Batteries and Energy Storage Workbook

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Regional Math and Science Center

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Batteries and Energy Storage

Shining New Ways of Sustainable Power

Introduction

Warm-up questions-

- What do you think of when you hear the word batteries? What are some things you use daily that require them?

- What do you think batteries are made of?

- How do you dispose of batteries at your home?

Introduction-

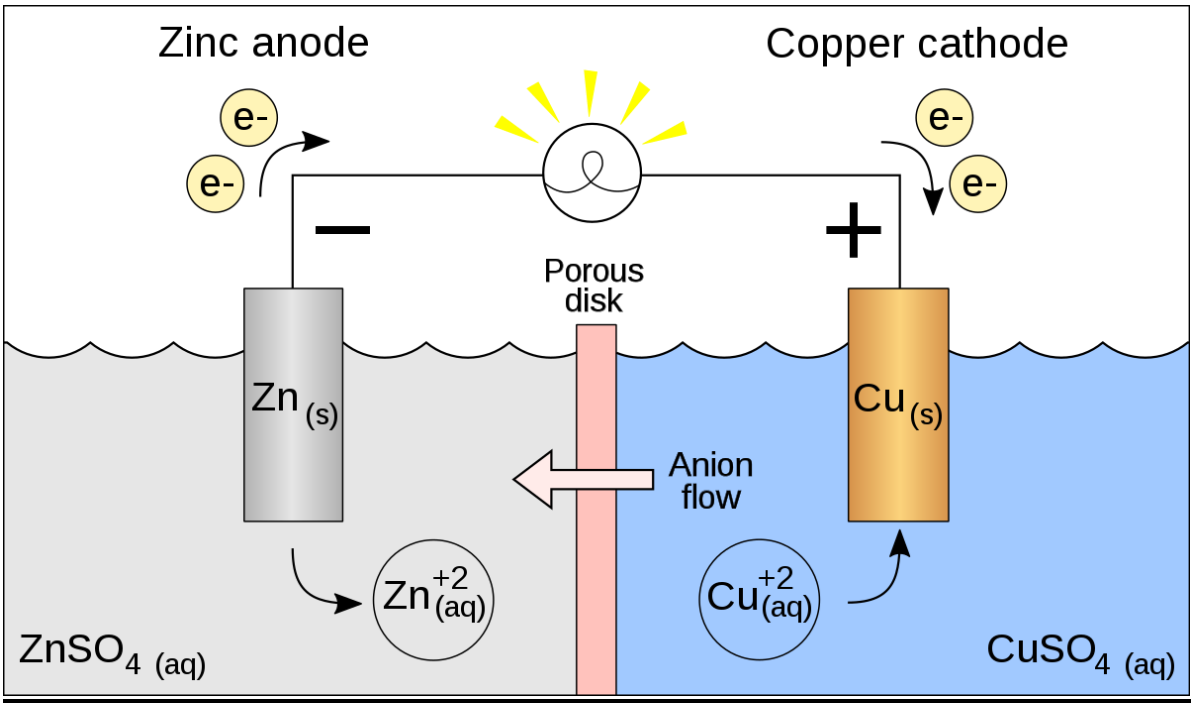
Key terms:

***Anode*:** negatively charged electrode
***Cathode*:** positively charged electrode
***Oxidation*:** loss of electrons
***Reduction*:** gain of electrons

Over the years batteries have become an essential part of our lives as technology progressed. We use them in our phones, computers, remotes, and even the fire alarms. But do you know how batteries are able to store so much charge to allow all of these devices to run for a long period of time? Batteries store electrical energy in the form of chemicals.

As shown in the picture below, batteries are composed of two electrodes (for example, a zinc anode and a copper cathode in the figure below) that are submerged in

an electrolyte salt solution or a paste. The electrical current produced by the battery is caused by the transfer of electrons from one electrode to the other through the wire or circuit. In the example below, the metallic zinc electrode is oxidized to zinc ions in the electrolyte solution when it loses its electrons, which are transferred through the wire to the copper electrode. The copper ions in the electrolyte solution then gain these electrons and are reduced to metallic copper on the electrode.



Activity

Materials (make sure you have what you need and separate materials)-

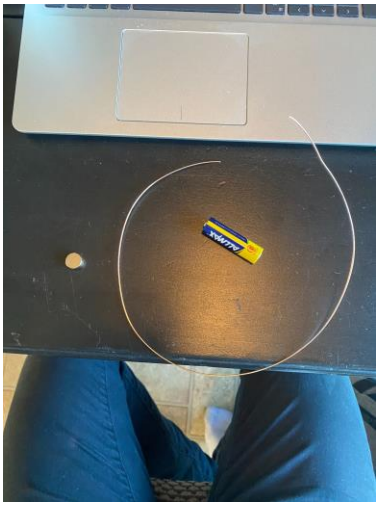
Here is a checklist of overall materials. It's recommended that you look for each material and split it into one of two groups designated by the number on top of it. Group 1 goes with group one materials and Group 2 goes with group two materials.

Group 1 materials (potato clock)-

- 1 potato clock set
- 2 potatoes

Group 2 materials (Battery Motor)-

- 2 magnets
- 1 double AA battery
- ½ ft / 6 inches of copper wire
- Ruler
- scissor

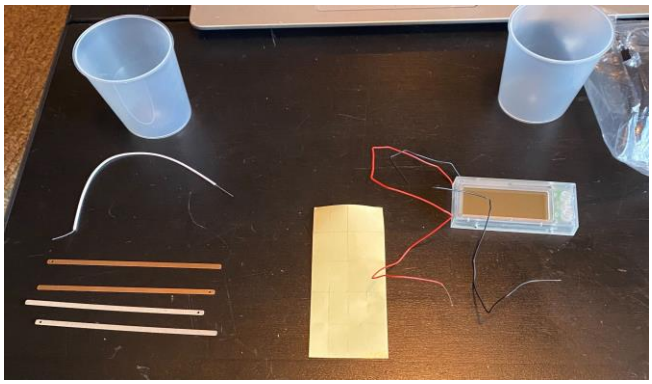


Once materials are split and everything is checked to be there, then it's time to begin activities.

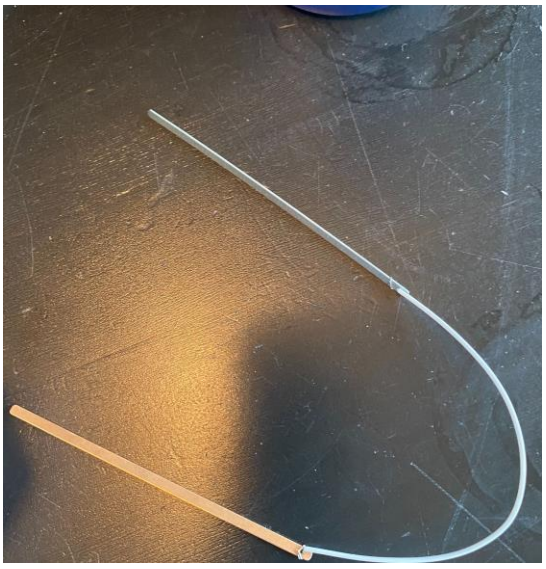
Activities (step by step on what to do)-

First activity, Potato Clock- (Group 1 materials)

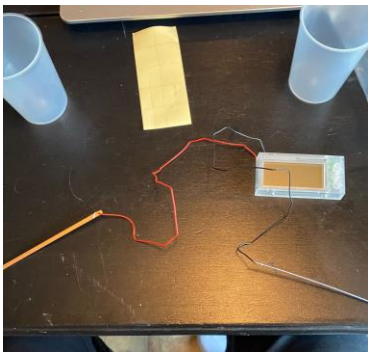
1. First open up the potato clock set and make sure you have two brown(copper) plates, two silver(zinc plates), a coated wire and a clock with a black and red wire connected to it. (pic under here)



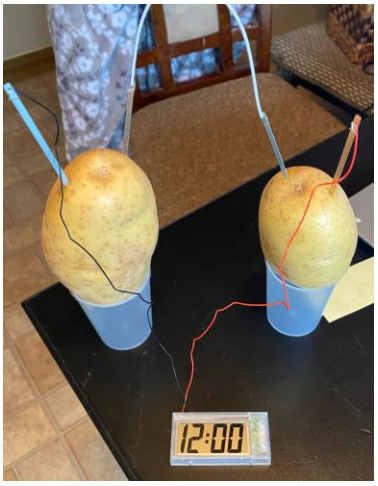
2. Begin activity by threading one side of the loose wire through the hole of one of the brown plates then wrap and spin it tightly to where it holds to the plate
3. Then on the other side do the same thing with one of the silver plates



4. Next we will do the same thing with the wires coming out of the clock. Here it's very important that we keep the red wire(positive wire) weaved with the brown(copper) plate and the black wire(negative wire) weaved through the silver(zinc) plate.



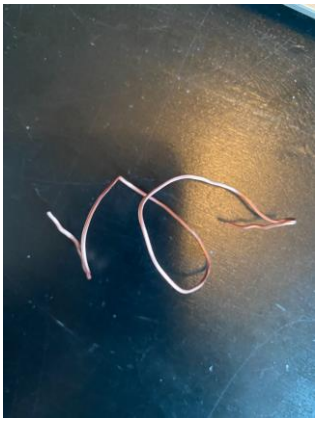
5. After all plates are connected to wires, stick one of each color into each potato so there should be a brown and silver plate in each. NOTE:MAKE SURE THE PLATES DO NOT TOUCH EACH OTHER.
6. Then after a few seconds the clock should be functioning and you have in fact made a potato battery strong enough to power a clock.



Second Activity, Battery Motor- (Group Two Materials)

1. First make sure you have all the materials in group two accounted for and in front of you.
2. Connect all 2 batteries together and make a stack
3. Then connect the stack of magnets to the flat(negative) side of the battery

4. Using a ruler measure out 9-10 inches of copper wire and cut it.
5. Now we need to be a little precise on how to make our copper wire so here a video to better show how to bend it- https://youtu.be/Y3-WmuOH-M0
6. Then once copper wire is bent correctly you will put the indented part on the top of the battery where there are no magnets and the bottom hole around the magnets.
7. This should cause the copper wire to start spinning and you have started a current from the battery strong enough to rotate the wire!
8. Here what the copper wire should look like-



Discussion Questions

1. Which activity did you prefer better? Why?

2. What is one thing you learned from this that you did not know prior?

3. What else do you think the potato clock battery could power?

4. In your words describe the battery mechanism:

5. If we didn't buy batteries in packages at a store, are they something that we would ever make on our own in our own homes?

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