Investigating Stars Name:_____ Block:_____

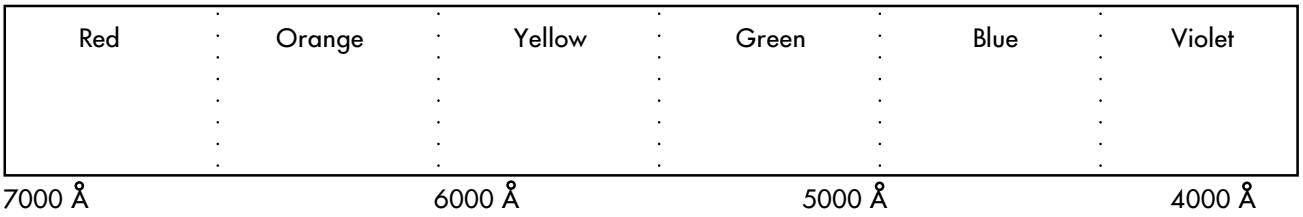
How Do We Analyze Light? **E2:A1**

Light carries information about the physical nature of the universe. By separating the electromagnetic radiation received from distant objects into its component wavelengths— similar to the way a prism splits white light into a rainbow—astronomers are able to study patterns that reveal information about that object's color, temperature, and composition. In this activity, you will learn about how light is analyzed using a technique called spectroscopy.

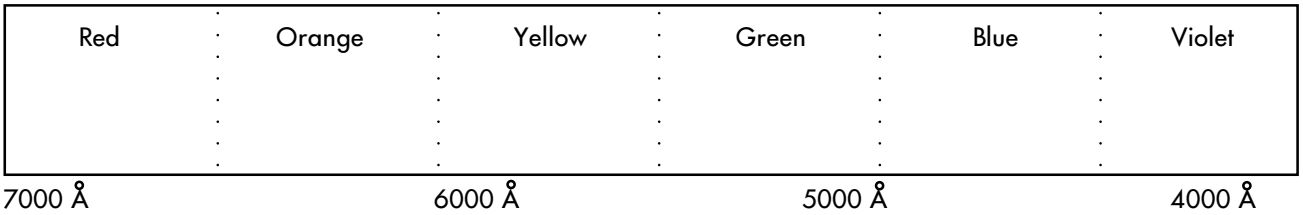
Part 1: Investigating Spectra

1. Read FYI: *Breaking Up Light With A Diffraction Grating*. Complete the reading guide and questions after reading. When everyone has completed this, go on to #2.

2. Use a spectroscope or a diffraction grating to observe the light emitted by an <u>incandescent light bulb</u>. Draw what you see by making a vertical mark by the colors you observe. Try to record wavelengths if you use a spectroscope. (Note: $7000\text{Å} = 700nm$)

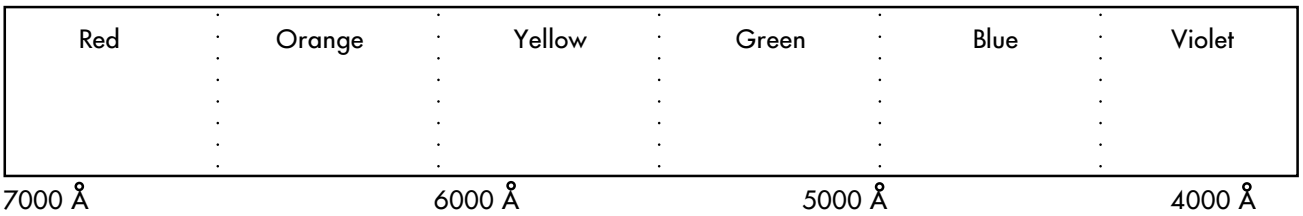


3. Now use your spectroscope or diffraction grating to observe the light emitted by the <u>overhead lights in your classroom.</u> Draw what you see by making a vertical mark by the colors you observe. Try to record wavelengths if you use a spectroscope. (Note: $7000\text{Å} = 700nm$)



4. Predict what you would see if you were to use your spectroscope or diffraction grating to observe the light emitted by a <u>fluorescent light tube</u>.

5. Now use your spectroscope or diffraction grating to observe the light emitted by a <u>fluorescent light tube.</u> Draw what you see by making a vertical mark by the colors you observe. Try to record wavelengths if you use a spectroscope. (Note: $7000\text{Å} = 700nm$)



6. What differences do you notice in the three spectra above?

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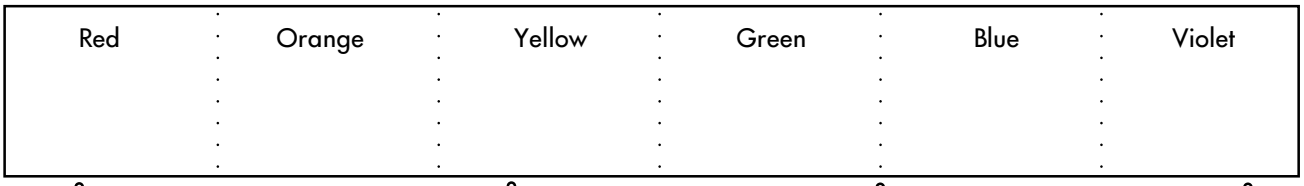
7. Read FYI: *Spectral Lines*. Complete the reading guide and questions after reading. When everyone has completed this, go on to Part 2.

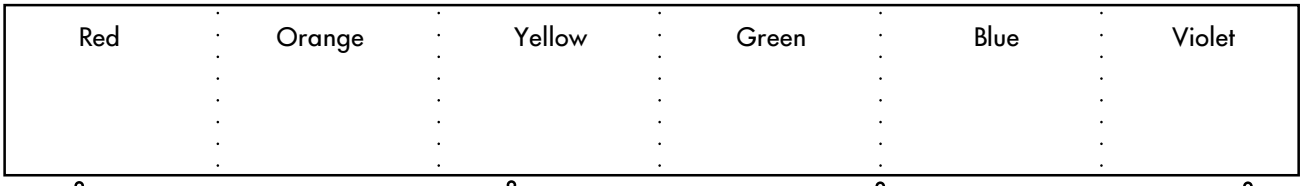
Part 2: Identifying Mystery Gases

Directions: Observe and record using your spectroscope the spectrum for each mystery gas tube. Then use the *Spectra Reference Chart* to identify what element is in each tube.

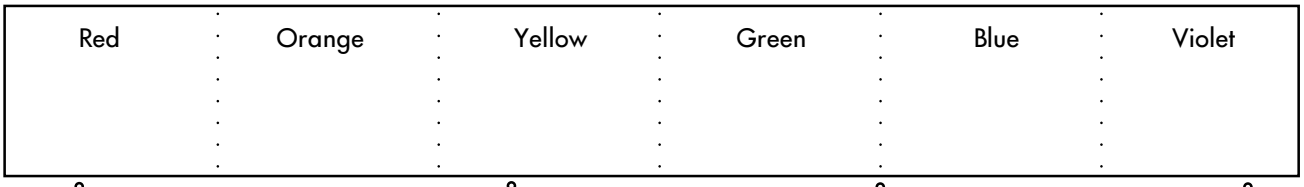
1. Mystery Gas Tube #1: _____



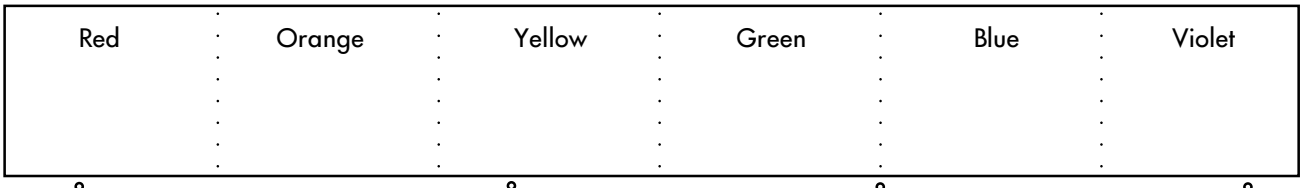
2. Mystery Gas Tube #2: _____



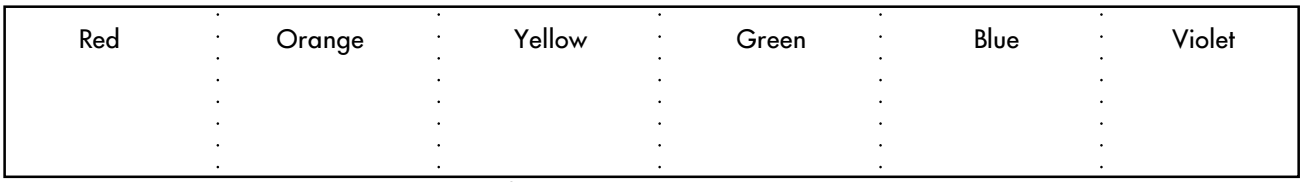
3. Mystery Gas Tube #3: _____



4. Mystery Gas Tube #4: _____



5. Mystery Gas Tube #5: _____



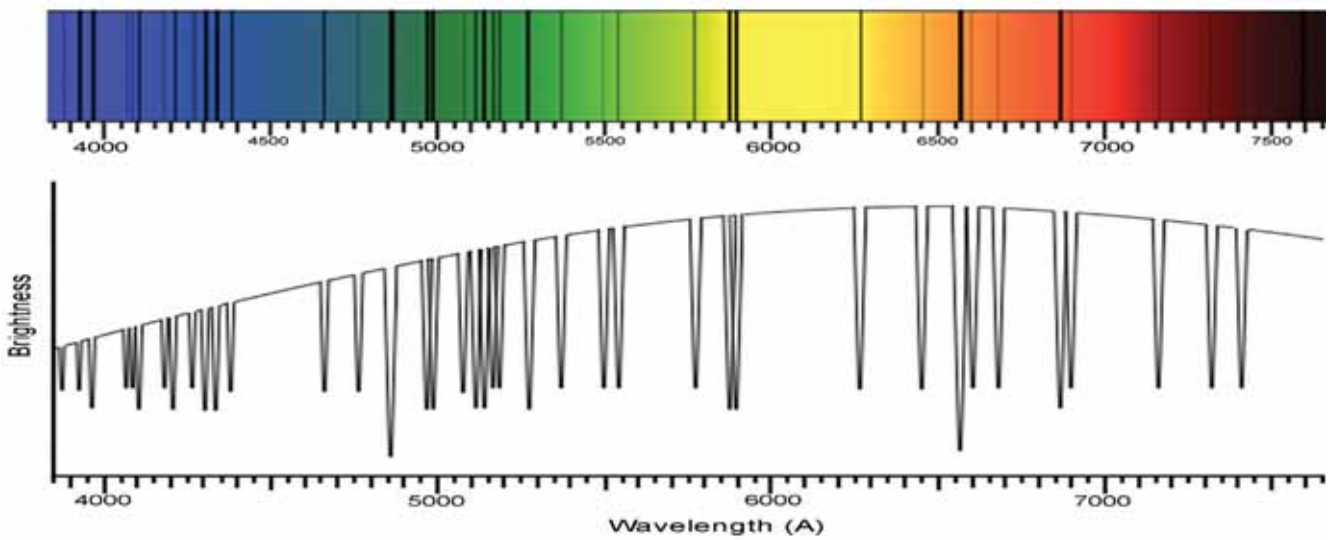


Figure 4-5: Image and graph of the solar spectrum. The solar spectrum is composed of thousands of individual absorption lines that can be used to identify the elements in a star. We can represent absorption lines graphically by plotting their brightness (or lack of) vs. wavelength.

The actual absorption spectrum of the sun has thousands of lines. Each line is part of a pattern of lines that is unique to one of the 92 elements in the periodic table.

Fig 4-6: A more detailed image of the solar spectrum

Can you identify elements in the solar spectrum?

Access the Spectral Catalog using the link on the *Investigating Tools of Astronomy*
https://ia.terc.edu/spectral_catalog.html

Click on each element and match the pattern of lines to your drawing to identify as many elements in the solar spectrum (Figure 4-6) as you can.

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Spectra Reference Chart