

# Cold Light

## Student Worksheet

Name \_\_\_\_\_

**Overview** On a dark a stormy night, everybody loves them... glow sticks! But how do they work? Be prepared to find out!

**What to Learn** You should understand that glow sticks work on the principle of chemiluminescence. This means that light is emitted without heat as the result of a chemical reaction.

### Materials

- Glass jar
- Measuring cup
- Water
- Test tube
- Luminol  $\text{C}_8\text{H}_7\text{N}_3\text{O}_2$  ([MSDS](#))
- Sodium hydroxide  $\text{NaOH}$  ([MSDS](#))
- Stir rod
- Hydrogen peroxide  $\text{H}_2\text{O}_2$  ([MSDS](#))
- Potassium hexacyanoferrate III  $\text{K}_3\text{Fe}(\text{CN})_6$  ([MSDS](#))
- Measuring spoon

### Lab Time

1. In a measuring cup, add:
  - a. 2 test tubes full of water
  - b. 1 spoon tip of luminol ( $\text{C}_8\text{H}_7\text{N}_3\text{O}_2$ ). Cap chemical and put well out of reach.
  - c. Tiny bit (about 1 milliliter) sodium hydroxide ( $\text{NaOH}$ ). Cap chemical and put well out of reach. Stir with a stirring rod, then wipe stirring rod dry.
2. In a jar, add:
  - a. 2 test tubes full of water
  - b. 1 spoon tip Potassium hexacyanoferrate III ( $\text{K}_3\text{Fe}(\text{CN})_6$ ). Make sure to use a clean spoon and cap chemical when finished. Stir with a clean stirring rod.
3. Add the contents of the measuring cup to the jar and swirl to mix. Turn down the lights and observe!
4. To make the glow last longer, add 1 more spoon tip of Potassium hexacyanoferrate III ( $\text{K}_3\text{Fe}(\text{CN})_6$ ).

## Cold Light Data Table

Amount of Potassium hexacyanoferrate III $\text{K}_3\text{Fe}(\text{CN})_6$	How Long did Glow Last?
1 spoon tip	
2 spoon tips (total)	
3 spoon tips (total)	

**Exercises** Answer the questions below:

1. Did this reaction involve a chemical change or a physical change? How do you know?
2. What is chemiluminescence?
3. Fluorescent light is created by exciting electrons. Is this a form of chemiluminescence? Why or why not?

## Exercises

1. Did this reaction involve a chemical change or a physical change? How do you know? (Chemical change, because light was produced.)
2. What is chemiluminescence? (When light is produced in a chemical reaction, but not heat.)
3. Fluorescent light is created by exciting electrons. Is this a form of chemiluminescence? Why or why not? (No, because the light is not caused by a chemical reaction.)

**Closure** Before moving on, ask your students if they have any recommendations or unanswered questions that they can work out on their own. Brainstorming extension ideas is a great way to add more science studies to your class time.