

West Side Science Club – Event #1– “ Electrolysis of Water”

Original Presentation

Date: 10 November 2012
Time: 10 am to 12 pm
Site: West Side Science Club

Concepts

- Concepts to cover from the “Work of CCI Solar” Mind Map: reactions (reduction-oxidation), sustainability (renewable energy), storage (fuels)

Lesson Plan

Student Objectives

- Everyone get to know each other
- Build trust and respect for mentors
- Learn about water splitting

Schedule/Agenda

- Introductions (10 min.)
- Icebreaker Activity: egg drop (25 min.)
- Initial Evaluations (15 min)
- Activity: Water splitting kit (45 min.)
- Demo: H₂ generation from Al and Na (20 min.)
- Wrap-up (5 min.)

Materials

Icebreaker

- Egg
- 2 styrofoam cups
- coffee filter
- cotton balls
- straws
- scotch tape
- papers with animal pictures on them (several of each)

Activity: Water-splitting kit

- beaker
- sodium sulfate
- 6V battery pack

- alligator clips
- 2 falcon tubes with Ni wire through each, epoxied at the exit point in the top
- matches

Activity: H₂ generation from Al and Na

- aluminum foil
- NaOH
- Balloons
- Erlenmeyer with gas adapter

Safety

- Goggles and gloves for water-splitting and H₂ demo
- Heat-proof gloves for the person holding the flask in the H₂ demo

Facilitation Questions

- What possible hazards do you see with these experiments?
- What parts of you should be protected? How?

Icebreaker:

Procedure

1. Everyone teams up with the group that has the matching animal taped to their back
2. As a team they must decide how to make a device that will protect an egg when being dropped off of the balcony, using only the materials provided

Facilitation Questions and Advice to Mentors

- What properties do your materials have?
- How can you use some of those properties to your advantage to protect the egg?

Water-splitting Activity:

Procedure

1. Add a few scoops of Sodium sulfate to a beaker of water.
2. Fill the falcon tubes with the solution and submerge in the beaker (so no air is inside)
3. Connect the wire on each falcon tube to the two leads of the battery with an alligator clip
4. Watch as the water is displaced inside the tubes with bubbling gas. One tube will have twice as much gas as the other. This is the hydrogen tube. The other contains oxygen.
5. Once mostly full (about 10 min) light a match and hold next to the tubes near the surface of the water. Lift up the tubes quickly to release the gas and ignite it. You will hear a “pop!” of the hydrogen and oxygen burning.

Facilitation/Concept Questions

- What is the molecular formula of water? How does that relate to the amounts of gases in the tubes?
- Why does lighting a match near the hydrogen and oxygen produce a sound?

H₂ Generation Demo:

Procedure

1. Add NaOH solution to a flask containing some aluminum flakes or foil
2. Immediately attach a balloon to the mouth of the flask to collect all of the gas generated
3. When filled, tie off the balloon and set aside, fill more if enough gas is generated.
4. Light a match at the end of a stick. Extend the stick to light the balloon, far from people as it will explode

Facilitation Questions and Concepts

- What is reacting in the flask to make the bubbles? What are the bubbles?
- Why did the balloon ignite like that?
- What similarities did you see between the demo and your activity?

Check for Understanding

- What was the purpose of these two activities? How do the experiments relate to what the scientists at Caltech are studying?

Wrap Up: Event #2 Preparation

- Reminder of field trip to Caltech

References

- (1) : "Water-splitting, H₂ from H₂O "
<http://www.H2fromH2O.org>