Name:____ Date:__________________ Period:________

Spectra Lab- Day 2… Improving Results

Engage: We just completed the spectra lab in class. We used the same tools (spectroscopes) and looked the same samples of gas lamps. ***If everything was the same, why didn't we all get the same data written down on our paper?*** ____

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In science, it is an important part of the scientific method process to be able to be able ***to repeat the same experiment and get the same results***. With about thirty people in class who all got slightly different results, our experiment would not meet this requirement. Does that mean there is something wrong with the patterns we saw? **NO!!!…** What it tells us is that we need to work on is our ***methodology***… the steps we took as well as the equipment we used in the lab.

Explore: Instead of relying on their eyes to accurately write down the patterns, scientists rely on better equipment that uses a computer to analyze the patterns. In the real world, scientists use an emission spectrophotometer and optical cables to collect and analyze the data.

Do an internet search for "***how does an emission spectrophotometer work***" and jot notes down here.

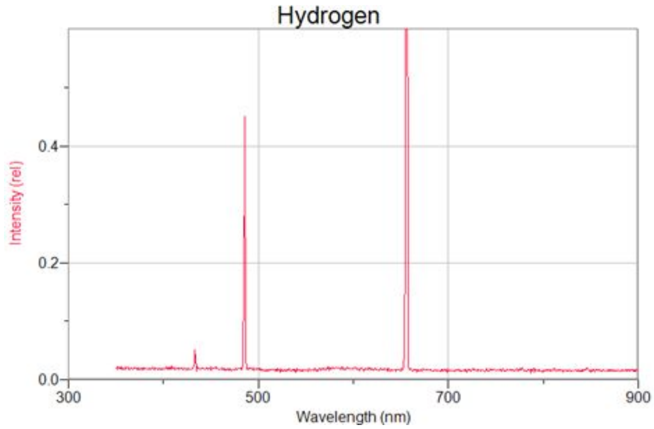
An **optical cable** will act just like our eyes or a lens to collect the light and transfer it to the spectrophotometer.

Today we will use an **emission spectrophotometer**. When electricity flows through the gas tube, it causes the electrons to jump to a higher energy level as Bohr described.

When the electron is ready to go back to where it belongs in ground state, it releases that extra energy as a photon of light. The optical cable detects the photon, carries it to the emission spectrophotometer. There the photon goes through a ***diffraction grating***, to separate the light based on energy level. The spectrophotometer then organizes the energy of the photon by wavelength and a computer will show the data as a graph instead of a "rainbow bar code."

The wavelengths of where the peaks are are the same as you should have seen with the spectroscope. However; the height of the peak of the peak (the y axis on the graph or how tall it is) tells us not only how much of the molecule there is, but corresponds to how bright the band was in the "rainbow bar code".

When you saw wide bands on the "rainbow bar code" that means that there were several peaks on the graph that were so close together that you can't see any space between them.
On the next page are four graphs that were obtained using the spectrophotometer and the optical cable. Write two observations down based on the graph and practice how to take the graph the spectrophotometer gives us and to translate it into the rainbow bar codes we are used to.

<table>
<tr><th>Spectrophotometer Graph Spectrum</th><th>“Rainbow Bar Code” Spectrum</th></tr>
<tr><td>
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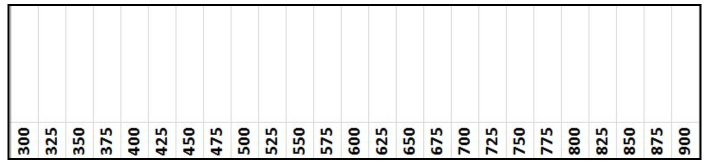
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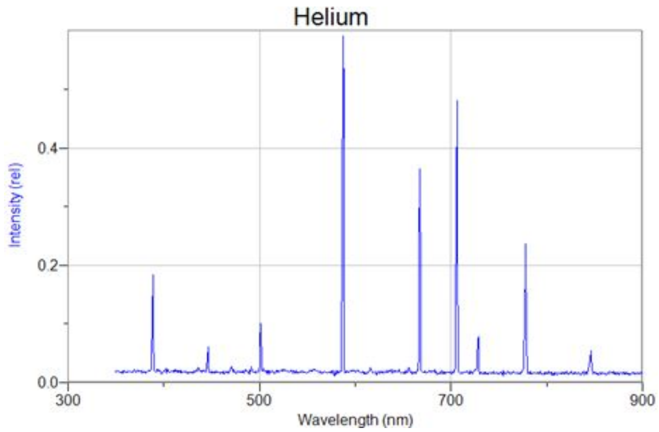
<tr><td>
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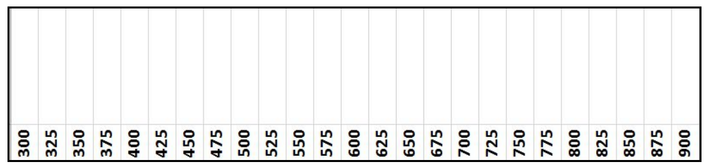
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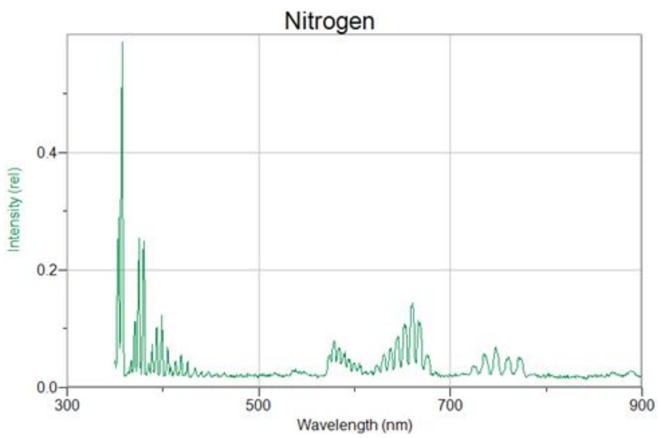
<tr><td>
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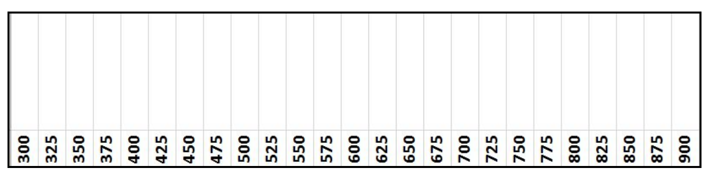
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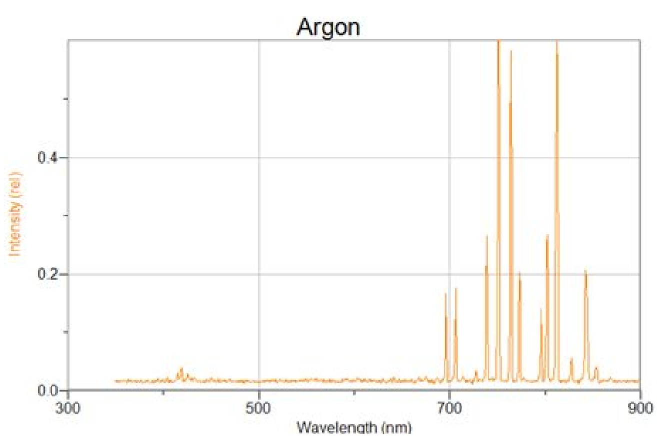
<tr><td>
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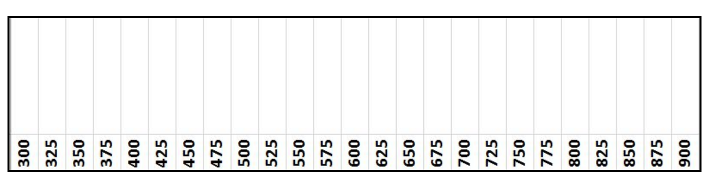
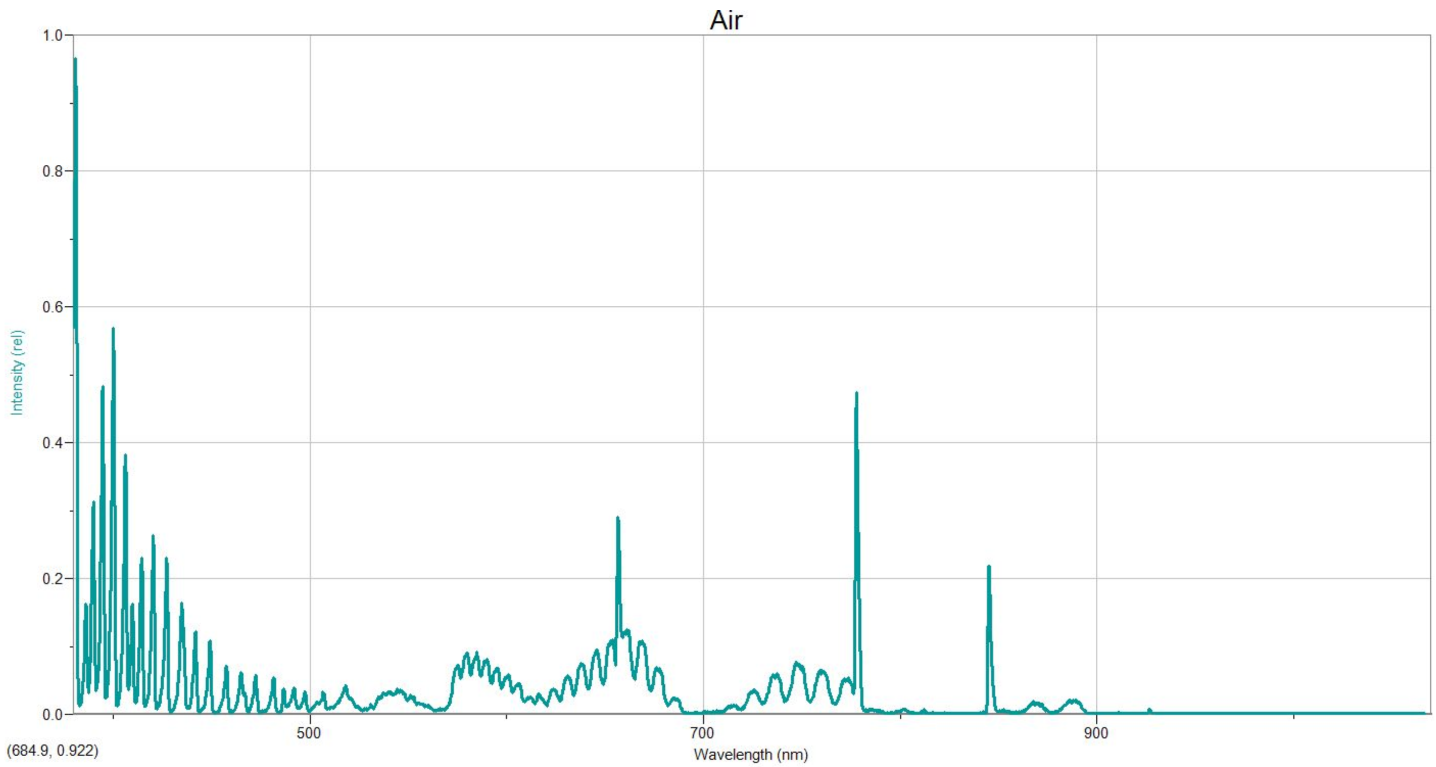

</td></tr>
</table>

Explain: Summarize how you can translate the graphs from the computer into the “rainbow bar codes”.

Extend/Elaborate*:* We were able to use the equipment to study a sample of air. The graph from the spectrophotometer is below.



Write at least 3 observations about the graph:

Evaluate: We know that air is a mixture of different gases. Using the 4 graphs of individual gases as a reference make a claim to say what gases are present in this sample of air. Use the evidence from the graphs (you may want to use the wavelengths!) and explain your reasoning.

Finally, is it possible that oxygen is in the sample of air? Use the graph of air as evidence to support your answer.