

Physical Science

Flame Test Lab - Introduction

In this lab, you will attempt to identify specific elements from the color and nature of the flame produced when a liquid containing the element is heated in an open flame.

In the first part of this lab, you will test each of 10 control samples, and write down a detailed description of what each looks like in the flame. You will then attempt to match it to the list of six specific elements by the general color of its flame. After you have turned in your analysis sheet, the teacher will tell you which indeed match

In the second part of the lab, you will attempt to match six unknown substances to one of the elements you examined in part 1. Again, there may be more than one match to a specific element, or it may match none of them.

Finally, there is a lab report which you must complete by yourself and turn in at the start of the next class. You should review the questions to be answered on this report NOW so you can be making notes to answer them while doing the lab.

Safety Rules

- 1. Safety glasses must be worn by any student within 6 feet (2 meters) of a lab table during this lab.** Although the chemicals we are using are not explosive, they can cause severe irritation if they come in contact with your eyes. Whenever using glass, it can shatter, and glass shards can cause permanent eye damage.
2. Do not place papers, notebooks, or other materials on the lab bench close to a lit burner. You can write in your lab notebook at the end of the lab pedestals.
3. If your burner goes out, or the burner hose becomes loose, turn off the gas immediately.
4. The test wire should be in its corresponding beaker whenever it is not in your hand.
5. The top should be screwed on the sample vial unless you are holding the vial in your hand.
6. If the test wire starts to glow red, remove it from the flame. No further valid test results will be obtained in this case anyway.
7. Wait until the test wire cools before putting it into the sample vial. If it hisses when it goes in, it is still too hot.
8. **NO** playing around, interference with others' work, distracting behavior, or other unprofessional acts in the lab. Work quietly and focus on your tests and analysis.

First violation of any of these rules: automatic reduction of 25% in lab grade for your group.

Second violation: zero on this lab, and must remain in seat for remainder of lab block.

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Flame Test Lab – Part 1 Instructions

There are 10 different samples, in the sample bottles labeled A-J. Each one has its own nickel-chromium test wire, with the same letter on it, and a beaker in which to place the wire when not in use. This avoids contaminating the wire with different substances.

Below is a table showing the distinctive colors of eight elements. You may find the spectra on the projector useful as well. Your job is to identify which, if any, of the samples contain each of these elements. *It is possible that some elements may be in more than one sample, and others may not be in any.*

Na	Orange
K	Light purple
Ca	Brick red
Cu	Blue-green
Ba	Yellow-green
Pb	Light blue
Li	Pinkish red
Sr	Bright red

For each sample:

1. Adjust the flame if necessary so that it is 2-3 cm tall, and all blue.
2. Remove the cap from the sample, and dip the corresponding test wire into the solution. You want enough solution to wet the loop on the end of the wire, but not enough to drip. The solution should NOT fill the loop.
3. Hold the wet loop in the hottest part of the flame and look for a color. It may not appear immediately, but if the loop begins to glow, you will no longer see valid colors. It may take a few tries to get the hang of it.
4. Remove the loop from the flame and let it cool for 20-30 seconds. Do NOT place a hot wire back in the sample vial, or in the beaker.
5. You may repeat the test several times to make sure you have a valid, detailed observation. When you do:
 - a. Replace the cap on the sample.
 - b. Place the loop end of the test wire in its corresponding beaker.
 - c. Move on to the next sample. If the group at the next station is not finished, wait patiently until they are.

Be sure to write down as detailed a description as you can of the appearance of the flame with the sample. You will only have your description to identify the unknown substances – you will not be able to re-examine the samples. You will probably want to wait until you have seen all the substances before reaching a final conclusion as to which, if any, of the elements in the table below it contains.

Record your detailed descriptions on the Part 1 Data Collection sheet as you observe each test. You may want to make some preliminary guesses as to the element it contains. Once every group has completed a station, you may go back and retest a sample at that station if you wish. Take turns!

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Your Name: _____

Flame Test Lab – Part 1 Data Collection

Your Partners: _____

Start with an initial observation of what the flame looks like with just the wire and no sample!

Sample	Detailed Description
Wire only	
A	
B	
C	
D	
E	
F	

G	
H	
I	
J	

Physical Science**Group:** _____**Flame Test Lab – Part 1 Control Analysis**

For each sample, you now need to come up with your best conclusion as to which element it contains, or if it contains “none” of the six. And, you must state your confidence in your conclusion; this will determine your score on that sample as follows:

Confidence	Correct	Incorrect
Positive	+10	-10
Sure	+6	-6
More likely than not	+4	-4
Best guess	+2	-2
No idea	0	0

Sample	Element or “none”	Confidence
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		

Physical Science**Group:** _____**Flame Test Lab – Part 2 Unknown Substance Analysis**

Now comes the tough part! Using your descriptions from Part 1, test each of the samples labeled 1, 2, 3, 4, 5, and 6 and try to identify which element it contains. To make this part a little easier, all of these samples do correspond to one of the eight elements from Part 1; however, more than one sample could be the same element, and so it is possible that not every element is represented in one of the unknown samples. The same scoring applies as in Part 1:

Confidence	Correct	Incorrect
Positive	+10	-10
Sure	+6	-6
More likely than not	+4	-4
Best guess	+2	-2
No idea	0	0

Sample	Element or "none"	Confidence
1		
2		
3		
4		
5		
6		

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Flame Test Lab – Conclusions

Your Name: _____

Your Partners: _____

1. What made the lab difficult? List and explain at least three specific things:

1.

2.

3.

2. What techniques did you develop as you did more and more flame tests to get the best results?
You should be able to list at least three specific things.

1.

2.

3.

3. Using Bohr's model of the atom, describe how a flame test allows you to identify the presence of certain elements.

4. Which elements are you able to identify confidently based on this test? Why?

5. Which elements are you not able to identify confidently based on this test? Why?