image 2. Karen Beck and Heather Rudolph performing titration experiments**

## pH and Conductivity Titration Experiment Results



**Graph 2. pH measurements during titration experiment**



**Graph 3. Conductivity measurements during titration experiment**

## Objectives

- Synthesize information collected from lab experiments into a coherent understanding of a process
- To compare the pH of common beverages, formulate a hypothesis and analyze by employing the Ward's DataHub pH sensor
- To use a standardized acid solution to determine the concentration of a base using standard titration method
- Correlate conductivity to ion concentration in a solution
- To increase Regents examine scores by 10% on acid/base content questions

## Conclusions

With these new labs, students will fully understand acid/ base properties. This will enable them to apply their new knowledge to Regents exams. Labs are specifically designed to strengthen concepts that they are responsible to understand on the exam. At the end of the 2014 exam, we plan to compare students' exam scores to previous exam scores on acid and base material. If needed, additional changes can be made to both course and lab curriculum if there is not at least a 10% increase in scores.

## Acknowledgements

We would like to thank the ISEP program for funding the summer research to improve this topic within the classroom. We would also like to thank Ward's Science for allowing us to use the DataHubs this summer for the development of these new labs. We would also like to thank Heather Rudolph for assistance in the development of the new labs and with the assistance of using the Ward's DataHub, and Angelina Montes for assistance in poster design.