

Emission (Bright Line) Spectra

Lab Activity

Learning Target

Explain what causes atomic emission spectra.

Gaseous atoms may be “excited” by passing a strong electric current through them. Such excited atoms give off visible light of different colors. When observed through a spectroscope, the light emitted by each element can be found to consist of a specific pattern of colors (wavelengths of light).

A **continuous spectrum** is observed if all of the colors of the visible light spectrum are present in an uninterrupted band with all wavelengths between about 400 and 700 nanometers ($1 \text{ nm} = 10^{-9} \text{ m}$). White light, such as that produced by an incandescent light bulb, will produce a continuous spectrum.

Most pure elements emit a **discontinuous spectrum**, characterized by narrow lines of color at specific wavelengths. This discontinuous spectrum is known as the **bright-line spectrum** or **emission spectrum** of an element. The bright-line spectrum for each element is unique and can be used to identify that element.

In this lab you will observe and sketch emission spectra for several known elements. You will then observe an unknown light source and use elemental spectra that you have already drawn to identify it.

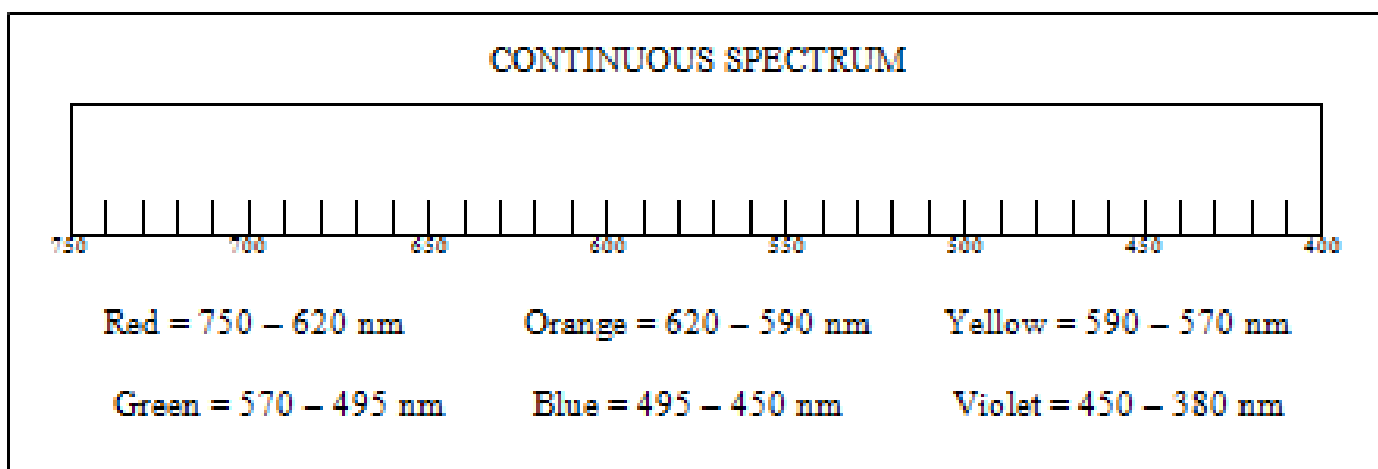
How Do Gas Discharge Tubes Work?

Procedure:

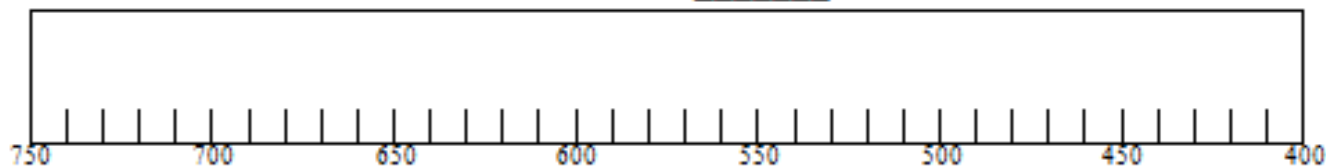
1. Use colored pencils to lightly shade in the continuous spectrum section using the key provided.
2. Observe the various light sources that are set up throughout the classroom. At each station, write down which element you are viewing. Then draw the bright-line spectrum in the space provided. If there are portions of your spectra that are continuous, indicate that with gentle shading, being mindful that your goal is to find and draw the brightest lines that can be identified.

Note: Each number in the spectroscope represents 100 nm (1 nm = 10^{-9} m).

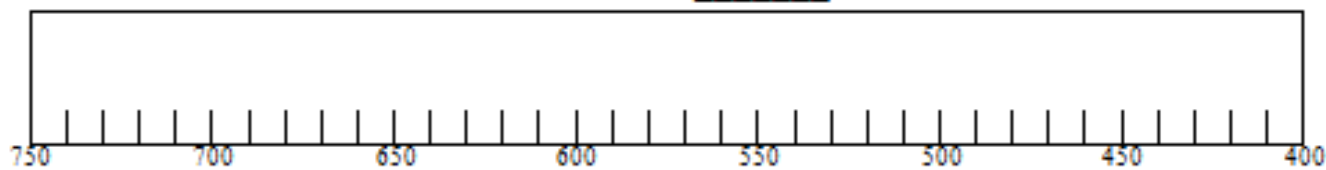
3. View the unknown and identify it by comparing the brightest lines it emits to your spectra of known elements.



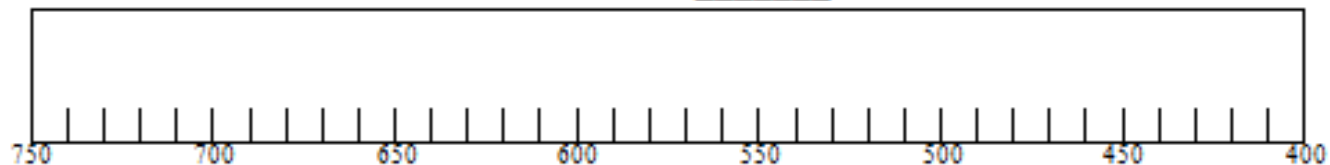
ELEMENT: _____



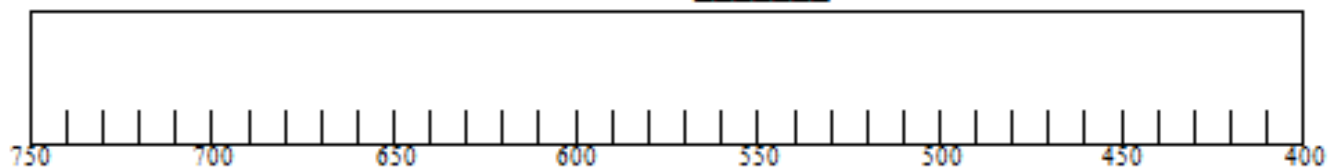
ELEMENT: _____



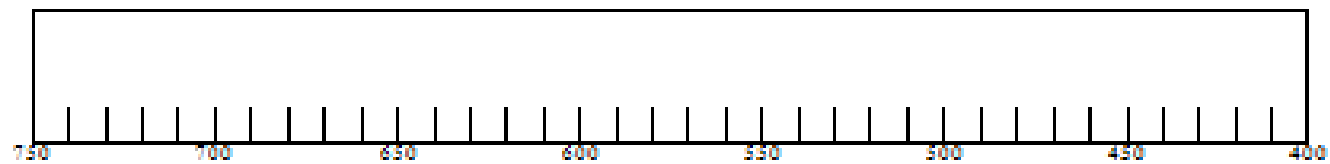
ELEMENT: _____



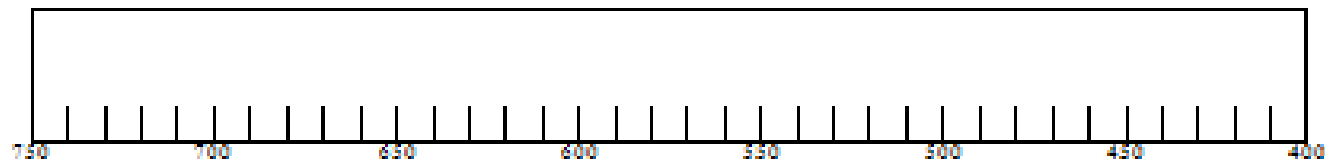
ELEMENT: _____



UNKNOWN



UNKNOWN



Questions:

1. What part of the electromagnetic spectrum are you observing in this experiment?
2. What is the identity of the unknown element?
3. Tell the whole story of an electron in this lab, starting with it in its ground state.

Draw a picture (using energy levels) to illustrate your story.

Why do you see specific lines and not a continuous spectrum?

4. How can emission spectra be used in chemical analysis? (How might a chemist use emission spectra in a lab?)