NAME DATE CLASS

Chapter 21

LABORATORY MANUAL

• Spectral Analysis 60

The photograph of the spectrum of a star, sorted by color across a plate, will reveal spectral lines upon close examination. The lines are produced by elements in a star at high temperature. These lines represent the chemical composition of the star. Each element has its own "fingerprint." To analyze the spectra of stars, scientists collected spectra of all the known elements. If we compare the spectral lines of an unknown star with the spectral lines of elements, we can determine the chemical composition of the star. More recently, we have discovered not only the composition of the stars but also their temperatures, their rotational rate, and their relative motion with regard to Earth.

Strategy

You will construct a simple spectral analyzer.
You will determine the composition of a star using the spectral analyzer.
You will determine other characteristics of a star by comparing the spectral lines with a standard.

Materials

page 153 of this book
scissors

Procedure

1. Cut out pull tab card found on page 153, spectroscope fingerprints card, and Stars B, C, and D along the dashed lines.
2. Make 5 slits along the dashed lines A, B, C, D, and E on the fingerprints card.
3. From left to right, insert "Pull Tab Out" up through slit E, down through slit D, up through slit C, down through slit B, and up through slit A.
4. Keeping the sodium doublets aligned, compare the lines of each known element with the lines of Star A. If lines match, then that element is present in Star A. Record your findings in Table 60-1.
5. Star B, Star C, and Star D are provided for further study and comparison. Each can be placed over Star A.

Data and Observations

Table 60-1

Star	A Chemical Composition	B Other Characteristics
A		
B		
C		
D		

Questions and Conclusions

1. When we say that the neon colored lights look beautiful at night, what color comes to mind? _____ What color is suggested by the "fingerprints" of neon? _____

2. Did any of the stars have the same chemical composition? Look at column A of the Table.

3. Sometimes scientists see spectral lines that do not fit the usual pattern. The lines might be shifted from their usual positions. This may suggest that the star is moving either toward the observer (shift toward the blue) or moving away from the observer (shift toward the red). Look at the spectral lines for Star B and Star D. Star B is the standard for comparison. How is Star D different? What is a possible explanation for the difference? _____

4. If the scientist sees the spectral lines wider than usual, he or she relates this spectral broadening to either rotational speed (the broader the faster), temperature (the broader the hotter), or pressure (the broader the greater pressure). Look at the spectral lines for Star B and Star C. Star B is the standard. How is Star C different? What could be a possible explanation? _____

5. Fill out column B in Table 60-1.

Strategy Check

_____ Can you construct a simple spectral analyzer?

_____ Can you determine the composition of a star using the spectral analyzer?

_____ Can you determine other characteristics of a star by comparing the spectral lines with a standard?