

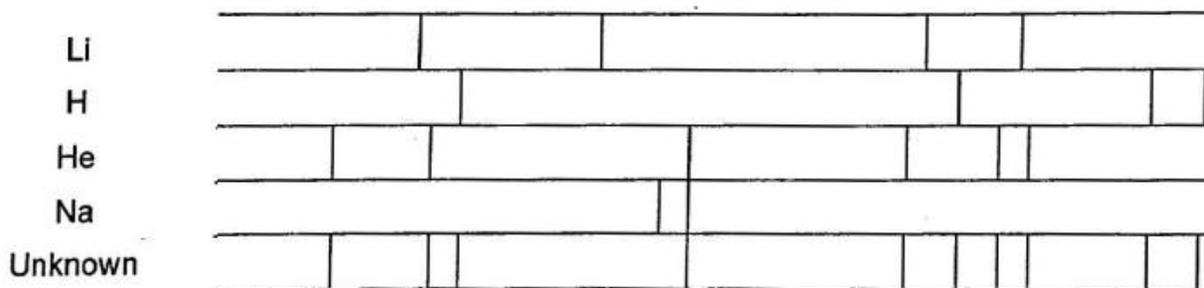
J2.1 Analysis of Spectral Lines

Why?

Many devices give off visible light when heated or when an electric current is passed through them. Everyday examples include light bulbs, stove and toaster oven elements, and neon signs. Visible light may be separated into individual colors of light by passing the light through a prism or a diffraction grating (which may be found in a spectroscope). White light and sunlight consists of all the colors of the rainbow, but the light given off by an excited element consists of light of specific colors. A display of the different colors is called an *emission spectrum* of the element. Just like fingerprints can be used to identify an individual, an emission spectrum can be used to identify the presence of an element.

Problems:

- Below are the bright line spectra of four elements and the *emission spectrum* of an unknown gas.



- Color code the vertical lines above. Each element should be its own unique color.
- Which elements are in the unknown?

- Why are you able to exclude the presence of the other elements?

- Young stars are mostly hydrogen with a small abundance of helium and other elements. Is the unknown a likely spectrum for a young star? Explain your answer.

- In a forensic investigation, it was suspected that a toxic chemical, which contains the element copper and accumulates in large amounts in hair as well as other tissues, poisoned the victim.
 - Using your knowledge of *emission spectra*, design a method by which you can confirm the presence of this toxin in the victim.
 - Include the resources and equipment would you need to make a definitive determination.