

## West Side Science Club – Event #5– “Glow Sticks”

### Original Presentation

Date: 5 January 2013  
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) Why does red light have less energy than blue light if red light has larger wavelengths than blue light?
  - (2) Why is it important to wear your safety glasses during experiments?

### Concepts

- Concepts to cover from the “Work of CCI Solar” Mind Map: light- wavelength, frequency, parts of spectrum, energy, emission, Reactions- electrons, photochemistry, color change, starting materials, products; Energy- conversions, light

### Lesson Plan

#### *Student Objectives*

- Understand relationship of energy and wavelength for light
- Recognize the importance of safety in the lab
- Perform and observe a chemical reaction of phosphorescence

#### *Schedule/Agenda*

- Review: Event # 4– “Light II” (5 min.)
- Activity: Waves with jump ropes (30 min.)
- Activity: Safety glasses decorating (30 min.)
- Activity: Making glow sticks (45 min.)
- Wrap-up (10 min.)

## Materials

### Activity: Waves with jump ropes

- Jump rope

### Activity: Safety glasses decorating

- Goggles
- Tape
- Stickers
- Sharpies

### Activity: Making glow sticks

- TCNO
- Hydrogen peroxide
- Vials
- Colored dye
- Spatula
- "Thick liquid solvent"

## Safety

- Safety glasses and gloves must be worn during the glow stick experiment

## Review of Previous Event: Light II

- Recall the activities: diffraction grating, UV light, wavelengths and energy

## Facilitation Questions

- What do you remember about wavelengths of the colors of light?

## Activity: Waves with jump ropes:

### Procedure

1. Have a mentor hold one end of a jump rope and a student hold the other
2. Ask them to create big waves with the jump rope
3. Then ask them to create smaller waves
4. Which one to more energy to create?

## Facilitation Questions and Advice to Mentors

- The inverse relationship of big wavelength- small energy may be counter-intuitive. Try to have the students recognize the relationship on their own.

- Perhaps you can also throw in a discussion of frequency which is also related to wavelength and energy and could also be seen on the jump rope

### **Activity: Safety glasses decorating**

#### **Procedure**

1. Distribute a pair of safety glasses to each student
2. Allow them to decorate them with stickers and colored tape and markers

#### **Facilitation/Concept Questions**

- Why is it important to have comfortable safety glasses you will want to wear?

### **Activity: Making glow sticks**

#### **Procedure**

1. Pass out a vial of solvent to each student
2. Have the students pick the color dye they would like (blue or green)
3. Dissolve the dye into a vial of solvent
4. Then, add a scoop of the white TCNO powder
5. Finally, add hydrogen peroxide and watch it glow
6. When the glow starts to fade, add more TCNO to supply the energy for the reaction

#### **Facilitation Questions and Concepts**

- Why does the intensity of the glow fade after a while? How can you fix it?
- Which ingredient is glowing? Why?

### **Check for Understanding**

- Describe the relationship between wavelength and energy
- What conclusion can you make about the energies of the blue glow stick versus the green glow stick

### **References**

- (1) : <https://sites.google.com/site/nurdrage/chemistry-experiments/how-to-make--tcpo--bis-2-4-6-trichlorophenyl--oxalate>
- (2) <https://sites.google.com/site/nurdrage/chemistry-experiments/how-to-make-a-glow-stick-with-real-chemicals?pli=1>