

Teacher Guide: Star Spectra



Learning Objectives

Students will...

- Determine the elements that are present in the spectrum of a star.
- Use this information to infer the approximate temperature of the star.
- Classify stars.
- Use other aspects of spectra to find nebulae, variable stars, binary stars, giant stars, and other unusual stars.



Vocabulary

absorption spectrum, binary star, blueshift, Cepheid variable, emission spectrum, giant star, nebula, redshift, spectrum, star



Lesson Overview

Astronomers spend their time gathering information about objects that are trillions of kilometers away. One of the most useful ways to investigate a star is to look at its spectrum—the combination of colors found in its light. Every star has a unique spectrum that yields clues about the star's surface temperature, motion, and composition.

The *Star Spectra Gizmo™* allows students to examine simplified stellar spectra. After determining which elements are present in the spectrum, students can use the Harvard Classification Scheme to classify the star and estimate its surface temperature.

The Student Exploration sheet contains two activities:

- **Activity A** – Students find the elements present in stellar spectra, then classify the stars.
- **Activity B** – Students observe unusual characteristics in stellar spectra and match these traits to unusual stars.



Do the spectral lines match up?



Suggested Lesson Sequence

1. Pre-Gizmo activity: Flame tests

(🕒 10 – 20 minutes)

When heated, any element will release light in specific colors called an *emission spectrum*. You can observe these spectra by heating substances in the flame of a lab burner. First, obtain a variety of salts such as sodium chloride (NaCl), lithium chloride (LiCl), potassium chloride (KCl), calcium chloride (CaCl_2), barium chloride (BaCl_2), copper sulfate (CuSO_4), and lead nitrate ($\text{Pb}(\text{NO}_3)_2$). You will also need a Bunsen burner, clean wire loops (wet Q-tips work as well), and student spectrosopes (optional).

To perform a flame test, first light the Bunsen burner. Dip a wire loop in water, then in the test substance. Place the wire over the hottest part of the flame to see a bright color. Have students observe each flame both with the naked eye and through a spectroscope.

Star Spectra Gizmo Assessment Answers

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Star Spectra Gizmo Assessment Answers:

Spectroscopy Keith Robinson (B.A., Ph.D., F.R.A.S.), 2007 This text explains the physics and physical processes that cause the stellar spectra to be as they are Written specifically for amateur astronomers this book assumes only a basic knowledge of physics but looks in detail at many topics including energy levels in atoms the molecular spectra of red stars and emission lines in nebulae

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