Laboratory Investigation Name _____

Chemistry: Form L2.4A Date _____ Period _____

Observing Bright Line Spectra

PROBLEM

What evidence indicates that electrons move around the nucleus in definite pathways?

INTRODUCTION

The quantum model of the atom, proposed by Niels Bohr in 1913,suggests that electrons move around the nucleus of the atom in definite pathways. The further the electron's path is from the nucleus, the more energy the electron has. The electrons path is called an energy level. Electrons can move to higher energy levels if they pick up enough energy, but they cannot be found between energy levels. Bohr reached this conclusion by examining the light given off by electrons as they fell from high energy levels back to their natural ground state. White, light can be separated into different colors as in a rainbow. Different colors of light have different energies. A rainbow has all the colors or energies of light in the visible spectrum. In this laboratory exercise, you will use a spectroscope to examine the light given off by several tubes of gas, each containing the vapor of a pure element. You will see what Bohr saw that led him to his conclusion.

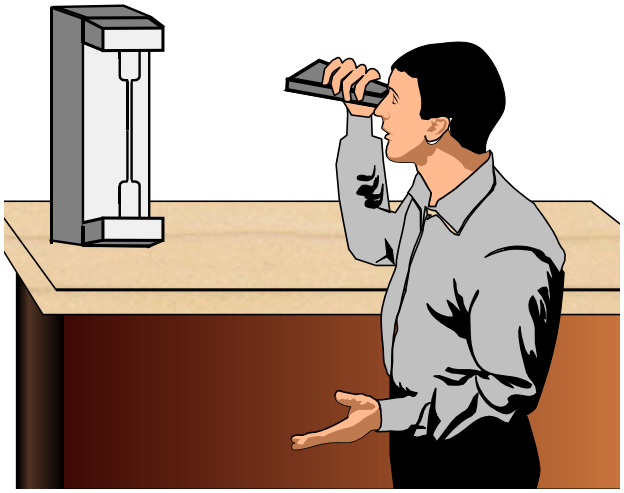
MATERIALS *(per group)*

Gas tubes; power supply; spectroscope

PROCEDURE

1. Examine a source of white light through a spectroscope. Look around in the spectroscope until you find the spectrum (a rainbow of colors). Turn your slide so the spectrum extends to both sides of the light source rather than above and below.

2. Your teacher will put gas tubes into the power supply and turn them on for you. Use the spectroscope to examine the spectrum emitted by the gas.



3. In the space provided on the next page, write the name of the gas. Then draw lines representing the line spectra you observed. Put the lines in the order - Red, Orange, Yellow, Green, Blue, Indigo, Violet.

4. Repeat the procedure in steps 2 and 3 for each tube of gas.

OBSERVATIONS

Name of Gas _____ R O Y G B I V	Name of Gas _____ R O Y G B I V	Name of Gas _____ R O Y G B I V
Name of Gas _____ R O Y G B I V	Name of Gas _____ R O Y G B I V	Name of Gas _____ R O Y G B I V
Name of Gas _____ R O Y G B I V	Name of Gas _____ R O Y G B I V	Name of Gas _____ R O Y G B I V

CONCLUSIONS

1. Do the electrons of the elements you examined give off all the colors of light in the visible spectrum? Why or why not? _____

2. What evidence indicates that electrons move around the nucleus in definite pathways? _____

3. Each element has its own characteristic bright line spectra (the arrangement of lines you saw as opposed to the complete spectrum). Why do you think this is so? _____

4. Helium was discovered on the sun before it was discovered on earth. How? (*HINT: The atoms in the sun are so hot, their electrons are constantly jumping up to higher energy levels and falling back down.)* _____