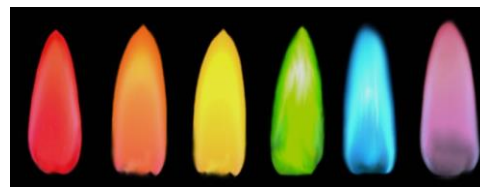


## Flame Lab



Introduction: The color of light emitted by an element heated in a flame is unique to each element. In this experiment, the characteristic color of light emitted by calcium, copper, lithium, potassium, sodium, and strontium ions will be observed.

Background: The color of the flame may be described in terms of its wavelength, and Equation 1 and Equation 2 may be used to calculate the energy of the emitted photon.

$$E = h\nu \quad \text{Equation 1}$$

$$c = \lambda\nu \quad \text{Equation 2}$$

$E$  → difference in energy between the two energy levels in joules (J)

$h$  → Planck's constant ( $h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$ )

$c$  → speed of light ( $c = 3.0 \times 10^8 \text{ m/s}$ )

$\lambda$  → (lambda) wavelength of light in meters

$\nu$  → (nu) frequency of a wave in seconds

**Table 1:** Wavelengths of visible light

Representative Wavelength, nm	Wavelength Region, nm	Color
410	400-425	Violet
470	425-480	Blue
490	480-500	Blue-green
520	500-560	Green
565	560-580	Yellow-green
580	580-585	Yellow
600	585-650	Orange
650	650-700	Red

### Procedure:

1. Light your Bunsen burner using the striker. Adjust the flame to the correct size.
2. Place the soaked wooden splint in the flame. Hold the splint in the flame for about 10 seconds. **\*\*If it starts smoking put it in the waste beaker immediately\*\***
3. While the splint is burning observe the color.
4. Place the burnt splint in the waste beaker.
5. Write a description of the color in Table 2 and make the color using the colored pencils at your station.
6. **Never leave a flame unattended. Choose one person to be the "keeper of the flame" until the next group arrives.**
7. Repeat steps 2-6 for all eight stations.

**Table 2:** Data Table (60 points)

Symbol	Element Name	Color (words)	Color (picture)	Wavelength ( $\lambda$ )
Ba				
Ca				
Cu				
K				
Li				
Na				
Sr				
Unknown 1				
Unknown 2				

**\*\*For the unknown flasks, write the name of the element(s) that you believe appear in that flask. Use information from the other stations to help.\*\***

**Post Lab Questions** (5 points per question)

1. Put the eight substances in order from highest wavelength to lowest wavelength.

Highest: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,  
\_\_\_\_\_ Lowest

2. Why do different elements have unique flame test colors?

