Name: _____

# FLAME LAB

## Flame Test Introduction

**The flame test is used to visually determine the identity of an unknown metal or metalloid ion based on the characteristic color the salt turns the flame of a Bunsen burner. The heat of the flame excites the metals ions, causing them to emit visible light. The characteristic emission spectra can be used to differentiate between some elements.**

***Objective***

**To observe and analyze the colors produced in solutions and through flame tests of different salts.**

***Background***

**When elements are heated to high temperatures, some of their electrons are excited to higher energy levels. Theses excited electrons can fall back to lower energy levels, releasing the excess energy in packages of light called photons, or light quanta. The color of the emitted light depends on its energy. Blue light is more energetic than red light, for example. When heated, each element emits a characteristic pattern of light energies, which is useful for identifying different elements. The characteristic colors of light produced when substances are heated in the flame of a gas burner are the basis of flame tests for several elements.**

***Safety***

**Always wear goggles when working in the lab.**
**Be careful not to burn yourself with the Bunsen burner.**
**Do not allow the chemicals to touch your skin, they can be corrosive. If they get on your skin rinse it off immediately with water and inform your teacher.**

***Method***

**1. Remove the toothpick from the solution.**
**2. Place the soaked toothpick into the flame.**
**3. Observe and record the color of the solution as it burns.**
**4. Place the used toothpick in the waste disposal provided at the station**
**5. Record the results in your data table.**

***Results***

| ***Metal ion*** | ***Complete observation*** |
|---|---|
| | |
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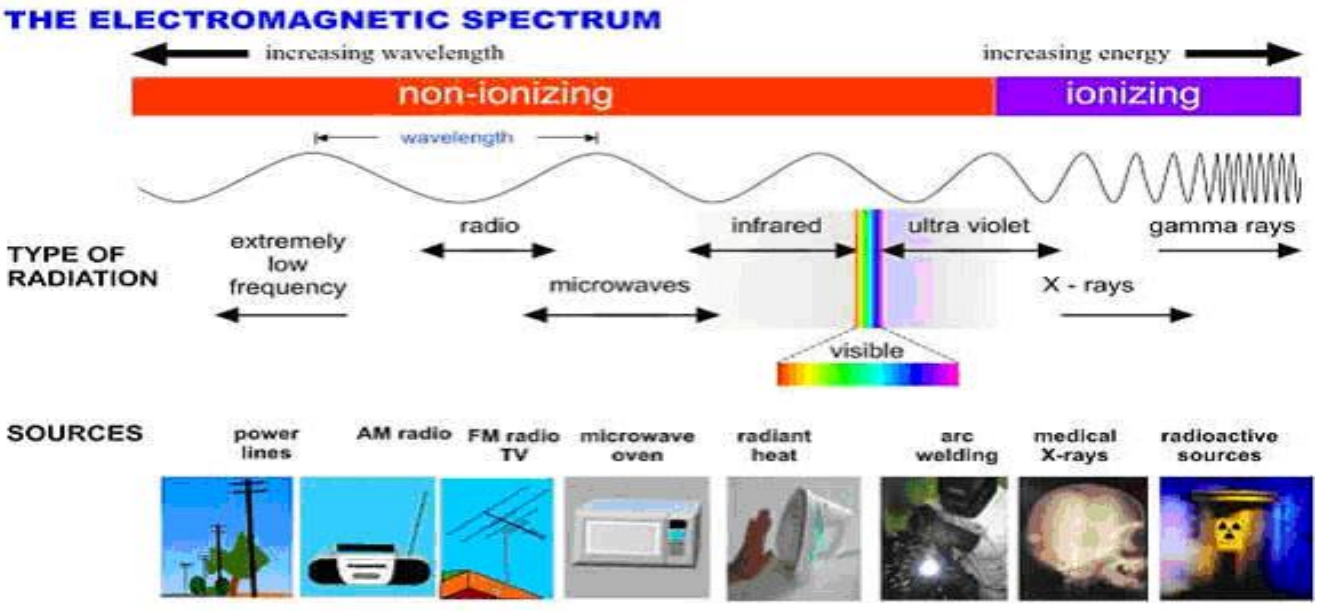
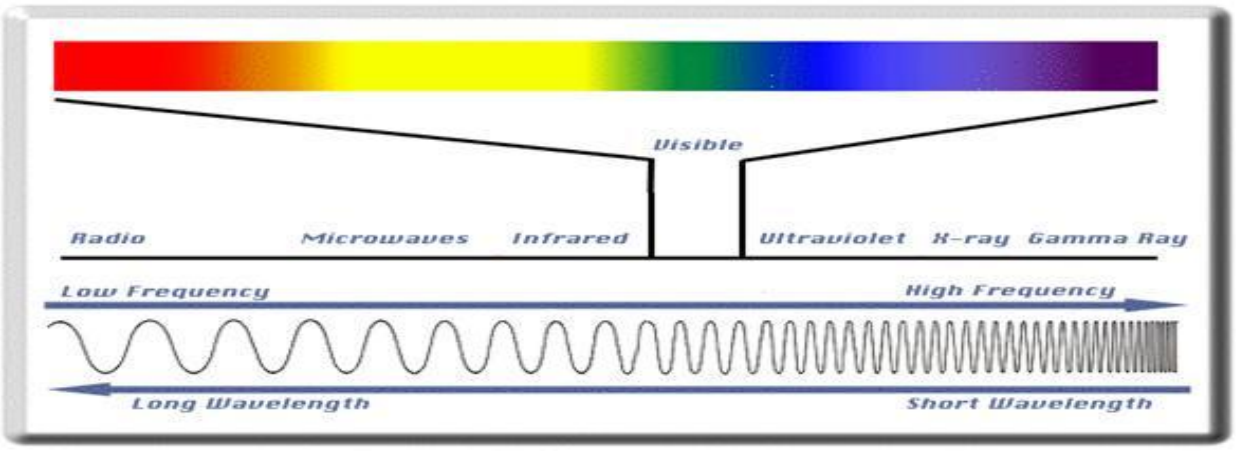
| | |
| | |
| | |
| | |
| ***UNKNOWN #***<br><br>***Identity:*** | |
| ***UNKNOWN #***<br><br>***Identity:*** | |
| ***UNKNOWN #***<br><br>***Identity:*** | |
| ***UNKNOWN #***<br><br>***Identity:*** | |

**Conclusion questions: *** 424nm=4.24x10$^{-7}$ m (1m = 10$^{9}$nm)**

**Useful information you may need:**



| Color | Wavelength |
|---|---|
| Red | 700 -650nm |
| Orange | 649-580nm |
| Yellow | 579-575nm |
| Green | 574-490nm |
| Blue | 489-455nm |
| Indigo | 454-425nm |
| Violet | 424-400nm |




1. **Which has a longer wavelength, light with a frequency of $7.32 \times 10^{14}$ Hz or light with a frequency of $6.0 \times 10^{14}$Hz?**

2. **Which has a higher energy, λ of 674nm or of 480nm?**

3. **Which has a higher frequency, orange light or indigo light?**

4. **A certain red light has a wavelength of 725nm and another red light has a frequency of $4.28 \times 10^{14}$ $s^{-1}$. Which would have a higher energy per photon?**

5. **Find the color of light whose frequency is $5.21 \times 10^{14}$ Hz.**

6. **What is the frequency of light if its wavelength is $5.4 \times 10^{-5}$cm?**

7. **Which would have a higher frequency, light of wavelength of 521nm or light with a wavelength of 605nm?**

8. **Which would have a longer wavelength, light with a frequency of $4.5 \times 10^{14}$Hz or light with a frequency of $6.19 \times 10^{14}$Hz?**

9. **Find the wavelength in centimeters of light whose frequency is $7.00 \times 10^{16}$Hz.**

10. **Is the light in #9 visible? How do you know?**

11. **How many Joules of energy are there in one photon of yellow light whose wavelength is 630nm?**

12. **Find the color of light whose photon has $4.75 \times 10^{-19}$ J of energy.**

13. **Which would have a longer wavelength, a photon with the energy of $4.59 \times 10^{-19}$J or a photon with the energy of $3.01 \times 10^{-19}$J?**

14. **While doing an experiment in light, a student finds the light emitted by the sample has a frequency of $4.62 \times 10^{14}$Hz. What is the wavelength of the light and the color?**

15. **What frequency is radiation with a wavelength of $5.00 \times 10^{-6}$cm?**