Flame test lab worksheet answer key chemistry

Name: _____ Date: _____

Flame tests

Introduction:

When metals are heated, their outer electrons become excited and jump up to higher energy levels. These energized electrons are not stable at higher energy levels so they fall back down to their normal energy level, giving off their extra energy as light. As a result, metals impart characteristic colors to a flame. In this laboratory demonstration, you will observe the colors several metals impart to a flame.

Lab Procedure:

1. Label your cups 1 – 7.
2. Have ONE person in your group go back to the solutions table and place 3 -4 toothpicks into each cup.
3. Carefully light your Bunsen
4. Take ONE toothpick from each cup and place it in the flame
5. Observe the color of the flame and match the color you see with the metal below
6. NOTE: some colors are close to each other in color. If you are unsure, re-test the solution to produce an accurate result.

Sodium = Yellow; **Calcium** = Orange; **Copper** = Green
Potassium = Purple; **Zinc** = Blue - Green **Iron** = Gold
Magnesium = White; **Strontium** = Red

Metal	Color of Flame
	Yellow
	Purple
	Green
	Gold
	Orange
	Blue-green
	Bright White
	Red

COMPLETE QUESTIONS ON NEXT PAGE →

Flame Tests

Name:
Date:
Class:

Pre-lab Questions

Answer the following questions and perform the following calculations.

1. Describe the energy levels of an atom and how an electron moves between them. Be sure to describe how the electron absorbs and emits energy when it does so.

2. What physical change happens to atoms and molecules in a solution that is strongly heated in a flame? Is there a phase change? If so, what is it?

3. What is going on *inside* atoms of a metal when a metallic salt of that metal is dissolved in water and then placed in a hot flame?

4. What would be required in order to observe a spectrum when viewing the flame test of a metallic salt? Why?

5. What is required in order to be able to identify an element based on its flame test color?

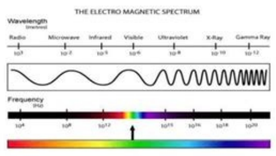
6. Why do different elements have different flame test colors?

7. How to the designers of fireworks make the explosions have different colors?

8. What are the wavelengths of light that are representative of the following colors: Violet, Blue, Blue-green, Green, Yellow-green, Yellow, Orange, and Red?

Name: _____ Date: _____

Lab ____
Atomic Spectra: Online and live



This activity will focus on the visible portion of the electromagnetic spectrum.

Background Information:

About 300 years ago, Sir Isaac Newton saw a beam of sunlight through a glass prism. He discovered that light is made up of a spectrum of seven distinct visible colors. This spectrum of colors always appears in the same order. You can see this color spectrum (Red, Orange, Yellow, Green, Blue, Indigo, Violet and all the colors in between) when you look through a diffraction grating. There are two color ranges that are not visible to our eyes in this spectrum: below red is infra-red and above violet is ultra-violet. In a rainbow after a rainstorm this same color spectrum appears in the same order. Rainbows are created when sunlight passes through rain drops that act as millions of tiny prisms.

The color of a solid object depends on the colors of light that it reflects. A red object looks red because it reflects red light and absorbs all other colors. A blue object looks blue because it reflects blue light and absorbs all other colors. A white object reflects all colors of light equally and appears white. A black object absorbs all colors and reflects no visible light and appears black. Just like when you color with too many colors in one area with crayons or markers, all colors are absorbed, none are reflected and it appears black!

Explanation of visible light at the electronic level:

What do fireworks, lasers, and neon signs have in common? In each case, we see the brilliant colors because the atoms and molecules are emitting energy in the form of visible light. The chemistry of an element strongly depends on the arrangement of the electrons. Electrons in an atom are normally found in the lowest energy level called the ground state. However, they can be "excited" to a higher energy level if given the right amount of energy, usually in the form of heat or electricity. Once the electron is excited to a higher energy level, it quickly loses the energy and "relaxes" back to a more stable, lower energy level. If the energy released is the same amount as the energy that makes up visible light, the element produces a color. The visible spectrum, showing the wavelengths corresponding to each color, is shown below:

Name: _____ Pd. ____ Date: _____

Flame Test Lab

Purpose

To observe the characteristic colors produced by certain metallic ions when vaporized in a flame; and to identify an unknown metallic ion by means of its flame test.

Materials & Equipment

- wooden splints
- Bunsen burner
- 7 different metals ions in solution
- spectrometer
- waste beaker with water

Procedure

1. Fill a beaker two-thirds of the way with water to dispose of used wooden splints.
2. Set up Bunsen burner. Adjust the gas and oxygen flow to produce a half blue flame.
3. Take a wooden split from the metal ion solution and insert into flame. Before the wooden splint begins to burn, record the color of the flame and the using the spectrometer record the wavelengths of the metal's visible atomic spectrum.
4. Place the used splint in the waste beaker for at least one minute before disposing of splints in trash can.
5. Repeat steps 1 through 4 for all 6 ions.
6. Obtain a splint from the unknown solution. Repeat steps 1 through 6.

Data

Table 1 – Observed Flame Colors & Visible Atomic Spectrum Wavelengths

Solution	Metal Ion	Flame Color	Visible Atomic Spectrum Wavelength(s), nm
NaCl	Na^{+}		
KCl	K^{+}		
LiCl	Li^{+}		
$CaCl_2$	Ca^{2+}		
$SrCl_2$	Sr^{2+}		
$CuCl_2$	Cu^{2+}		
$BaCl_2$	Ba^{2+}		
Unknown	—		

Data Analysis

1. Based on the flame color, what could the unknown solution be?

Flame test lab worksheet answer key.

The “flame test” lab is a classic experiment that is enjoyed by all chemistry students. Students absolutely love this lab, and it is a great way to review and reinforce the concepts of electrons, excited state, ground state, and the visible spectrum.==========Please Note: This lab is included in a money-saving bundle of labs called "15 Must-Do Physical Science and Chemistry Labs." Click this link to view the bundle.==========Purpose of the Lab:To observe the characteristic colors produced by metallic ions when heated in a flame.To identify an unknown metallic ion by means of its flame test.What is this lab about?When atoms of elements are heated to high temperatures, some electrons may absorb enough energy to allow them to move to higher energy levels. The electrons quickly return to their positions of lower energy or their ground state. As the electrons return to their ground state, the energy that was absorbed is given off in the form of visible light. The color of this light can be used to identify the elements involved. In a flame test, the element will give off a characteristic color that serves as a simple method of identification of that element. In this lab, students will conduct flame tests of several known elements, and then will try to identify an unknown element by its flame test.Materials List:Bunsen burner Lab apronSafety goggles Wood Splints Test TubesCobalt glass squares Test Tube RacksNitrate solutions of sodium, potassium, lithium, calcium, strontium, barium, and copper.What will the students be doing?Students will carry out this classic chemistry lab by placing metallic ions into a Bunsen burner flame to see the characteristic colors emitted by each metallic ion.Students will develop a reference table of the colors emitted by 7 metallic ions: Sodium, potassium, lithium, calcium, strontium, barium, and copper.Students will use their reference table to identify unknown solutions of ions.Students will use cobalt glass as a tool for identifying the components of a metallic salt mixture.Students will evaluate the usefulness of using this method of metal identification.Students will answer 7 analysis questions to complete the lab.This lab reviews and reinforces the concepts of electrons, electron configurations, energy levels of electrons, excited states, ground states, and the visible spectrum.What is included in this product?Editable lab handouts that are ready to be printed and passed out to your students. (3-page student handout.)Complete instructions.4-page Teacher Guide containing tips, tricks, and suggestions. •Complete Answer Key containing sample data and all answers.Everything you need for the successful completion of this lab.Related resources include the following:Atoms and Atomic Structure Task CardsElectron Configuration Study Guide / HomeworkElectron Configuration QuizElectron Configuration Unit TestQuantum Mechanics WorksheetFor updates about sales and new products, please follow my store:My TpT StoreI would love to have you follow me at these locations as well:My Blog: Amy Brown Science.comMy Facebook PageOn PinterestInstagram: @AmyBrownScience Thank you for your participation!

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