

# Black Light Treasure Hunt

**Overview:** Ever notice how BRIGHT your white T-shirt looks in direct sun? That's because mom washed with fluorescent laundry soap (no kidding!). The soap manufacturers put in dyes that glow white under a UV light, which make your clothes appear whiter than they really are.

**What to Learn:** Light can be absorbed and retransmitted in a different color, depending on how the light strikes the object and the amount of energy the light initially has.

## Materials

- UV black fluorescent light
- dark evening inside your house

## Experiment

1. Turn off all the lights in your house and turn on your UV black light.
2. Find things that glow both inside and outside the house.
3. What fluoresces in your house? Here are some things to try: white paper (although paper made pre-1950 doesn't, which is how investigators tell the difference between originals and fakes), club soda or tonic water (it's the quinine that glows blue), body fluids (yes, blood, urine, and more are all fluorescent), Vitamins (Vitamin A, B, B-12 (crush and dissolve in vinegar first), thiamine, niacin, and riboflavin are strongly fluorescent), chlorophyll (grind spinach in a small amount of alcohol (like ethyl alcohol) and pour it through a coffee filter to get the extract (keep the solids in the filter, not the liquid)), antifreeze, laundry detergents, tooth whiteners, postage stamps, driver's license, jellyfish, and certain rocks (fluorite, calcite, gypsum, ruby, talc, opal, agate, quartz, amber) and the Hope Diamond (which is blue in regular light, but glows red).
4. Complete the data table.

## Black Light Treasure Hunt Data Table

Item/Object	What color did it glow?

### Reading

Light bulbs use *incandescence*, which means that the little wire (which is made from the element *tungsten*) gets so hot when you switch it on that it gives off heat and light. Unfortunately, these bulbs give off a lot of heat, which you'll notice if you bring your hand close to it after it's been on for a while. Incandescence happens when your electric stove glows cherry red-hot and you can visibly see the light energy. Our sun gives off energy through incandescence also – a lot of it.

On the other end of things, *cold light* refers to the light from a glow stick, called *luminescence*. A chemical reaction (chemiluminescence) starts between two liquids, and the energy is released in the form of light. On the atomic scale, the energy from the reaction bumps the electron to a higher shell, and when it relaxes back down it emits a photon of light.

*Phosphorescent* light is the glow-in-the-dark kind of light you see after you charge up a glow toy with a bright light source. This delayed afterglow happens because when you charged the object with light, the light actually hits the atom's electron and whacks it into a higher energy state. When the electron relaxes back down its lower energy state, it emits a light particle of (usually) a different wavelength (color). That's why glow-in-the-dark toys are often a different color than the light they emit after charged up. Since light is a form of energy, then in order for things to glow in the dark, you have to add energy first.

*Triboluminescence* is the spark you see when you smack two quartz crystals together in the dark. Other minerals spark when struck together, but you don't have to be a rock hound to see this one in action – just take a Wint-O-Green Lifesaver in a dark closet with a mirror and you'll get your own spark show. If you chew the candy with your mouth open, you'll be able to see the sparks in your mouth with a mirror. The spark is basically light from friction.

*Fluorescence* is similar to phosphorescence, except that it requires a continual light source in order to glow. These types of paints are popular with dark amusement-park rides. If you look carefully, you'll see UV lights hidden all around to make the images glow as you speed through the ride. In nature, you'll find fluorescence in certain rocks, plants and animals. Fluorescent objects absorb the UV light and reemit a completely different color. Like with phosphorescence, the light strikes the electron and bumps it up a level, and when the electron relaxed back down, emits a photon (light particle) of a different wavelength.

Fluorescent lights give out less heat, but more light. Since they don't lose as much energy to heat, they are more energy-efficient. I will usually hold up an incandescent bulb and a fluorescent bulb and ask the students how each makes light. A fluorescent tube is lined with white stuff called phosphor, which gives off light whenever it's struck by UV rays. The tube is filled with a gas that gives off UV rays when placed in an electrical field. When the bulb is turned on, electrons rip through the tube and go out the other side. As they go through, they smack into the gas vapor which releases light rays (UV in a fluorescent tube) that hit the phosphor on the inside of the tube, which then emits light. Fluorescent lights, or any tube of gas from the noble gases column on the periodic table, like neon, will also glow in an electrically charged field.

Phosphorescence is a type of fluorescence like you find in glow sticks and other glow-in-the-dark items.

Triboluminescence is a type of fluorescent light that comes from friction, like when striking two quartz crystals together. (You can hand out Wint-O-Green Lifesavers as part of their homework for the day and have them record their results in their lab.)

## Exercises

1. Why are incandescent lights less energy-efficient than fluorescent lights?
2. What are the two types of fluorescent lights?
3. What kinds of things did you find that glow on your treasure hunt? Give at least five examples.

**Answers to Exercises: Black Light Treasure Hunt**

1. Why are incandescent lights less energy-efficient than fluorescent lights? (Incandescent light give off more heat and less light – they lose energy to heat and fluorescent lights do not.)
2. What are the two types of fluorescent light? (Phosphorescence and triboluminescence)
3. What kinds of things did you find that glow on your treasure hunt? Give at least five examples. (answers vary)