

Lesson 4 Stars

Lesson 4

—Day 1



Twinkle, twinkle, little star...

This familiar rhyme and the appearance of stars may lead us to think stars really do twinkle. Stars actually glow with a steady light. When their light hits Earth's atmosphere, gas molecules move the light around. This makes the stars

look like they are twinkling in the night sky.

Most stars go through life stages. Stars are born in giant clouds of two gases, **hydrogen** and **helium**.

Gravity pulls the giant clouds together to form a spinning cloud. The spinning causes the atoms to collide and heat up. As heat increases, the core of the new star is formed and starts to burn, or shine.

A star's lifespan depends on its mass at birth and how quickly it burns up hydrogen. An average-sized star, like our Sun, will burn until it runs out of hydrogen. It then expands, cools, collapses, and dies. A "dead star" is called a **black dwarf**.

The death of a massive star is spectacular. As hydrogen burns up, the star expands, contracts, and then explodes with a brilliant flash. This is called a **supernova** (soo per **noh** vuh).

Stars move through the Universe, but because they move at the same rate as all the objects around them, they do not appear to be moving.

Our Sun is the star that is the closest to Earth. Proxima Centauri is the next closest star to Earth. Alpha Centauri and Alpha Centauri B are the third and fourth closest stars to Earth. Because the Sun is so close to Earth, it appears larger than other stars. This is also why we can see the Sun during the day and other stars are usually only seen at night.

Materials:

SP Lesson 4 Day 1
7 sheets 8.5"x11" paper or cardstock
Newspaper
yardstick or long dowel
modeling clay
rocks
compass

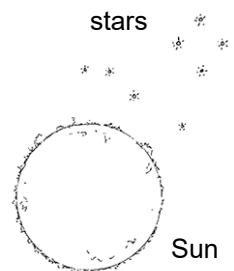
Vocabulary Words:

Hand out vocabulary strip for this lesson. Encourage your students to use the words while talking about the material and in their written work.

hydrogen
helium
black dwarf
supernova
constellations
Orion



Earth

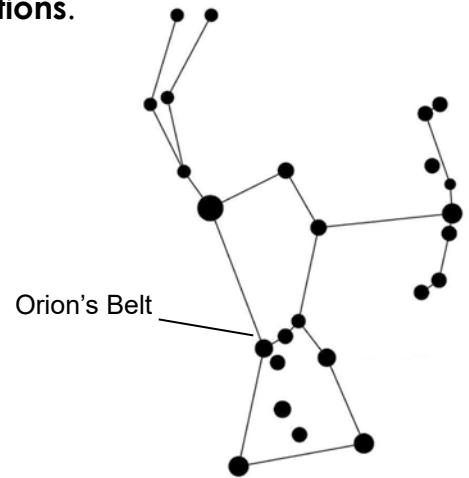




Because the Sun is so close to Earth, it looks much brighter than the star Sirius, which is the brightest star in the night sky.

Since ancient times, people have looked at a group of stars and seen them as a figure or pattern. These are called **constellations**.

One of the most famous constellations in the sky is named **Orion**. It is a set of stars visible during winter in the northern hemisphere. It is named for a hunter in Greek mythology. The Greeks saw a hunter with a club and shield. The three stars that form a line across the middle of the hunter is called Orion's Belt.



Astronomers look at stars using powerful telescopes and instruments and measure the light they give off. They also study the makeup of stars and study their movements to better understand them. Scientists also use computers to create models to help understand how stars form and change. With all this, we have learned a lot about stars, but some things are still a mystery.

Constellations Activity

Note: This activity is to be completed on a clear night. If possible, you might want to download a night sky guide to a phone to help you.

Locate one of the following constellations:

The Orion Constellation is easily found in the northern sky from November through February, around 9 or 10 PM. It is easier to find Orion's Belt first. Look for the three stars in a line, then look for the rest of the constellation's shape. The body is formed by a group of stars that look like a hunter. Look for two bright stars, one on each shoulder

The Little Dipper is easily found by finding the Big Dipper first and then using the picture in the graphic to find the Little Dipper.



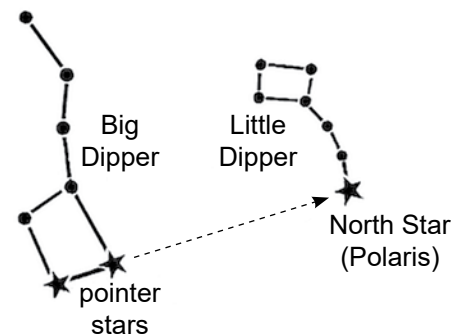
Draw the constellation the way you see it in the sky.



Draw the constellation the way you see it and write the number of stars in the constellation you viewed.



Draw the constellation, research and label the name of the stars in the constellation you viewed.

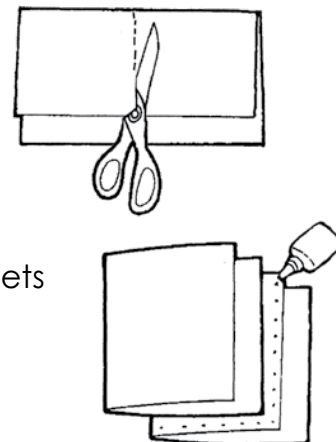


Lab Book

Hand out 7 sheets of 8.5"x11" paper or cardstock.

Today, we are going to make a Lab Book to record our labs. Using a sheet of 8.5"x11" paper, make a Large Question and Answer Book by folding it in half like a Hamburger. Fold it in half again like a Hamburger. Open this fold and cut up the crease to the top fold. This will make a book with two inside tabs.

Make five more Large Question and Answer Books with the other sheets of paper and glue the books front to back.



Find North – Lab 4-1



Note: This activity needs to be scheduled for noon or 1 p.m. Eastern Standard Time.

Materials: SP Lesson 4 Day 1, newspaper, yardstick or long dowel, modeling clay, rocks, compass, Lab Book

Cut out and glue Lab 4-1 image on the first tab of your Lab Book. Write the name of the lab and the date at the bottom.

At certain times of the day, shadows indicate the direction north because of the location of the Sun.

Find an open area outside, away from any shade. Lay newspapers on the ground and put rocks on the edges to keep them in place. Form the modeling clay into a base and put it in the middle of the newspaper. Stick the yardstick into the clay. Write a brief description of this lab on the top section of your Lab Book.

Which way do you predict the shadow will fall? Write your thoughts below the description.

Look at the shadow of the yardstick. Draw a line along the shadow. What direction do you think the shadow is pointing? Use the compass to find out what direction the shadow is pointing.

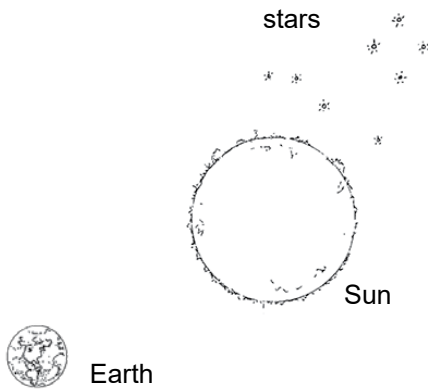
If you live in the Northern Hemisphere, the line will point north. If you live in the Southern Hemisphere, the line will point south.

What can you learn about finding the north from this experiment? Record your conclusions on the bottom section of your Lab book.

Lesson 4

—Day 2

The Sun is a star at the center of our Solar System that is composed mostly of hydrogen and helium. Unlike other stars, the Sun looks very large and can be seen during the day. That is because it is so close to Earth.



Materials:

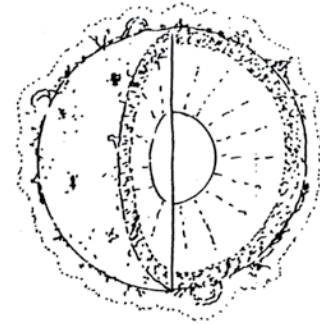
SP Lesson 4 Day 2 Pages 1-2
8.5"x11" sheet of yellow paper or cardstock
clear gallon container
water
bleach
flashlight
Lab Book
Space Timeline

Vocabulary Words:

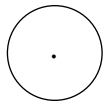
Hand out vocabulary strip for this lesson. Encourage your students to use the words while talking about the material and in their written work.

core
photons
diameter
gravity
photosphere
chromosphere
corona

The Sun is not solid. It is a ball of hot gases. Heat in the Sun is produced by hydrogen being transformed into helium.



Look at the dot in the middle of this circle:



A dot this size, made up of the Sun's heat, could kill anything 90 miles away. What is 90 miles from where you are now?

The Sun produces light and heat from its center, or **core**. Tiny bits of light called **photons** are produced and released from the Sun's core. These photons travel from the core to the surface of the Sun.



It takes 8 minutes and 20 seconds for the light of the Sun to reach Earth. Compare that to our next closest star, Proxima Centauri. It takes about 4.2 years for the light from Proxima Centauri to reach Earth.

The Sun's shadow points north because of Earth's movements. The Earth spins from west to east and the Sun's light moves toward the south. When the Sun is high in the sky, its shadow always points north.

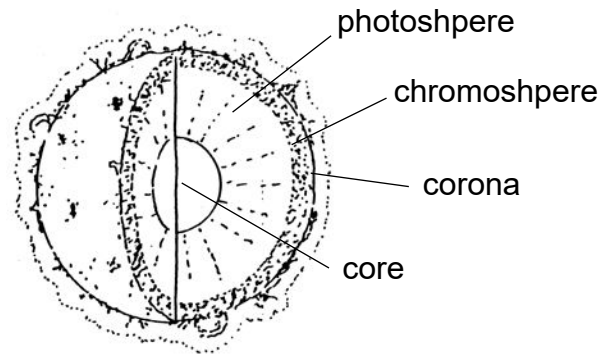


The Sun's length across, its **diameter** (dahy **am** i ter), is about 865,000 miles (1,392,000 km). If the Sun were a hollow ball, it could hold over 1 million Earths.

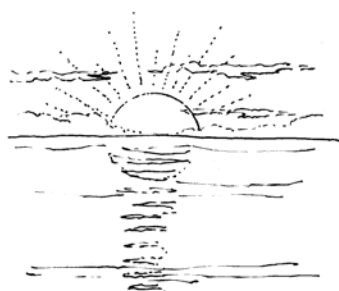
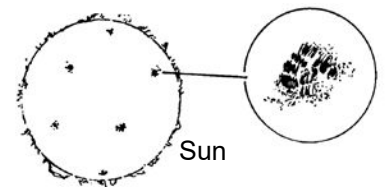
The Sun's gravitational pull keeps the planets and thousands of asteroids in orbit around it. **Gravity** (grav i tee), the force that attracts one object to another, on the Sun's surface is about 30 times stronger than that of Earth. An object that weighs 100 pounds on Earth would weigh about 3,000 pounds on the Sun.

The Sun is made up of four main layers.

1. The core is the center of the Sun. The heat and light that we feel and see are produced in the Sun's core.
2. The next layer, the **photosphere** (foh tuh sfeer), is the Sun's surface. The energy produced in the core makes its way to the surface where it gives off heat, light, and electromagnetic radiation.
3. The next layer is the Sun's lower atmosphere, called the **chromosphere** (kroh muh sfeer). Solar flares are extremely powerful explosions that are unleashed from the chromosphere.
4. The outermost layer of the Sun's atmosphere is called the **corona** (kuh roh nuh). It is constantly expanding and changing shape.



One interesting feature of the Sun is its sunspots. Sunspots are cooler than the surrounding photosphere and appear darker than the rest of the Sun's surface. Their average size is about the size of the Earth.



When the Sun appears low in the sky, its light passes through the atmosphere to reach Earth. This part of the atmosphere is filled with dust and particles that scatter the Sun's light. This scattering light makes beautiful colors that we see at sunrise and sunset.

Never look directly at the Sun without wearing special glasses because it can damage your eyes, even blind you.

Parts of The Sun

Hand out SP Lesson 4 Day 2 Pages 1-2 and 8.5"x11" sheet of yellow paper or cardstock.

Make a Half Book from the yellow paper by folding it like a Hamburger. Turn it so the fold is on the left, and put it aside.

Cut out 4A and cut the dotted lines on the image to make four tabs. Fold the tabs back and forth to create windows. Put glue on the back of 4A, being sure not to glue the openings made by the tabs. Glue 4A onto the cover of the Half Book. Do not glue the tabs shut. Cut out 4B and glue the four words under each tab.

Inside:



Draw a big Sun and review the parts of the Sun.



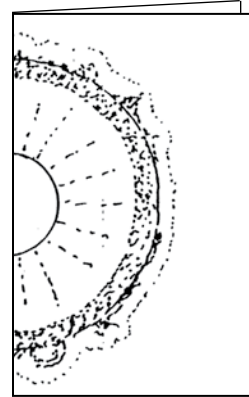
Write words about each part. Ex.

core - Sun's center

photosphere – Sun's surface

atmosphere - Sun's lower atmosphere

corona – Sun's outermost layer



Describe each part. Ex:

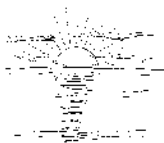
The core is the center of the Sun. The heat and light that we feel and see are produced in the Sun's core.

The next layer, the photosphere, is the Sun's surface. The energy produced in the core makes its way to the surface where it gives off heat, light, and electromagnetic radiation.

The next layer is the Sun's lower atmosphere, called the chromosphere. Solar flares are extremely powerful explosions that are unleashed from the chromosphere.

The outermost layer of the Sun's atmosphere is called the corona. It is constantly expanding and changing shape.

Colorful Sunset Lab 4-2



Materials: clear gallon container, water, bleach, flashlight, Lab Book

Cut out and glue Lab 4-2 image on the next tab of your Lab Book. Write the name of the lab and the date at the bottom.

Add water to the gallon container until it is half full. Add 1 tablespoon of bleach and mix well. Although you cannot see the bleach in the water, it acts like the tiny particles in Earth's atmosphere. The flashlight represents the Sun, and the water represents Earth's atmosphere.

Set the gallon container on the table. Shine the flashlight at the top of the gallon container as someone faces the container, eyes level with the water. Gradually move the flashlight down toward the table while shining the light in the container. At the same time, the observer will gradually move upward, looking through the water. On the top section of your Lab Book record what you think the observer will see as they gradually move upward.



Trade positions and complete the activity again. What was observed through the “atmosphere”? What colors appeared and in what order? Record your observations in your Lab Book.

What does this lab indicate about the setting of the Sun? Why do colors appear? Record your conclusions on the bottom section of your Lab Book.

Space Timeline

Hand out Space Timeline.

Cut out and glue 4C-E on the Space Timeline in the correct location. Discuss each picture.

Lesson 4

—Day 3

Collect materials for the activities you choose:
penny
magnifying glass
chocolate square

Choose one or more activities to complete today.

1. Penny-Sized Sun Activity

Materials: penny

One person holds up the penny. Another person will stand in front of the penny, facing it. Carefully back away from the penny. Discuss the activity. What happens as you back away from the penny? Does the penny appear smaller as you step farther away? Did the size of the penny change? What can you conclude about the size of the Sun from this activity about distance not time.

2. Find out how the North Star is used for navigational purposes.

3. This activity requires adult supervision. Go outside with a magnifying glass and a piece of chocolate. Tip the magnifying glass at an angle to capture the rays of the Sun and direct them onto the chocolate. Describe what happens.

4. Take time to view a sunrise or sunset. Write a paragraph or draw and color a picture describing what you see.
5. Read and discuss one or more of the following books:
Once Upon a Starry Night by Jacqueline Mitton (gr. 1-3)
Glow in the Dark Constellations by C. E. Thompson (gr. 1-3)
Sally Ride: Shooting for the Stars by Jane Hurwitz and Sue Hurwitz (gr. 4-7)

Spectacular Space

There are more stars in the universe than grains of sand on all the beaches on Earth. That's at least a billion trillion!

