Make Your Own Tiny Battery

Concepts:

Half-cell reaction, voltaic vs. electrolytic cell, oxidation-reduction reaction standard-reduction potential

Use the following recommendations to increase and/or decrease the challenge difficulty for your students.

Short-on-time Inquiry Lab:

Students assemble their very own handheld, tiny battery in this lab. Batteries have tremendous impacts in our everyday lives. Students delve into voltaic and electrolytic cells—how are these types of cells related to batteries? A few simple materials are provided in order to successfully complete the lab and the procedure guides students to ensure success.

Guided Inquiry Lab:

Students assemble two cells in the guided version of this lab and identify each as a voltaic or electrolytic cell. Students make connections between their experimental batteries and how batteries have tremendous impacts in our everyday lives. A few simple materials are provided in order to successfully complete the lab and the procedure guides the students to ensure success.

Open Inquiry Lab:

With limited direction students build a handheld battery from a few simple materials. Successful completion of the battery results in a lit LED fueled by a thermodynamically favored reaction. Batteries have tremendous impacts on our everyday lives. A few simple materials are provided in order to successfully complete the lab.

Advanced Inquiry Lab:

Students expand their knowledge of electrochemistry with this writing with electricity lab. Electricity is the flow of electrons. Students use electrolysis to write messages with either iodine or phenolphthalein and explore the reactions occurring at the anode and cathode when an aqueous solution of potassium iodide is electrolyzed.

Outcomes:

Students build a handheld voltaic cell in this lab and make connections to thermodynamically favored reactions. They expand on their knowledge of these reactions by exploring the voltaic cell's various parts such as the cathode, anode, and salt bridge. Students carry out an investigation to build a handheld battery from a few simple materials while gaining a wealth of knowledge about batteries in our everyday lives. Students also apply their knowledge to electrolytic cells and make comparisons with the voltaic cell built in their experiment.

Associated Phenomena:

Batteries

Standards

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing explanations and designing solutions Using mathematics and computational thinking	HS-PS2.A: Forces and Motion HS-PS2.B: Types of Interactions HS-PS3.A, PS3.D: Definitions of Energy, Energy in Chemical Processes and Everyday Life	Structure and function

Performance Expectations

HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

HS-PS1-2: Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS1-7: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.