

Inquire & Investigate

CHEMICAL ANALYSIS FLAME TEST

One way forensic scientists observe the chemical properties of an unknown substance is to test how it reacts to a flame. A flame test can identify some of the basic elements in a chemical, helping scientists identify the substance. When performing your own chemical flame test, be sure to conduct the experiment in a well-ventilated area with an adult present.

You will start by testing how alcohol reacts to a flame. Alcohol will be your known chemical. Then you'll add other chemicals to the alcohol and see what happens. To prepare, make an observation chart. Then fill a glass cup or bowl with water to keep nearby for extinguishing flames.

Caution: Wear safety goggles and be very careful using a flame with rubbing alcohol, which is very flammable. Adult supervision is required when using a flame.



- **Pour a small amount of rubbing alcohol into a paper cup (5 milliliters) and soak one end of a cotton swab in it.** Because rubbing alcohol is very flammable, make sure you replace the lid on the bottle immediately. Before you light the candle, move the alcohol bottle at least 6 feet away (2 meters).
- **Holding the dry end of the cotton swab, quickly pass the other end through the flame so the tip catches on fire.** Carefully observe its colors. Is the color the same throughout? Drop the swab into the bowl of water. Then record your observations.
- **Now test the other additives, starting with a tablespoon of table salt (5 milliliters).** Always use a fresh paper cup and a fresh cotton swab. After you observe the flame, drop the swab into the bowl of water and record your observations. The metals in the substances you test cause the flame to produce colors. What colors did each of these metals produce? How does a flame test help forensic scientists identify each substance?

To investigate more, compare the flames from each substance that you tested. Did any of the flames appear to have similar colors? What explains this result?

Ideas for Supplies ▼

- safety goggles
- water
- measuring spoons
- 90 percent Isopropyl or rubbing alcohol
- paper cups
- cotton swabs
- candle
- matches
- table salt (sodium chloride)
- salt substitute (potassium chloride)
- de-icer (calcium chloride)
- cream of tartar (potassium chloride)
- plaster of Paris (calcium sulfate)
- powdered roach killer (boric acid)

