Teaching Aids to Support Online Chemistry Courses

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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

1. Christiansen, M. A., and Weber, J. M. (2017). Teaching and the Internet the application of web apps, networking, and online tech for chemistry education. American Chemical Society.
2. Gupta, T., and Hartwell, S.K. (2017). Enhancing retention in introductory chemistry courses: teaching practices and assessments. American Chemical Society.
3. Hidayah, F., Imaduddin, M., Praptaningrum, D., Ristanti, D. (2020). Cogenerative Dialogue of Cross-Generation Educators to Improve Chemistry Teaching Quality through Technology. Journal for the Education of Gifted Young Scientists, 9, 465-487.
4. Jeschofnig, L., and Jeschofnig, P. (2011). Teaching Lab Science Courses Online: Resources for Best Practices, Tools, and Technology. Jossey-Bass.
5. Kennepohl, D. K. (2016). Teaching Science Online: Practical Guidance for Effective Instruction and Lab Work. Vol. First Edition. Stylus Publishing.
6. Masciangioli, T. M. (2011). Chemistry in Primetime and Online: Communicating Chemistry in Informal Environments: Workshop Summary. National Academies Press.
7. Mendez, J. (2017, April 4). Using Traditional and 3D Printed Physical Models in an Online Introductory Chemistry Course. Symposium conducted at the meeting of the American Chemical Society, San Francisco, CA.
8. Tüysüz, Cengiz. (2010). The Effect of the Virtual Laboratory on Students' Achievement and Attitude in Chemistry. International Online Journal of Educational Sciences. 2, 37-53.

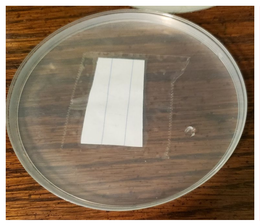
The Labs

Crystal Structures - Unit Cells

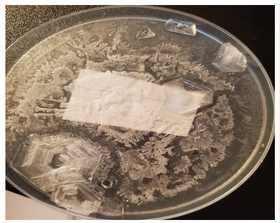
Teaches students to grow their own crystals in just a few days and identify their lattice structure by comparing them to 3D printed model

Lab Kit Contents

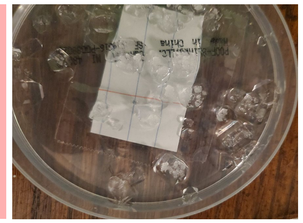
DAY 1



DAY 2



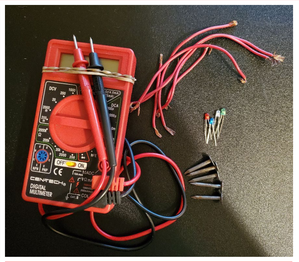
DAY 3



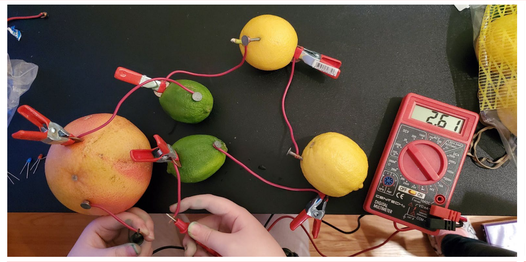
Electrochemistry- Making A Voltaic Cell

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

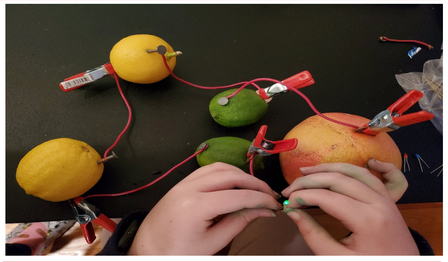
Student Provided Items



Lab Kit Contents



Measure Voltage with Multimeter



Lighting LED with the Battey

Acids and Bases - The Strength of Some Common Acids and Bases

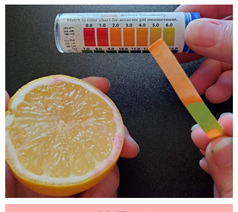
Teaches student to see acids and bases all around them by testing food and household items for pH levels.

Student Provided Items

Lab Kit Contents

Red Cabbage Indicator

Red Cabbage Test



pH Test

pH Test

Acids and Bases - Determining Ka of a Weak Acid

Teaches student a basic acid/ base titration experiment

Student Provided Items

Lab Kit Contents

At the Beginning of Experiment

Final Check

CALCULATIONS

SCAN ME

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