Colorful Campfires and Rainbows

Student Worksheet

Name_____

Overview: Welcome to every kid's dream. You'll get a chance to burn chemicals, see lots of colors, and use your cool spectroscopes.

What to Learn: Today you'll see how you can use your spectroscopes in a real-life situation. You'll burn different chemicals and see if you can match the spectra seen in your spectroscope to the spectra of known elements.

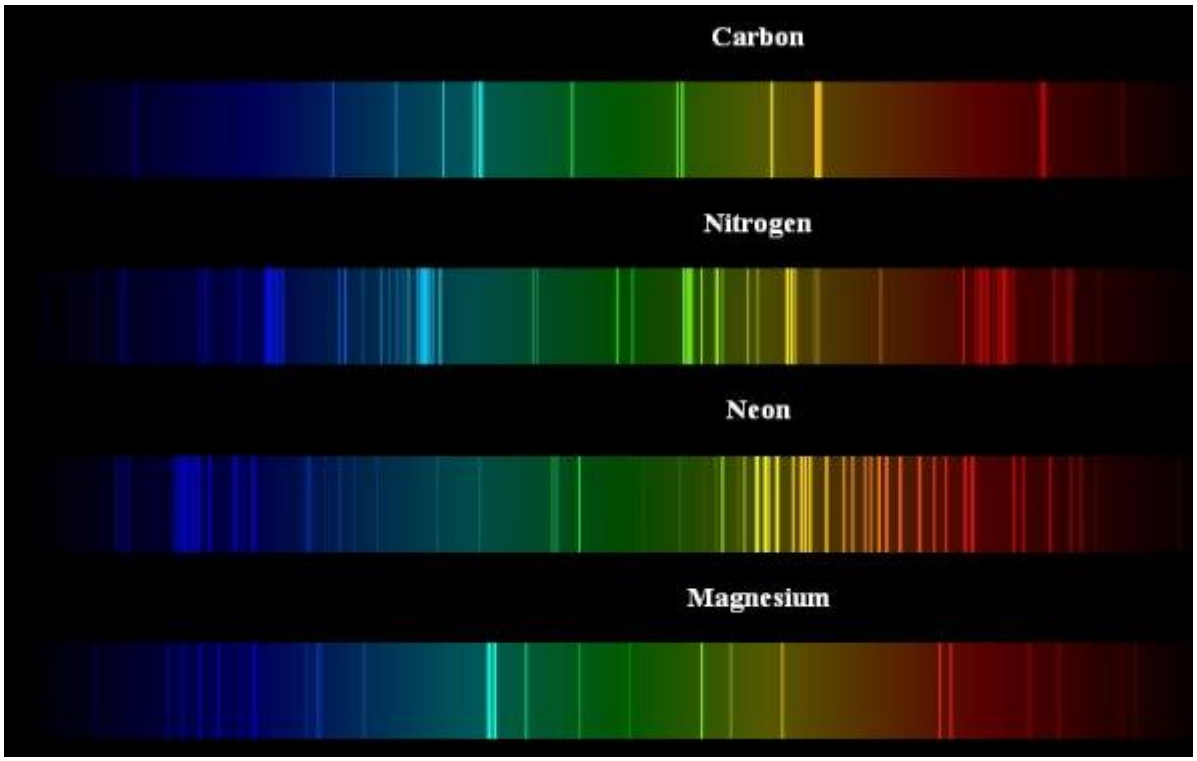
Materials

- Container for flame: Old pot with lid, flower pot, or ceramic vessel
- Flame-proof surface outdoors (such as a concrete sidewalk or ceramic tile)
- Disposable spoons
- Methanol (Heet, in a yellow bottle) (MSDS)
- Magnesium sulfate (Epsom salt) (MSDS)
- Sodium carbonate (washing soda) (MSDS)
- Sodium tetraborate (Borax) (MSDS)
- Boric acid (MSDS)
- Potassium chloride (salt substitute) (MSDS)
- Spectroscope from previous lab (either simple or calibrated spectroscope)

Lab Time

1. For a campfire, simply sprinkle the solids into your flames (make sure they are ground into a fine powder first) and you'll see a color change. OR:
2. Once outside on a safe, non-flammable surface, add 2 tablespoons of methanol to the bottom of your pot or other container. Add 1 teaspoon magnesium sulfate (Epsom salts). Use a disposable spoon to mix. Put lids on both methanol and magnesium sulfate and put far out of reach.
3. With adult help, use a lighter to ignite. Observe the colors of the flames. Use your spectrometer to observe spectral lines, and attempt to identify using the chart provided.
4. Allow the flame to extinguish itself.
5. Follow steps 4-6 for each chemical below, using a different disposable spoon to mix and letting each flame extinguish itself before moving on:
    a. 1 teaspoon sodium tetraborate (Borax) and 2 tablespoons methanol.
    b. 1 teaspoon boric acid and 2 tablespoons methanol
    c. 1 teaspoon potassium chloride and 2 tablespoons methanol
    d. 1 teaspoon sodium carbonate (washing soda)and 2 tablespoons methanol

NOTE: Do not combine all chemicals together. This will produce a toxic gas



Colorful Campfires and Rainbows Data Table

Chemical	Flame Colors	Elements Identified Using Spectroscope

Exercises Answer the questions below:

1. Why did you see different colors?

2. How are spectral lines like fingerprints?

3. Someone once asked if they could combine all the chemicals together and see what happens. Why is this NOT good science?

4. Explain how you used your spectroscope to determine the element being burned in the flame

Exercises

1. Why did you see different colors? (Different chemicals were burned and each element in the chemical has its own color signature.)
2. How are spectral lines like fingerprints? (They can be used to identify elements because elements have their own unique color signatures just like all people have their own unique fingerprints.)
3. Someone once asked if they could combine all the chemicals together and see what happens. Why is this NOT good science? (For one, it is dangerous and produces toxic gas. But also, scientists are concerned with controlling experiments and determining the effect of one thing at a time. By combining all these chemicals, it would be impossible to see what chemical was causing what light.)
4. Explain how you used your spectroscope to determine the element being burned in the flame (The lines on the spectroscope were compared to the known spectra lines of different elements to see if any matched up.)

Closure: Before moving on, ask your students if they have any recommendations or unanswered questions that they can work out on their own. Brainstorming extension ideas is a great way to add more science studies to your class time.