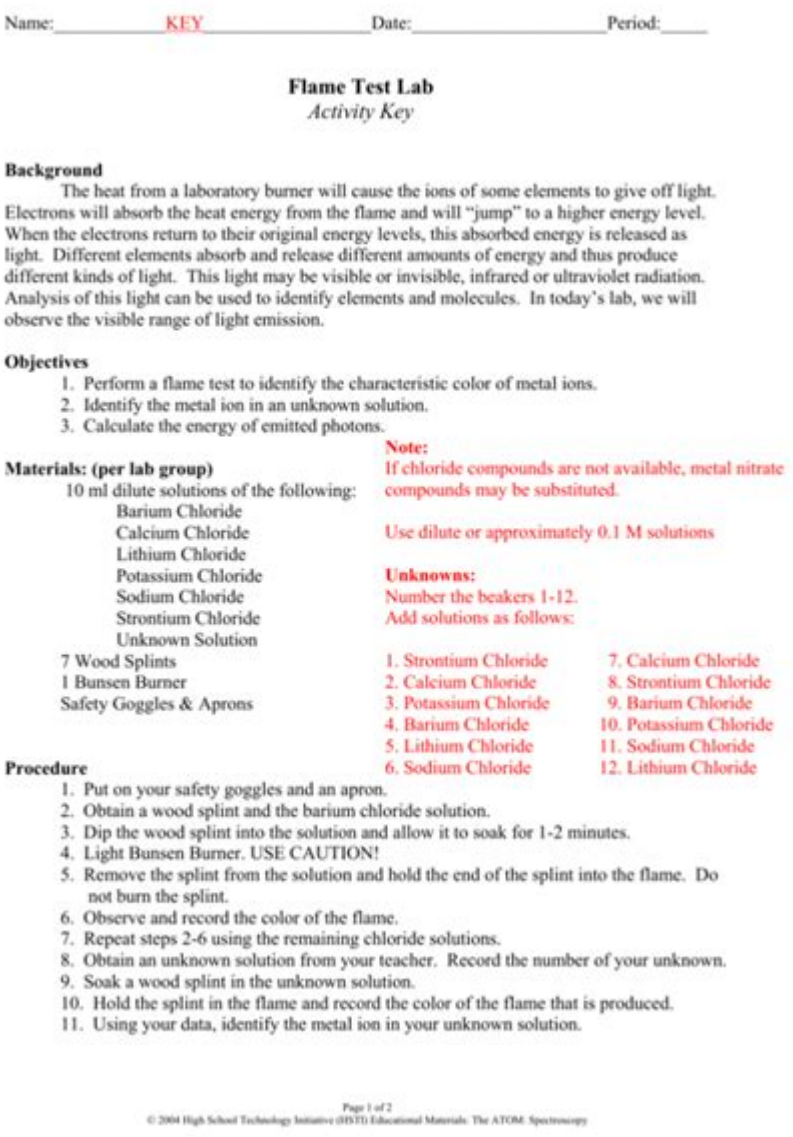
Flame Test Lab Answer Key



Name:_____KEY_____Date:_____Period:_____

Flame Test Lab
Activity Key

Background

The heat from a laboratory burner will cause the ions of some elements to give off light. Electrons will absorb the heat energy from the flame and will "jump" to a higher energy level. When the electrons return to their original energy levels, this absorbed energy is released as light. Different elements absorb and release different amounts of energy and thus produce different kinds of light. This light may be visible or invisible, infrared or ultraviolet radiation. Analysis of this light can be used to identify elements and molecules. In today's lab, we will observe the visible range of light emission.

Objectives

1. Perform a flame test to identify the characteristic color of metal ions.
2. Identify the metal ion in an unknown solution.
3. Calculate the energy of emitted photons.

Materials: (per lab group)

10 ml dilute solutions of the following:
- Barium Chloride
- Calcium Chloride
- Lithium Chloride
- Potassium Chloride
- Sodium Chloride
- Strontium Chloride
- Unknown Solution

7 Wood Splints
1 Bunsen Burner
Safety Goggles & Aprons

Note:
If chloride compounds are not available, metal nitrate compounds may be substituted.

Use dilute or approximately 0.1 M solutions

Unknowns:
Number the beakers 1-12.
Add solutions as follows:

1. Strontium Chloride
2. Calcium Chloride
3. Potassium Chloride
4. Barium Chloride
5. Lithium Chloride
6. Sodium Chloride
7. Calcium Chloride
8. Strontium Chloride
9. Barium Chloride
10. Potassium Chloride
11. Sodium Chloride
12. Lithium Chloride

Procedure

1. Put on your safety goggles and an apron.
2. Obtain a wood splint and the barium chloride solution.
3. Dip the wood splint into the solution and allow it to soak for 1-2 minutes.
4. Light Bunsen Burner. USE CAUTION!
5. Remove the splint from the solution and hold the end of the splint into the flame. Do not burn the splint.
6. Observe and record the color of the flame.
7. Repeat steps 2-6 using the remaining chloride solutions.
8. Obtain an unknown solution from your teacher. Record the number of your unknown.
9. Soak a wood splint in the unknown solution.
10. Hold the splint in the flame and record the color of the flame that is produced.
11. Using your data, identify the metal ion in your unknown solution.

Flame Test Lab Answer Key: A Comprehensive Guide for Students

Are you staring at your incomplete flame test lab report, feeling utterly bewildered by the vibrant colors and their corresponding elements? Don't worry, you're not alone! Many students find the flame test a challenging yet fascinating experiment. This comprehensive guide serves as your ultimate flame test lab answer key, providing not just the answers, but a deeper understanding of the underlying chemistry. We'll break down the process, explain the science behind the colors, and offer troubleshooting tips to ensure you ace your lab report.

Understanding the Flame Test: A Quick Recap

The flame test is a qualitative analytical technique used to identify the presence of certain metal ions based on the characteristic color they impart to a flame. When heated, the electrons in metal atoms absorb energy and jump to higher energy levels. As they return to their ground state, they release energy in the form of light, resulting in the vibrant colors we observe. This emitted light has specific wavelengths, directly correlating to the element present.

Common Flame Test Colors and Their Corresponding Elements

This section acts as your core flame test lab answer key, detailing the colors associated with various elements. Remember that slight variations can occur due to impurities or the concentration of the metal ion.

Intense Colors & Their Corresponding Metals:

Li (Lithium): Crimson red. A vibrant, deep red is characteristic of lithium.
Na (Sodium): Intense yellow-orange. Sodium’s color is so intense it can often mask other colors, making it crucial to use clean equipment.
K (Potassium): Lilac or lavender. This is a softer, more subtle color compared to sodium.
Ca (Calcium): Brick red or orange-red. Distinguishable from lithium's crimson by its slightly more orange hue.
Sr (Strontium): Bright red. A brighter, more intense red than calcium.
Ba (Barium): Pale green or yellowish-green. Barium’s color is less intense than others.

Less Intense or Variable Colors:

Cu (Copper): Green or blue-green (depending on the oxidation state). Copper can show different colors depending on the copper compound used.
Mg (Magnesium): Very faint white. Magnesium's flame color is often difficult to observe.

Interpreting Your Results: A Step-by-Step Guide

1. Accurate Observation: Record the exact color observed. Use descriptive terms like "bright crimson," "pale green," or "intense yellow-orange." Avoid vague terms like "red" or "green."
2. Control Experiments: Always include a control experiment using distilled water to ensure no contamination is influencing the results.
3. Contamination Issues: Sodium is a ubiquitous element, and even trace amounts can mask other colors. Clean your equipment meticulously to minimize sodium contamination.
4. Concentration Effects: The intensity of the color is usually proportional to the concentration of the

metal ion.
5. Comparing to Known Standards: If possible, compare your observed colors with known samples of the elements to aid in identification.

Troubleshooting Common Flame Test Problems

Faint or No Color: This could indicate a low concentration of the metal ion, impure chemicals, or a faulty burner.
Inconsistent Results: Ensure consistent heating and use fresh samples each time. Impurities in the chemicals can also lead to inconsistent results.
Difficulty Distinguishing Colors: Practice identifying colors, and if necessary, use color charts or spectral analysis to confirm your observations.

Advanced Flame Test Techniques

While basic flame tests rely on visual observation, advanced techniques like flame photometry use instruments to measure the intensity of emitted light at specific wavelengths, allowing for more precise quantitative analysis.

Conclusion

The flame test, although seemingly simple, offers a powerful method for identifying metal ions. By carefully observing colors and understanding the underlying chemistry, you can confidently analyze your results and produce a high-quality lab report. Remember to pay close attention to detail, maintain clean equipment, and practice your color identification skills. This flame test lab answer key serves as a comprehensive guide to help you succeed in your experiment.

FAQs

1. Why do different elements produce different flame colors? Different elements have unique electronic structures, resulting in different energy levels for their electrons. The energy released when electrons return to their ground state determines the wavelength (and thus color) of light emitted.

2. How can I ensure accurate results in a flame test? Use clean equipment, distilled water, and ensure consistent heating of the sample. Compare your results with known samples whenever possible.

3. What if I see multiple colors in the flame? This might indicate the presence of multiple metal ions in your sample. Try to identify each color individually.

4. Are there any safety precautions I should follow during a flame test? Always wear appropriate safety goggles and handle chemicals carefully. Avoid pointing the flame toward yourself or others. Ensure proper ventilation.

5. Can the flame test be used to identify all elements? No, the flame test is most effective for identifying alkali metals and alkaline earth metals. Other elements may produce faint or indistinct colors, making identification difficult.

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passing of his beloved wife, author Jim Reuther, better known as Gunky, discovered her extraordinary letter in a handwritten notebook titled, “How to Get Along Without Me.” The notebook was a simple “How to Guide” for the tasks she had done faithfully for him until the end. But one request stood out; she challenged him to continue his writings. In Gunky’s Adventures, Reuther features a collection of twenty-five tales, one for each letter of the alphabet, beginning with his late wife’s note, “Afterlife Love Letter and Wish.” Ranging from the humorous to tear-jerkers, to odd happenings and surprise endings, to musings on rock and roll, to stories about family, friends, foes, and fails, he reflects on an array of life experiences. His first poems ever written are included under the title of “Xtraordinaire (Silent Sentinels).” Narrating a life-hearted series of alphabetic escapades, Gunky’s Adventures offers an anthology of poems and short stories reflecting on a life wonderfully lived.

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3 Yasuyuki Horie, 2008-09-18 This book is the second volume of Solids Volumes in theShockWaveScience and Technology Reference Library. These volumes are primarily concerned with high-pressure shock waves in solid media, including detonation and hi- velocity impact and penetration events. This volume contains four articles. The ?rst two describe the reactive behavior of condensed-phase explosives, and the remaining two discuss the inert, mechanical response of solid materials. The articles are each se- contained, and can be read independently of each other. They o?er a timely reference, for beginners as well as professional scientists and engineers, cov- ing the foundations and the latest progress, and include burgeoning devel- ment as well as challenging unsolved problems. The ?rst chapter, by S. She?eld and R. Engelke, discusses the shock initiation and detonation phenomena of solids explosives. The article is an outgrowth of two previous review articles: “Explosives” in vol. 6 of En- clopedia of Applied Physics (VCH, 1993) and “Initiation and Propagation of Detonation in Condensed-Phase High Explosives” in High-Pressure Shock Compression of Solids III (Springer, 1998). This article is not only an - dated review, but also o?ers a concise heuristic introduction to shock waves and condensed-phase detonation. The authors emphasize the point that d- onation is not an uncontrollable, chaotic event, but that it is an orderly event that is governed by and is describable in terms of the conservation of mass, momentum, energy and certain material-speci?c properties of the explosive.

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