



Name:

Date:

September 13, 2021

Student Exploration: Star Spectra

Directions: Follow the instructions to go through the simulation. Respond to the questions and prompts in the orange boxes.

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

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

1. What happens when light goes through a prism?

It is refracted by the different sides/angles of the prism, and is separated into rays of different colors.

This band of colors is called a **spectrum**.

2. A rainbow is an example of a spectrum. What is the sequence of colors in a rainbow?

Red, orange, yellow, green, blue, purple/indigo, violet

Gizmo Warm-up

The interior of a **star** produces a continuous spectrum of light, like a rainbow. Cooler gases in the outer layers of the star absorb certain wavelengths of light, causing dark lines to appear in the spectrum. The resulting **absorption spectrum** can tell astronomers a great deal about the star.



1. On the *Star Spectra* Gizmo, turn on **Show labels**. Select star 1 to see its absorption spectrum. How many lines do you see in the spectrum?

I see ten lines in the spectrum.

2. Drag the **Hydrogen** spectrum next to the **Star** spectrum so that the edges line up. Do some of the lines on the two spectra match up?

Yes, some of the lines on the two spectra match up.

3. Drag the **Helium** spectrum next to the **Star** spectrum. Do some lines match?

Yes, some match.

4. Try out the other available spectra. Do any others have lines that match?

No.

5. Which elements have contributed to the spectrum of star 1?

Hydrogen and helium.

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**American Association of Physics
Teachers**

A red circular graphic with a gradient, appearing as a partial circle or a thick arc, located to the right of the American Association of Physics Teachers text.

Student Exploration Star Spectra:

A History of Women in Astronomy and Space Exploration Dale DeBakcsy, 2023-05-31 For the last four hundred years women have played a part far in excess of their numerical representation in the history of astronomical research and discovery It was a woman who gave us our first tool for measuring the distances between stars and another who told us for the first time what those stars were made of It was women who first noticed the rhythmic noise of a pulsar the temperature discrepancy that announced the existence of white dwarf stars and the irregularities in galactic motion that informed us that the universe we see might be only a small part of the universe that exists And yet in spite of the magnitude of their achievements for centuries women were treated as essentially second class citizens within the astronomical community contained in back rooms forbidden from communicating with their male colleagues provided with repetitive and menial tasks and paid starvation wages This book tells the tale of how in spite of all those impediments women managed by sheer determination and genius to unlock the secrets of the night sky It is the story of some of science's most hallowed names Maria Mitchell Caroline Herschel Vera Rubin Nancy Grace Roman and Jocelyn Bell Burnell and also the story of scientists whose accomplishments were great but whose names have faded through lack of use Queen Seondeok of Korea who built an observatory in the 7th century that still stands today Wang Zhenyi who brought heliocentrism to China Margaret Huggins who perfected the techniques that allowed us to photograph stellar spectra and thereby completely changed the direction of modern astronomy and Hisako Koyama whose multi decade study of the sun's surface is as impressive a feat of steadfast scientific dedication as it is a rigorous and valuable treasure trove of solar data A History of Women in Astronomy and Space Exploration is not only a book however of those who study space but of those who have ventured into it from the fabled Mercury 13 whose attempt to join the American space program was ultimately foiled by betrayal from within to mythical figures like Kathryn Sullivan and Sally Ride who were not only pioneering space explorers but scientific researchers and engineers in their own rights aided in their work by scientists like Mamta Patel Nagaraja who studied the effects of space upon the human body and computer programmers like Marianne Dyson whose simulations prepared astronauts for every possible catastrophe that can occur in space Told through over 130 stories spanning four thousand years of humanity's attempt to understand its place in the cosmos A History of Women in Astronomy and Space Exploration brings us at last the full tale of women's evolution from instrument makers and calculators to the theorists administrators and explorers who have while receiving astonishingly little in return given us quite literally the universe *State of the Universe 2008* Martin A. Ratcliffe, 2008-02-01 The State of the Universe annuals provide an annual astronomy review suitable for the popular science level reader The 2008 annual covers the year's astronomical news on topics beyond the Solar System placing them in the context of the longer term goals of astronomers and astrophysicists around the world The book also includes web links for all major news stories providing a bridge between the public news stories and the actual research web sites *Exploration of*

the Universe George Ogden Abell,1969 **Abell's Exploration of the Universe** David Morrison,Sidney C. Wolff,Andrew Fraknoi,1995 **The Universe** Erik Gregersen Associate Editor, Astronomy and Space Exploration,2009-12-20 Outlines the history of astronomy from the earliest conceptions of the universe to the Copernican revolution profiles famous astronomers and discusses recent contributions to the field **Mercury** ,1980 The Roaring Twenties Thomas Streissguth,2009 Covers the social political and economic history of the 1920s including developments in science from astrophysics to laboratory science to discoveries and inventions the creation of new professional sports leagues the labor union movement censorship and writers artists and moviemakers This volume captures the complexities of the 1920s *Effective Astronomy Teaching and Student Reasoning Ability* Dennis Schatz,1978 **The Encyclopaedia Britannica** Hugh Chisholm,1922
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