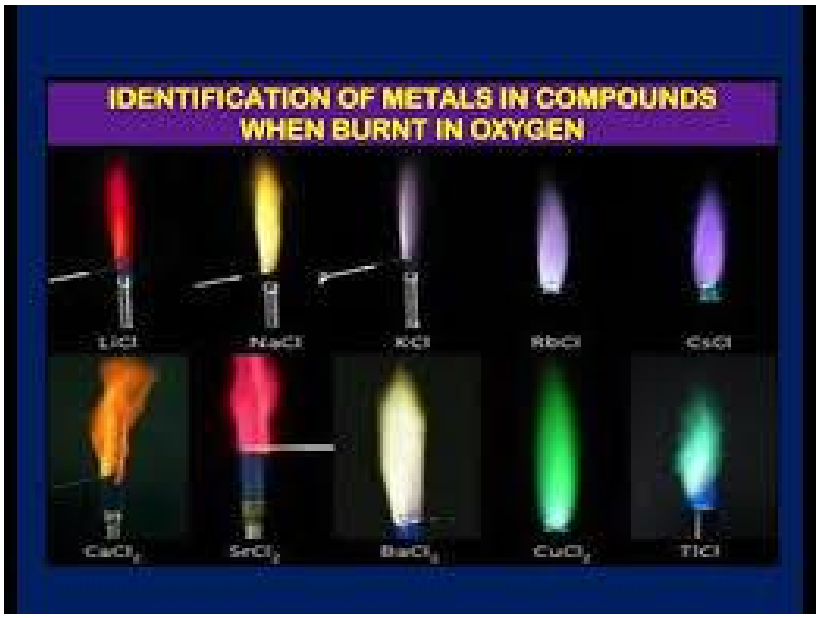
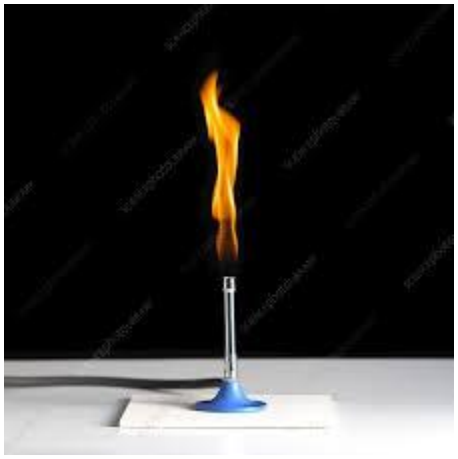
A flame test is a type of scientific test that involves subjecting an unknown substance to a controlled flame and documenting the resulting color in order to determine the elements the substance is made out of. While the technique is antiquated by more modern methods, it can still be used as a component of qualitative inorganic analysis. It is important to note here that the emissions of each element that determine the flame color involves atoms instead of ions. The transition of electrons in the atoms tends to produce the visible color lines which are seen in the flame test.



The Bunsen burner was invented in 1855, and was useful for flame tests due to the flame not giving off enough light to disrupt the effects generated by the test materials. This invention, combined with the prism, led to the invention of the spectroscope, used to see the spectral emissions of various elements.



A flame test involves introducing a sample of some substance under a non-luminous flame and observing the color of the resulting flame. Different flames can

be attempted in order to verify the accuracy of the observed color. The color of the flames also mostly depends on the temperature and the oxygen fed to the flame, and even then, the amount of elements that are available for testing is very low. Most elements produce a very weak color, while a few make a stronger hue, and a number only produce sparks. All of these variables combine to a very subjective testing process.

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The reason that the flame test even works properly in the first place is because during the testing process, ions are excited thermally, promoting electrons to a higher energy level. These excited ions then return to their ground state after releasing a photon of light, with each element releasing a different wavelength of light. In the case of sodium(or other metals), these jumps involve a lot of high energy, releasing UV rays our eyes cannot process. We can understand this principle by using the principles of atomic electron transition and photoemission.