Chemistry Name: _____

Section _____ SPECTRA AND QUANTA Date: _____

Spectra and Quanta Lab Lab #10

Pre-Lab Discussion:

In 2008, Swedish scientists made a movie of an electron riding a light wave. (See a YouTube at https://www.youtube.com/watch?v=ofp-OHIq6Wo). It was the first direct image of an electron. Even so, it is still very difficult to imagine or know what an electron is like or what it is doing in an atom. The best evidence we have is still the spectra of the elements which tell us information about which electron shell or energy level electrons are moving too and from. Here are a few key words to help us understand something about electrons and their movements within an atom:

electron: _____

_____

ground state: _____

_____

excited state: _____

_____

quanta (quantum, singular): _____

_____

When excited electrons relax toward the ground state (drop back to lower energy levels), they emit or release energy in the form of a specific wavelength (or frequency) of light (an exact color of light). Viewing such emission of light through a spectroscope shows the spectrum or the spectral lines of that element. These lines act like a fingerprint which can be used to identify the element.

Research Question:

How do bright-line spectra form? What do they represent?

Materials and Equipment:

Power source
Spectroscopes
Spectral tubes of H_2, He, Ne, Ar, Kr, N_2, O_2, H_2O, I_2

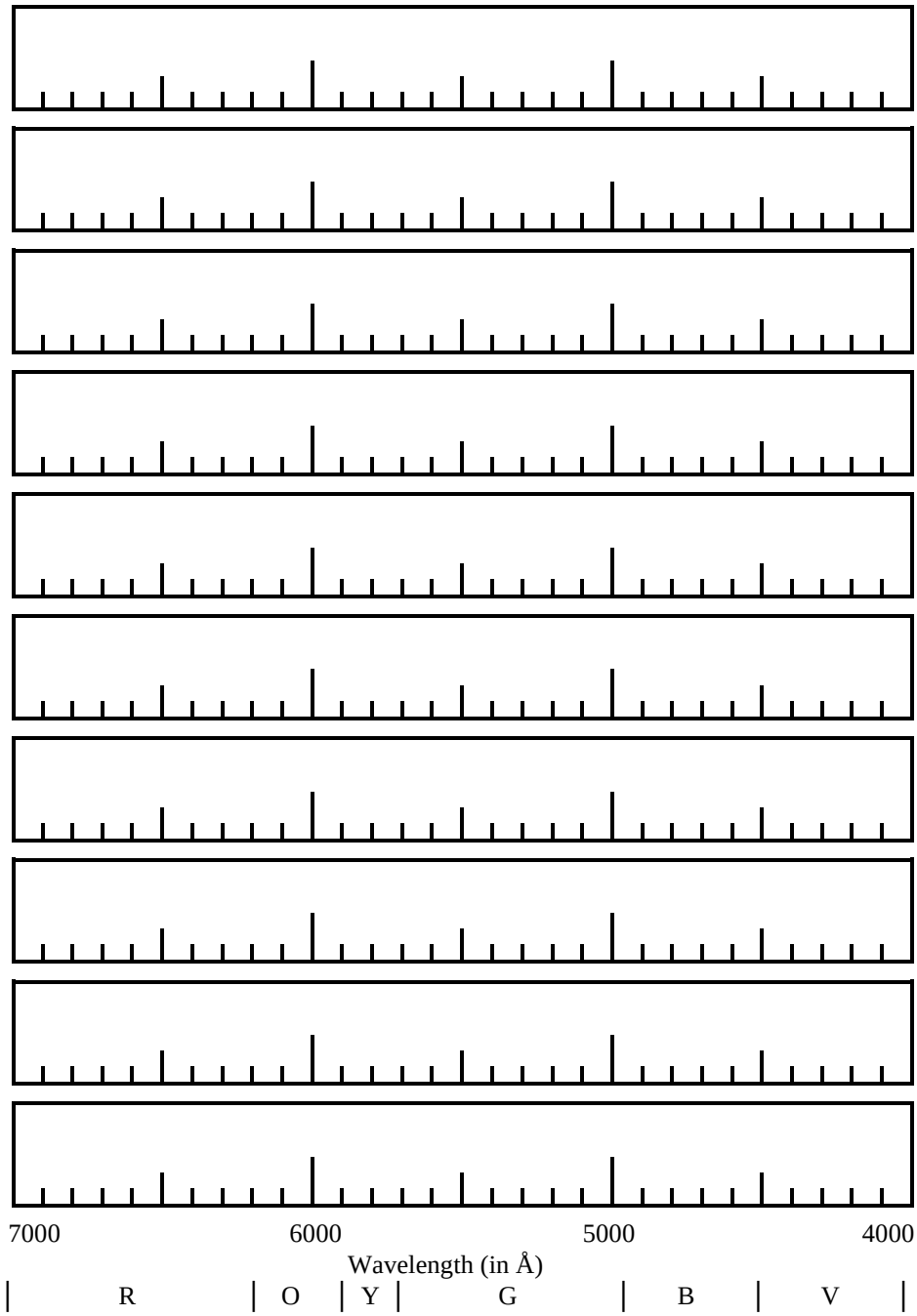
Method:

1. Observe a continuous spectrum by pointing a spectroscope out a window at the sky.
2. Record the colors in order of appearance on the Data Table. (Example: VBGYOR)
3. Observe the spectrum of Ba^{++} and record the colors on the Data Table by drawing a line at the approximate location of each of the brightest lines in the spectrum.
4. Repeat for all the known samples (or standards).
5. Observe the spectrum of unknown #3 and record is spectrum and identity.

Data Collection and Processing:

Data Table

Ion Tested	Tube Color	Spectrum
sky	continuous	
H_2	_____	
He	_____	
Ne	_____	
Ar	_____	
Kr	_____	
N_2	_____	
O_2	_____	
H_2O	_____	
I_2	_____	



Conclusions and Evaluations:

1. What does a spectroscope do to light? _____

   _____

2. How are bright-line spectra produced?

   _____

   _____

3. How many bright-lines did hydrogen have? _____

   Are the number of lines equal to the number of electrons in an atom? Explain. _____ ,

   _____

   _____

4. How are quanta related to bright-line spectra? _____

   _____

   _____

5. Is it better to use flame tests or spectra to identify elements? Explain. _____

   _____

   _____

Applications:

1. What did YOU (personally) learn?

   _____

2. How can any idea, principle, or activity in this lab be used in the real world?

   _____

   _____

   _____