

## West Side Science Club – Event #22– “Battery Exploration”

### Original Presentation

Date: 1 February 2014  
Time: 10 am to 12 pm  
Site: West Side Science Club

### Big Questions

- These questions are meant to frame the day’s event and might be written on the chalkboard
  - (1) What is a battery? How do they work?
  - (2) Are all types of batteries the same?

### Concepts

- Concepts to cover from the “Work of CCI Solar” Mind Map: Reactions- oxidation/reduction, acid/base, yield, rate, starting materials, products; Social Aspects- climate change, greenhouse gases, global energy demand, fossil fuels, renewable vs nonrenewable energy; Energy- forms, storage, conversions.

### Lesson Plan

#### *Student Objectives*

- Understand that not all batteries are created equally
- Be able to broadly define what constitutes a battery and how that are used
- Be introduced to renewable energy batteries

#### *Schedule/Agenda*

- Review: Event #21– “H<sub>2</sub> Generation ” (10 min.)
- Activity: Comparison of different types of energy sources: (1 hr)
  - Lemon Batteries
  - Standard batteries
  - Fuel cells
  - Solar cells
- Activity: Check out vintage car and its battery (40 min.)
- Wrap-up (10 min.)

## Materials

### Activity: Battery comparisons

- Alkaline batteries
- Copper and zinc strips
- Lemons
- Alligator clips
- Multimeters
- Tiny devices to power batteries
- Fuel cells
- Solar cells

### Activity: Car batteries

- A vintage car
- A modern car

## Safety

- Though there are no serious risks involved in these experiments, safety glasses and gloves should be worn to promote good safety habits

## Review of Previous Event: H<sub>2</sub> Generation

- Recall the activities: H<sub>2</sub> generation with Aluminum and Gallium; fuel cell electrolysis

## Facilitation Questions

- What types of reactions were able to generate hydrogen?
- Why would we want to use hydrogen as a fuel?
- Do you think that hydrogen is a good fuel? How does it compare to other fuel sources we already use?

## Activity: Comparison of different types of energy sources

### Procedure

1. Using multimeters, test the amount of voltage and current that can come from the following sources
  - Lemon Batteries
    - Puncture a lemon at two points and insert a zinc electrode in one hole and a copper electrode in the other

- Then attach one end of an alligator clip to one electrode and the other end to the multimeter. Do the same with the opposite electrode
  - Standard batteries
    - Attach the leads of the multimeter to each end of the battery
  - Fuel cells
    - Attach an alligator clips to each output lead of the fuel cell and the other end of the clips to the multimeter
  - Solar cells
    - Attach an alligator clips to each output lead of the solar cell and the other end of the clips to the multimeter
2. Multiply the current and voltage together to obtain the power output of each source
  3. Next, based on power output results, try and power a variety of small devices such as LEDs, tiny motors and fans.

### Facilitation/Concept Questions

- Which battery source do you expect to have the most power?
- Were your expectations correct?
- What changes do you think you could make to each battery source to make them output more power?
- What are the pros and cons of each power source?

### Activity: Car Batteries

#### Procedure

1. Have students visually inspect the outside of a vintage car and make some predictions about how it works
2. Lift the hood and have the students now explore what the motor is like in an older car and how it runs
3. Next inspect the outside and under the hood of a modern car
4. Take note of the differences between the two cars and why certain changes have likely been made over time

### Facilitation Questions and Concepts

- How are older cars powered? Newer cars?
- How can you integrate a battery into a car? Why has that improvement been made?
- How might a fuel cell be incorporated into a car?

### Preparation for future week

- Unveiling of the toy fuel cell car for the building competition in the next few weeks