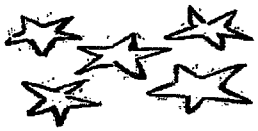
JHS Regents Chemistry Laboratory

IDENTIFICATION OF THE ELEMENTS



Introduction:

The normal electron configuration of atoms or ions of an element is known as the ground state. In this most stable of energy states, all electrons are in the lowest energy levels available. When atoms or ions are heated to high temperatures, they enter an excited state. In an excited state, the electrons have absorbed enough energy to "jump" to higher energy levels. Electrons in a higher energy state are unstable and the excited electrons "fall back" to their ground state. When returning to the ground state, an electron must give off or emit the energy that was absorbed. This energy is released in the form of visible light. The observed colors or spectrum of the substance is caused by different sets of visible wavelengths of light emitted. Since each element emits a unique set of wavelengths, emission spectra can be used as a tool to identify the elements.

One method used to demonstrate the emission spectrum of a substance is the flame test. Using this method, a small amount of a substance is heated and the characteristic glow is observed. In this part, several metallic salts will be burned in a flame and the characteristic color will be noted.

Another method used to demonstrate the emission spectra of a substance is the use of gas tubes in a power source. When atoms of an element in the gaseous state are excited with an electric current, the vapor will glow brightly. When the light is viewed through a spectroscope, the light separates into its unique bright-line spectrum. This spectrum is said to be the "fingerprints" of the elements because no two elements have the same bright-line spectrum

CAUTION:

- Follow instructions exactly
- Wear goggles over eyes.
- Long hair must be pulled back.
- Bunsen burner cannot be left unattended.
- Do not burn the wooden splints completely; just burn enough to get the characteristic color.
  Signed: _____
- Sinks are to be free and clear of any garbage. Dated: _____

Procedure

PART A: FLAME TEST

1. Obtain one wooden splint for each test salt. The sticks have been soaked in a solution of the metallic salt. Test them one at a time.
2. Place the splint into the hottest part of the flame.
3. Note and record the color of the flame in the data table.

Metal	Flame test color (Describe in detail)
Lithium	dark red
Strontium	Bright Red
Copper	blue/green
Barium	yellow/green
Sodium	orange
Calcium	red orange
Potassium	yellow orange
Unknown	

PART B: SPECTRAL LINE IDENTIFICATION

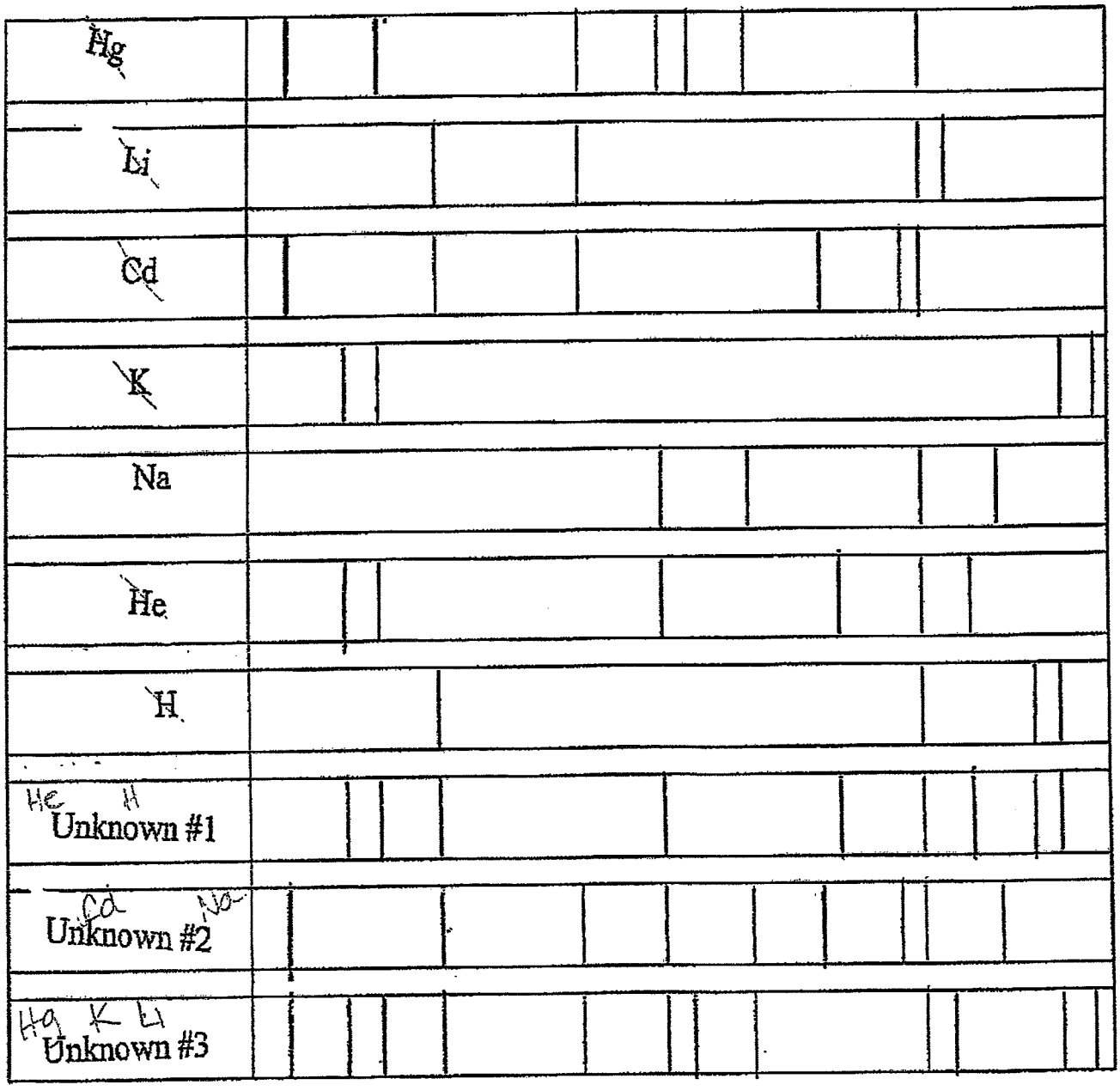
1. Use the spectroscope to view the following list of light sources.
2. Draw the spectral lines seen for each element taking care to separate the colors or lines as you see them. Use the color guide to place your lines appropriately. Be sure to show bright-line spectra for the elements and continuous spectra for the white light.

Continuous Spectrum:	V i o	B l u	G R E	Y E L	O R A	R E D
Element:						
Element:						
Element:						
White Light						
Sunlight						

Answers will vary - you can check spectral lines of each element on website @ "spectral lines" link

PART C: ATOMIC FINGERPRINTS

1. Below are the bright-line spectra for 7 elements.
2. Use these given spectral lines to determine the elements present in the 3 unknown substances.
3. Remember that all of the lines must be present in the spectrum of the unknown substance for the substance to be identified positively.



Elements that are identified in the unknown substance

Unknown	Elements present in the unknown
#1	H & He
#2	Cd & Na
#3	Hg K & Li

Name: _____ Period: _____

QUESTIONS AND CONCLUSIONS:

1. Explain the difference between the ground state and the excited state of an atom.

ground state - e^- in original state of energy
excited state - e^- jump up to higher energy levels

2. List and explain two methods used to excite atoms of an element.

heat } both provide energy for e^- to become
electricity } excited.

3. What difficulties may be encountered using the flame test method for identification of elements?

many of the flame colors are simlar making it hard to distinguish

4. What are spectral lines and how are they formed?

Spectral lines are due to the release of energy when excited e^- fall back to ground state. The energy released is in the form of colored light

5. Why do some elements have more than a few spectral lines?

due to the greater # of e^- transitions that occur. More e^- in an atom = more excited state possibilities

6. Why is bright-line spectra referred to as the "fingerprints of an element"?

each element has a distinctive spectral pattern unique only to that element.

7. How is it that astronomers know what gases are burning in the stars?

match the spectral line samples of gases to those present when looking at stars through a spectroscope.