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Imagine the Universe! | Lesson Plans | Student Worksheet: The Flame Test

Introduction

Objectives

1. Put on lab apron and safety goggles.
2. Add 15 drops of each 0.5M solution to a different clean test tube.
3. To clean the wire, dip it into the test tube of 1M of HCl and heat the wire in the hottest part of the flame until no color shows.
4. When the platinum wire is clean, dip the wire in the test tube containing a 0.5M solution and hold it in the hottest part of the flame. Record your observation of the color of the flame on the data table.
5. Repeat the process of cleaning the platinum wire. Now get ready to test another solution.
6. Test all of the solutions and make sure that you record the color of the flame for each **element** on the Data Table.
7. Check your flame colors to known results.

8. Fill one clean test tube with 15 drops of one of the 0.5M solutions. The teacher keeps track of what element solution is in this "mystery tube." Repeat the flame test, without telling the students what solution it is. Students must use the information gained from the first part of the experiment to identify the mystery solution.
9. Use the diffraction grating to observe the color of the flame for the following elements: Sodium, Barium, Copper, and Lithium. The students should be able to see the individual lines making up the **light** from the flame. This can be tricky! In order for it to work, the room will have to be completely dark (in order to block out other light sources) and the students will have to be close to the flame, holding the diffraction grating up to their eyes. It may be necessary to rotate the diffraction grating in order to see the emission lines. Be patient!
10. Record the colors of the elements' emission lines in column three of the Data Table.
11. Before leaving the laboratory, wash your hands thoroughly with soap and water.

Stations	Observed Flame Color	Color of Emission Lines	λ (m)	ν (Hz)	E (J)
Calcium (0.5M CaCl)					
Sodium (0.5M NaCl)					
Barium (0.5M BaCl)					
Lithium (0.5M LiCl)					
Copper (0.5M CuCl)					
Cesium					

(0.5M CsCl)		
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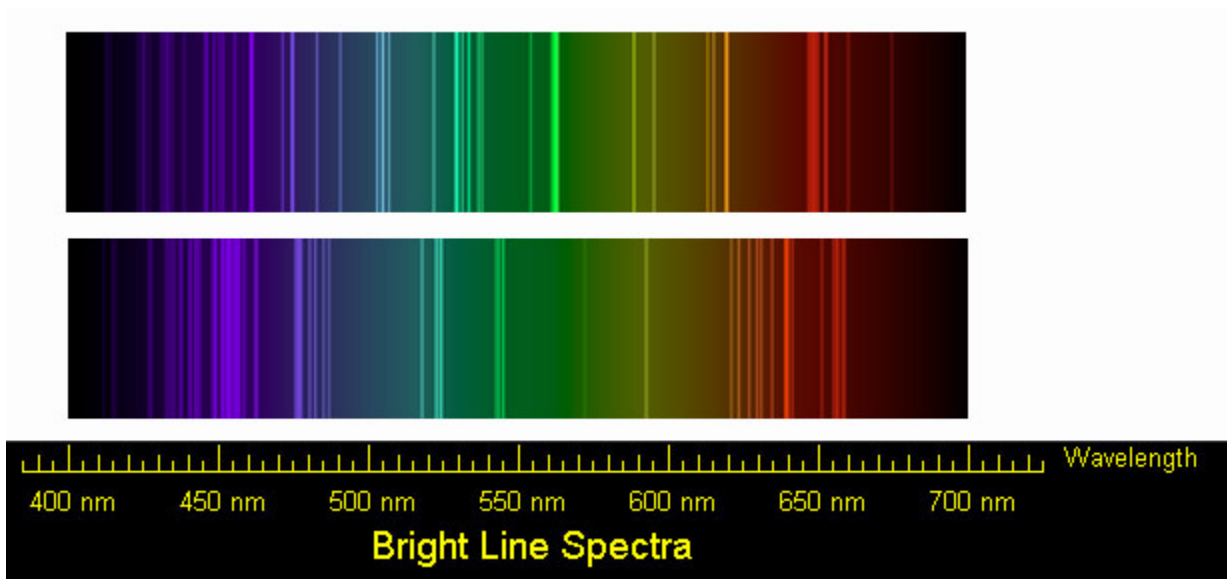
Discussion Questions

Discuss the following questions in lab groups. Remember you are trying to determine what is taking place during the Flame Test whereby various colors of light are being emitted. One person in your group will have the responsibility of writing the group answers down. After discussing these questions in the group, another person will be responsible for sharing your thoughts with the whole class. You may refer to background material.

- What particles are found in the chemicals that may be responsible for the production of colored light?
- Why do different chemicals emit different colors of light?
- Why do you think the chemicals have to be heated in the flame first before the colored light is emitted?
- Colorful light emissions are applicable to everyday life. Where else have you observed colorful light emissions. Are these light emission applications related? Explain.
- What is the characteristic flame color for Sodium, Lithium, Barium, Copper, Cesium, and Calcium? Explain why.
- When the diffraction grating was used to view the flame, explain why different colorful emission lines were observed for the elements.

Conclusion

Use the image below to view the spectra of calcium (top) and sodium (bottom). Solve for **frequency** and energy of the two brightest emission lines for each element. Use the brightest lines. Show your work and record your answers on the Data Table.



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http://imagine.gsfc.nasa.gov/docs/teachers/lessons/xray_spectra/student-worksheet-flame.htm