Revised August 2011

AP LAB 3b: Flame Tests

Aim To observe the flame colors of some metal ions

Apparatus Wooden splints, Bunsen burner, 250 mL beaker

Chemicals Solutions of sodium chloride, copper (II) chloride, potassium chloride, calcium chloride, strontium chloride, lithium chloride plus one "unknown" solution, water, blue glass

Method

1. Collect a wooden splint from one of the beakers.
2. Half-fill a 250 mL beaker with water.
3. Without burning the wood, hold the soaked end of the splint on the extreme edge of the roaring flame of the Bunsen burner. Move the splint back and forth through the flame.
4. Record the flame color that you observe in the results table.
5. Extinguish the splint in the water bath.
6. Repeat steps 1 through 5 for the remaining solutions.

Tips:

(i) Be very careful not to cross contaminate between solutions. If you do you will not be able to distinguish clearly between the colors produced.

(ii) View the potassium flame test through the blue glass provided.

(iii) You must observe the colors **BEFORE** the wooden splint starts to burn. When it starts to burn it will produce an orange flame that will obscure the color imparted to the flame by the metal ions.

Results

Solution	Flame Color
sodium chloride	
copper(II) chloride	
potassium chloride	
calcium chloride	
strontium chloride	
lithium chloride	
UNKNOWN	

Conclusion/Calculation

Read the following paragraph below before answering the questions that follow.

> *The normal configuration of the electrons about the atom or ion of an element is called "the ground state". The electrons of this stable particle are at their lowest possible energy level. However, when these stable particles are heated to very high temperatures, some of the electrons leave their "ground state" and become "excited"; that is, these electrons move to a higher energy level. They do so by absorbing heat energy. This "excited" state is unstable and the tendency of these "excited" electrons is to return to their "ground state". As these electrons return to the "ground state" they release the absorbed heat energy in the form of electromagnetic energy. Some of this released energy falls in the visible light region of the electromagnetic spectrum. The energy released in this region of the spectrum will be in the form of visible light possessing color. A red color light possesses low energy, while a violet color light possesses high energy. The color of the visible light released can confirm the identity of an element. This technique of confirmation is called a flame test. Metallic atoms and ions possess electrons that are easily "excited". This being the case, the flame test is a quick, simple technique to help identify a particular metal.*

1. From your results which substances were more difficult to distinguish from one another and explain why it was so?

2. Based on your results, which metal ion was most likely present in the unknown solution?

3. Identify two things that people may have done incorrectly that would have caused them to get totally different answers from the rest of the class. Be specific about what might have been done.

   (i)

   (ii)

4. Will an electron stay in an excited state without outside energy (e.g. a flame)? Explain.

5. Green light has a wavelength of around 485 nm. How much energy does a photon of green light possess?