

Ion Flame Test Inquiry

I. Pre-lab

A. Purpose: To determine what part of a compound in household products is responsible for flame color in a flame test.

B. Determining the Independent and Dependent variables:

1. The Independent variable in this experiment is

_____.

2. The Dependent variable in this experiment is

_____.

C. Write a problem statement:

1. How will the _____ (I.V.)

effect the _____ (D.V.)?

D. Decide on a hypothesis using the If/then format:

1. _____

_____.

II. During Lab:

A. The experiment:

1. Place a small amount of the solid compounds on an evaporating dish.

2. Add 2 mL of methanol to dissolve the solid.

3. Light a match and ignite the methanol.

4. Watch the flame color and observe any changes from the control.

B. Data and Observations

Household Product	Compound Formula	Positive Ion	Negative Ion	Flame test color	What ion causes color?
Control ??		None	None		None
Antacid tablets	CaCO_3		CO_3^{-2}		
Eyewash	H_3BO_3	None	None		
Plaster of Paris	CaSO_4		SO_4^{-2}		
Cream of Tartar	$\text{KC}_4\text{H}_5\text{O}_6$		$\text{C}_4\text{H}_5\text{O}_6^{-1}$		
Epsom salt	MgSO_4		SO_4^{-2}		
De-icer	CaCl_2		Cl^{-1}		
Salt substitute	KCl		Cl^{-1}		
Detergent booster	Na_2CO_3		CO_3^{-2}		
Table salt	NaCl		Cl^{-1}		
Other compounds tested:					
	BaCl_2				
	SrCl_2				
	LiCl				
	CuCl_2				
	CsCl				
Unknown 1	?				
Unknown 2	?				
Unknown 3	?				
Unknown 4	?				

III. Post-lab questions:

- A. Why is it important to test the flame color of the methanol without any compounds dissolved in it?
- B. Do the positive ions or the negative ions cause the change in flame color? Explain why based on your observations.
- C. Which of the compounds would be a good choice for making purple fireworks? What about green fireworks?

CHALLENGE QUESTIONS:

- D. Potassium gluconate (formula = $K^+C_6H_{11}O_7^-$) produces a light purple flame. Copper (II) sulfate (formula = $Cu^{2+}SO_4^{-2}$) produces a green flame. What flame color would you expect for copper (II) gluconate (formula = $Cu^{2+}[C_6H_{11}O_7^-]_2$)? Explain.
- E. How could you tell the following three white artificial sweetner powders apart using the flame test? You have:
 1. Equal ($C_{14}H_{18}N_2O_5$, a non-ionic compound)
 2. Ace-K ($K^+C_3H_4NO_4S^-$)
 3. Sweet 'N Low ($Ca^{2+}[C_7H_4NO_3S^-]_2$).
- F. Boric acid is a molecular, non-ionic compound. Based on its flame test there is a color observed, but is this due to positive ions or negative ions? Why?

***TURN IN THESE ANSWERS IN ON A SEPARATE SHEET OF PAPER BY JANUARY 15th, 2008 TO WIN A PRIZE FOR CORRECT ANSWERS.