## Background

- Everyone has been hit hard by the effects of COVID-19
- Practical labs have been hit hardest
- An established bank of course materials is vital
- Home labs should not lose any content and should be just as educationally sound

## Experimental

- How can the current required introductory Chemistry experiments be done safely at home
- Find alternatives to experiments requiring safety precautions
- Are the labs feasible
- What kind of lab kit is the best suited for these labs
- Make kits as minimal as possible
- What if the students are confused
- Teacher Accessible on Zoom during scheduled lab session

## Results

- Four labs were re-written as home experiments including:
  - 2 acid/base experiments
  - 1 electrochemistry experiment
  - 1 crystal lattice structure experiment
- Future goals include translating a larger catalogue of practical labs into home-based labs appropriate for the college level

## References


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### The Labs

#### Crystal Structures - Unit Cells

- Teaches students to grow their own crystals in just a few days and identify their lattice structure by comparing them to 3D printed model

<table>
<thead>
<tr>
<th>Lab Kit Contents</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
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<tbody>
<tr>
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<td><img src="image2.png" alt="Image" /></td>
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#### Electrochemistry - Making A Voltaic Cell

- Teaches students to make a battery using produce, measure the actual voltage output of their battery with a multimeter, and compare to calculated values

<table>
<thead>
<tr>
<th>Student Provided Items</th>
<th>Lab Kit Contents</th>
<th>Measure Voltage with Multimeter</th>
<th>Lighting LED with the Battery</th>
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<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
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#### Acids and Bases - The Strength of Some Common Acids and Bases

- Teaches student to see acids and bases all around them by testing food and household items for pH levels.

<table>
<thead>
<tr>
<th>Student Provided Items</th>
<th>Lab Kit Contents</th>
<th>Red Cabbage Indicator</th>
<th>Red Cabbage Test</th>
<th>pH Test</th>
<th>pH Test</th>
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<tbody>
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<td><img src="image10.png" alt="Image" /></td>
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#### Acids and Bases - Determining Ka of a Weak Acid

- Teaches student a basic acid/base titration experiment

<table>
<thead>
<tr>
<th>At the Beginning of Experiment</th>
<th>Final Check</th>
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