Shaping My Knowledge

Warm-up

First, elicit words students use to describe the Sun and the stars (*bright, cheery, fiery*). Then, tell students to work in small groups to brainstorm a song that reminds them of the Sun and the stars. Next, elicit the names of the songs, and play snippets of them in class. Afterward, tell students to vote on the most "sun-like" song.

Teaching Tip

For Exercise 3
Before class, write out the words in sentences and definitions from Exercise 3 with errors on separate slips of paper and paste them at stations around the room. For example, on one slip of paper, you might write *The element reached a peek*; on another, you might write *The lowest point on a mountain or graph*. In class, after completing Exercise 3 individually, first, tell students to work with a classmate, visiting all the stations. While at the stations, students must match the definitions and the sentences, correcting them as they write. After finishing, tell students to check their answers against those in their books.

Differentiation Strategy

For Exercise 2
Go to the Differentiation Strategies Bank and adapt this exercise using Strategy 6.

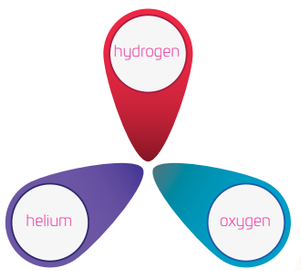
Flexi Exercises
(To adjust to students' needs, you can either use or not the activities below)

Exercise 1

Science

What is the Sun made of?

01 **With a classmate, research the three most common elements in our universe.**



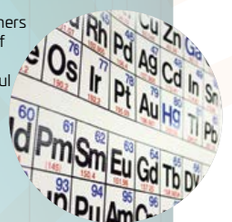
02 **Before reading "Reach for the Stars," predict whether the statements are "T" true or "F" false. Read the text and check your answers.**

1. The spectrograph only provides information on composition and temperature of stars. F
2. Short wavelengths are seen as blue and purple light. T
3. Each element is represented by different peaks and valleys on a graph. T
4. The closest star is nanometers away from us. F
5. Hydrogen only produces shades of blue and violet light. F

03 **Read the text again. Write the word next to its definition.**

1. the highest point on a mountain or graph — peak
2. the combination of elements — composition
3. unit of measurement, one billionth of a meter long — nanometer
4. the lower phase of a horizontal wave — valley
5. the instrument used to measure the type of light emitted from objects — spectrograph
6. the distance light can travel in one year, almost 10 trillion kilometers — light-year

Reach for the Stars



A spectrograph is a tool astronomers use to measure the light given off by distant objects such as stars. Spectroscopy gives us meaningful information on these celestial objects' **composition**, density, temperature, and speed.

A **spectrograph** calculates these measurements by checking the energy emitted or released in moving electrons, corresponding to specific light colors on the visible spectrum. The more energy emitted or absorbed, the more intense the jump or fall, and the shorter the wavelength of light, corresponding to purple and blue lights. Conversely, the less energy that is emitted or absorbed, the less intense the movement of the electron, and the longer the wavelength of light that is emitted. These wavelengths correspond to red and orange colors on the spectra. Scientists transform the spectra into a graph to calculate the **peaks** and **valleys** in the wavelengths of light.

Since each type of matter has a different composition and placement of electrons, the movement of these electrons is different, thus emitting and absorbing different quantities of energy. The various peaks and valleys shown on a heavenly body's graphs correspond to distinct elements. Scientists can produce precise measurements of these quantities in **nanometers**, thus determining the composition of celestial bodies in our universe millions of **light-years** away. For example, if a star has a lot of hydrogen, it will have emission lines at 410 nm (violet light), 434 nm (blue light), 486 nm (blue-green light), and 656 nm (red light).

04 **With a classmate, discuss the questions below.**

- Why do you think it is important for scientists to know about a star's composition, speed, and density?
- What celestial object would you like to know the data about? Why?

Shaping My Knowledge

Language Structures and Functions Tip

For Exercise 6
First, give students additional words that can be used as verbs and nouns (*hand, foot, elbow, eye, knee*). Tell students to work with a classmate to write two sentences, one with the word as a verb and the other with the word as a noun. After writing, tell students to mingle, read their sentences aloud, and ask classmates to identify which form of the word is being used. For example: *1. Ian covered his eyes from the bright light. (noun) / Hungrily, Ian eyed the candy on the top shelf. (verb)* Finally, if time allows and you deem necessary, review the grammar point in more detail.

Teaching Tip

For Exercise 7
First, in groups, tell students to choose a role (timekeeper, group leader, writer, editor). Then, tell students to complete Exercise 7, using their role. After a few minutes, ask them to switch roles with a classmate. Change students' roles every five minutes, allowing everyone to perform the different roles. Before class, find a simple video describing what a spectrograph does and what it measures. In class, show students the video. Afterward, working in groups, tell students to identify what they would take from the video regarding content or design to add to their videos. Finally, volunteers from each group should be asked to share their ideas.

Wrap-up

First, in small groups, ask students to discuss the following questions: *What have you found the most interesting about spectography? Why? What else would you like to learn about the use and application of spectrographs? Why?* Then, in their groups, ask students to write four questions about spectrographs for a physicist or astronomer based on their discussions. Upload the questions to an online forum at a local university for a response.

Differentiation Strategy

For Exercise 8
Go to the Differentiation Strategies Bank and adapt this exercise using Strategy 9.

Flexi Exercises
(To adjust to students' needs, you can either use or not the activities below)

Exercise 5

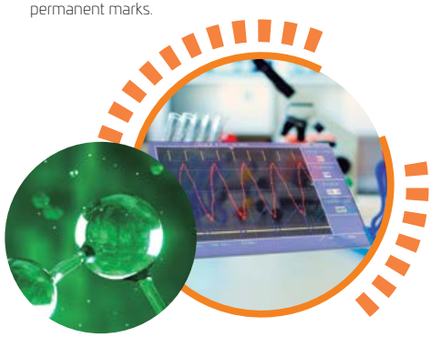
05 Match the sentence halves.

1. Please turn on the fan	a. out the cards into a perfect arc.
2. The magician fanned	b. the astronomy club meetings for months.
3. Helen has been chairing	c. her and get her what she wants.
4. Gabriel sat down in the chair	d. since it's too hot for the spectrograph machine.
5. Alan has a great sense of humor	e. and is always making people laugh.
6. I know that Shelly is being difficult, but please humor	f. the waiter pulled out for him.

06 Write the letter of the word that best completes the sentences.

1. The ___c___ broke in to my neighbor's house and stole a very expensive telescope.
2. I used ___b___ to learn more about the composition of stars.
3. The ___e___ of the telescope's findings on astronomy is not fully understood yet.
4. The science lab was ___d___ last night, and expensive equipment was stolen.
5. I ___a___ the images sent by the Webb telescope.
6. The rocket ___f___ the Moon and left permanent marks.

a. googled
b. Google
c. burglar
d. burgled
e. impact
f. impacted



07 Form a small group. Write a script for a video describing what a spectrograph does and what it measures. Include at least three examples of verbing.
Answers will vary.

08 With your group, design visual material to support the information provided in your video. Record your videos and share them with the class. Vote on whose was the clearest.

Possible visual material:

- spectra for different common elements
- a picture of a spectrograph machine
- images of the composition of different stars