

**GEEK  
& CO.  
SCIENCE!**



PROJECT KIT **Ages  
8+**

# GLOW STICK LAB



## Warning.

Not suitable for children under 8 years. For use under adult supervision. Contains some chemicals which present a hazard to health. Read the instructions before use, follow them and keep them for reference. Do not allow chemicals to come into contact with any part of the body, particularly the mouth and eyes. Keep small children and animals away from experiments. Keep the experimental set out of reach of children under 8 years old. Eye protection for supervising adults is not included.

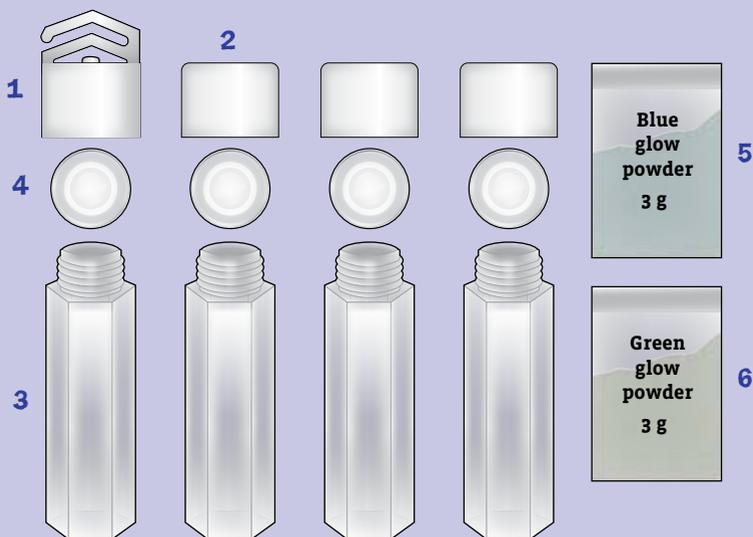
**WARNING** — This set contains chemicals and/or parts that may be harmful if misused. Read cautions on individual containers and in manual carefully. Not to be used by children except under adult supervision.

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- 2 | Cap without led (3)
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- 5 | Blue glow powder (Strontium aluminate, 3 grams)
- 6 | Green glow powder (Strontium aluminate, 3 grams)

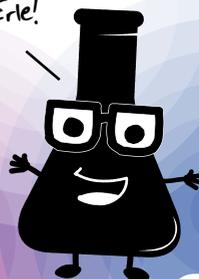
**YOU WILL ALSO NEED:** *Water, dark room (or nighttime), light-colored vegetable oil, clear or light-colored dish soap or detergent, filter paper or coffee filter, turmeric powder, rubbing alcohol (denatured alcohol), tablespoon, measuring cup, jar, liquid laundry detergent (e.g., Tide®, Gain®, or All®), tonic water (or bitter lemon drink), small Phillips head (cross-head) screwdriver*

**TO REPLACE THE BATTERIES:** *3 button cell batteries (1.5 volt, 7.9 mm wide by 3.6 mm high; common names: LR41, SR41, 192, 384, 392, AG3, SG3, G3-A)*

## Hey Glow Geeks!

Want to make some awesome glow sticks that shine in cool colors under UV lights and that glow in the dark? With this kit, you can make five different glowing concoctions using the included materials and materials from around your house. Then, learn why they glow! Erle the Geeker will be your guide!

Hi! I'm Erle!



# PART 2

# FLUORESCENT GLOW STICKS

## Neon glow from the spice drawer

### You will need:

UV LED cap with hook, cap without led, hexagonal bottle, clear stopper, filter paper or coffee filter, turmeric powder, rubbing alcohol (denatured alcohol), tablespoon, measuring cup, jar, water, dark room

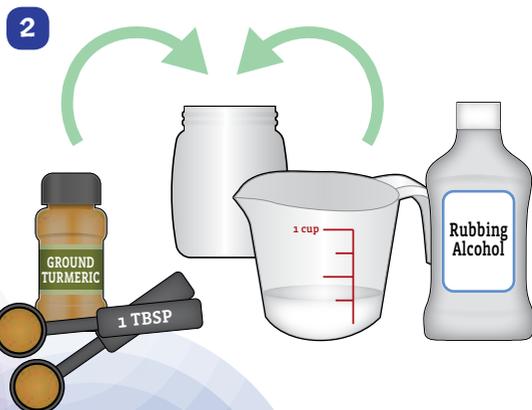
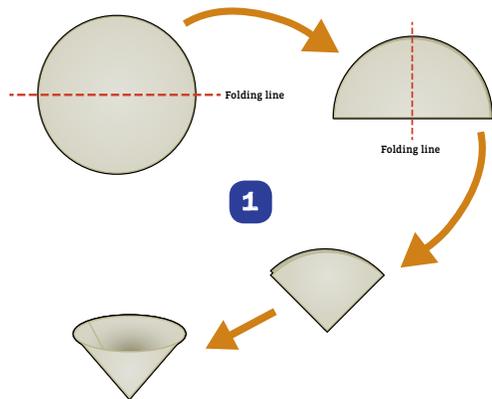
### Here's how:

- 1 Make a cone out of filter paper (such as a coffee filter) as shown here.



- 2 Mix 2 tablespoons of turmeric powder and 1/4 cup of rubbing alcohol in a glass jar.

- 3 Pour the mixture through the filter into a clean hexagonal bottle.



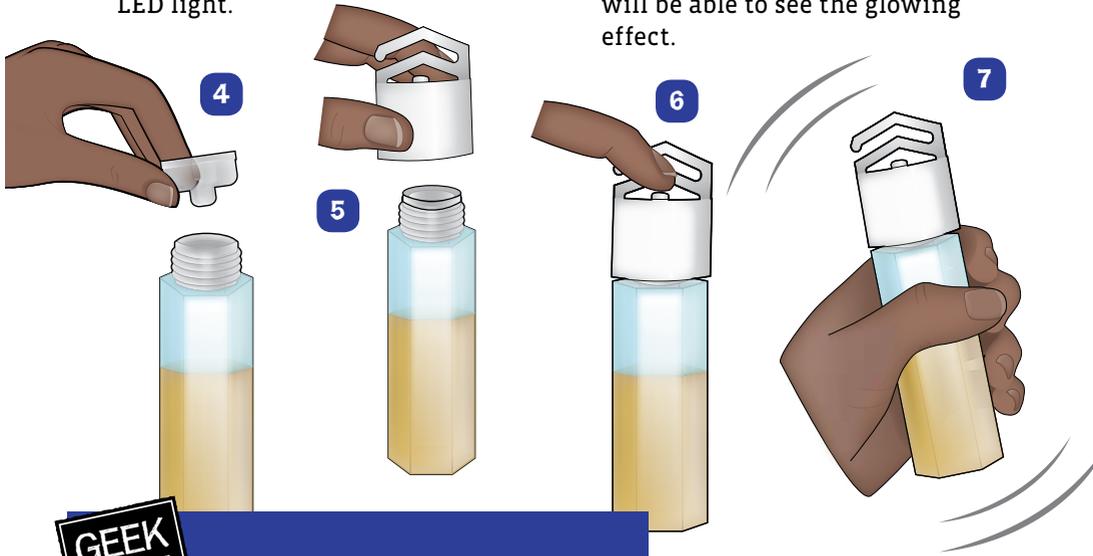
4 Insert the clear stopper and press it tightly into the bottle's opening.

5 Screw on the LED cap tightly and your glow stick is ready!

6 Press the button to turn on the LED light.

7 Shake up the glow stick when the powder starts to settle.

8 Take the glow stick into a dark room and you will see the turmeric powder glow as long as the LED is shining on it! The darker the room, the better you will be able to see the glowing effect.



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OUT!**

## WHAT'S HAPPENING?

**Turmeric** is a spice that comes from the root of a plant in the ginger family. It is used a lot in Indian cuisine. Turmeric contains a UV-fluorescent substance called **curcumin** that glows a bright chartreuse color in ultraviolet light, or UV for short. The LED in your glow stick emits UV light, which has a shorter wavelength and higher energy than visible light. Materials that are **fluorescent** under UV light absorb the light and then immediately re-emit light. Usually the emitted light has a lower energy and a longer wavelength and is therefore visible. As long as the UV light shines, the curcumin fluoresces.

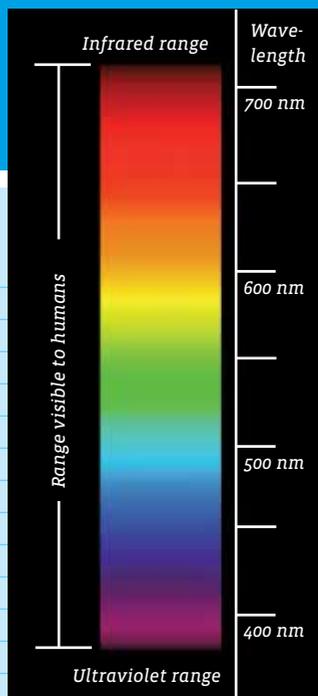




# THE LIGHT SPECTRUM

The sun emits invisible light in addition to visible light. In a rainbow, you see the colors that are visible to the naked eye. Each end of the rainbow is bordered by light that our eyes cannot see! There is an infrared range that borders red light as well as an ultraviolet range that borders violet light.

**Ultraviolet light** (or UV light for short) displays some astonishing properties. It has a higher energy and a shorter wavelength than visible light, which means it behaves differently than visible light in many ways. For example, it has a much stronger effect on photographic film (which is how it was discovered in the first place), it tans the skin, and it produces fluorescence, as you saw with the laundry detergent and tonic water. Strong ultraviolet light from the sun is very useful in nature. Unlike humans, many bird species, honeybees, and bumblebees can see UV light. That is why a lot of flowers (such as dandelions and orchids) have patterns that are only visible to humans under UV light, and that are invisible to the human eye normally.



**Luminescent light** is emitted without heat, and is also known as **cold light**. There are many types of luminescence. **Chemiluminescence** is light emitted by a chemical reaction, like glow sticks and glowing diatoms in the ocean.

A solid substance that lights up when exposed to energy, like light or electricity, is called a **phosphor**. A phosphor can be **phosphorescent**, which stays glowing after the energy source is removed, or **fluorescent**, which only glows while the energy is present and for a brief moment after. Conventional glow sticks and glow-in-the-dark stars are made of phosphor. In this kit, the strontium aluminate mixtures are phosphorescent and the other solutions are fluorescent.