

# The Flame Test

The flame test is a qualitative test used in chemistry to help determine the identity or possible identity of a metal or metalloid ion found in an ionic compound. If the compound is placed in the flame of a gas burner, there may be a characteristic color given off that is visible to the naked eye.

**Safety:** Always use good safety techniques. Wear chemical splash approved goggles. Wear a chemical apron. Practice the flame test under the supervision of a chemistry teacher.

## **To perform the flame test:**

The **classic** technique is to use a clean wire loop made out of platinum or nickel-chromium (nichrome) wire, dip the loop into the powder or solution to be tested, and then placed into the hottest portion of a flame. The resulting color of the flame is observed and this may be an indication of the presence of a particular ion.

To clean the wire, dip the wire into hydrochloric acid. Then rinse with distilled water. Test the loop by placing it into a gas burner flame. If there is a burst of color, then you did not clean it sufficiently. If there is no distinct color, then it is ready for use. If you have more loops, use a different loop for each test.

The clean loop is dipped in either a powder or solution of an ionic (metal) salt. The loop is then placed in blue part of the gas burner flame. Note the color of the flame and match the color to the list at the end of this document. You will not be allowed to bring notes or reference materials. You must memorize the colors.

An **alternative** method for performing the flame test is to use wooden splints. Soak the wooden splints in distilled water overnight. Pour out the water and rinse the splints in more clean distilled water. Be careful not to contaminant the splits with sodium compounds such as sweat from your hands.

Cotton swabs can be used by moistening the ends with water. Dip the swab into the substance to be tested and place it in the gas burner flame. Use a different swab for each test. This is a very inexpensive way to do a flame test. Be careful not to catch the swab on fire.

**Cobalt Blue Glass:** In flame tests, sodium ions may contaminant a sample and produce a flame of yellow masking the color of other ions. If a piece of cobalt blue glass is used, the blue glass will absorb the yellow color, and the other substance's flame can be seen.

### What is the flame test?

The flame test is used to visually determine the identity of an unknown metal of an ionic salt based on the characteristic color the salt turns the flame of a bunsen burner. The substances in the competition are: Sodium acetate, sodium chloride, sodium hydrogen carbonate, sodium carbonate, lithium chloride, potassium chloride, calcium nitrate, calcium sulfate, calcium carbonate, boric acid, and ammonium chloride. Cornstarch, glucose, sucrose, magnesium sulfate will give a negative flame test.

Color	Metal Ion
Red	<i>Carmin</i> : Lithium compounds. Masked by sodium. <i>Yellow-Red</i> : Calcium compounds.
Yellow	Sodium compounds, even in trace amounts
Green	<i>Blue-Green</i> : Boric acid. <i>Faint Green</i> : NH <sub>4</sub> compounds.
Violet	Potassium compounds - Masked by sodium or lithium. <i>Purple-Red</i> : Potassium in the presence of sodium when viewed through cobalt blue glass.

Lange's Handbook of Chemistry, 8th Edition, Handbook Publishers Inc., 1952.

Flinn Scientific Inc, Manual 2004.