Name _____ Date _____ Class _____

The Sun

Key Concepts

- What are the three layers of the sun's interior?
- What are the three layers of the sun's atmosphere?
- What features form on or above the sun's surface?

The sun's mass is 99.8 percent of all the mass in the solar system. Because the sun is so large, its gravity is strong enough to hold all of the planets and other distant objects in orbit.

Unlike Earth, the sun does not have a solid surface. Like Earth, the sun has an interior and an atmosphere. **The sun's interior consists of the core, radiation zone, and convection zone.** Each layer has different properties.

The sun produces an enormous amount of energy in its **core,** or central region. The sun's energy comes from nuclear fusion. In the process of **nuclear fusion,** hydrogen atoms in the sun join to form helium.

The light and heat produced by the sun's core first pass through the middle layer of the sun's interior, the radiation zone. The **radiation zone** is a region of very tightly packed gas where energy is transferred mainly in the form of electromagnetic radiation.

The **convection zone** is the outermost layer of the sun's interior. Hot gases rise from the bottom of the convection zone and gradually cool as they approach the top. Cooler gases sink, forming loops of gas that move heat toward the sun's surface.

The sun's atmosphere consists of the photosphere, the chromosphere, and the corona. The inner layer of the sun's atmosphere is called the **photosphere.** *Photo* means "light," so the photosphere is the sphere that gives off visible light.

At the beginning and end of a solar eclipse, you can see a reddish glow around the photosphere. This glow comes from the middle layer of the sun's atmosphere, the **chromosphere.** *Chromo* means "color," so the chromosphere is the "color sphere."

During a total solar eclipse, a fainter layer called the **corona** is visible. The corona sends out a stream of electrically charged particles called **solar wind.**

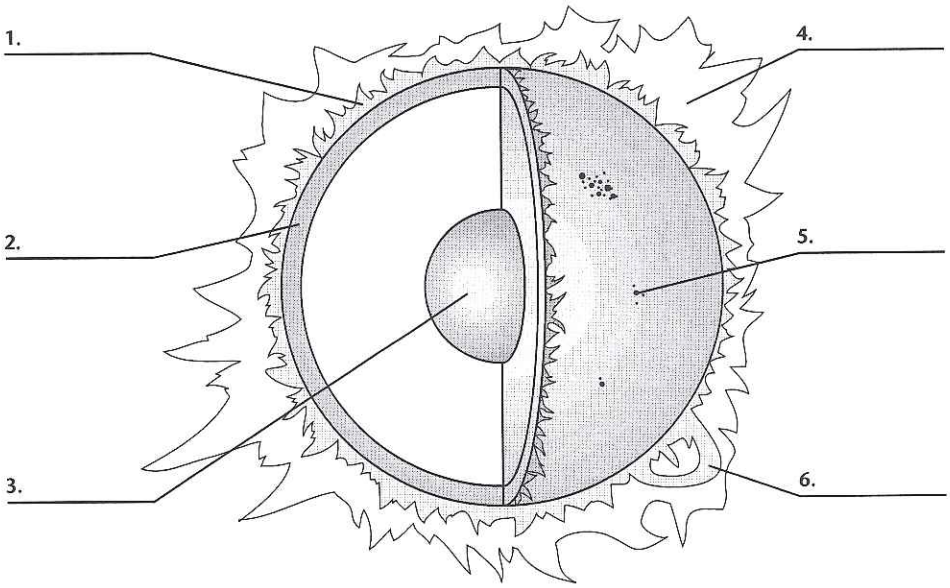
Features on or above the sun's surface include sunspots, prominences, and solar flares. Sunspots are areas of gas on the sun that are cooler than the gas around them. Sunspots usually occur in groups. Reddish loops of gas called **prominences** link different parts of sunspot regions. Sometimes the loops in sunspot regions suddenly connect, releasing large amounts of energy. The energy heats gas on the sun to millions of degrees Celsius, causing the gas to explode into space. These explosions are known as **solar flares.** Solar flares can greatly increase the solar wind.

Name _____ Date _____ Class _____

The Sun

Understanding Main Ideas

Label the diagram of the sun below.



Building Vocabulary

Match each term with its description by writing the letter of the correct description in the right column on the line next to the term in the left column.

____ 7. solar flare
____ 8. core
____ 9. chromosphere
____ 10. sunspot
____ 11. corona
____ 12. nuclear fusion
____ 13. photosphere
____ 14. solar wind
____ 15. prominence
____ 16. radiation zone
____ 17. convection zone

a. the layer of the sun's atmosphere that gives off visible light
b. the layer of the sun's atmosphere that has a reddish glow
c. the layer of the sun's atmosphere that looks like a halo during an eclipse
d. areas of gas on the sun's surface that are cooler than the gases around them
e. reddish loops of gas that link parts of sunspot regions
f. eruptions that occur when the loops in sunspot regions suddenly connect
g. a stream of charged particles produced by the corona
h. the center of the sun
i. the outermost layer of the sun's interior
j. the joining of hydrogen atoms to form helium
k. the layer of the sun's interior where energy is transferred mainly by electromagnetic radiation

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The Solar System ▪ *Skills Lab*

Stormy Sunspots

During which years were electrical disturbances on Earth most common? In this lab, you will consider the relationship between sunspot activity and magnetic storms on Earth.

Problem

How are magnetic storms on Earth related to sunspot activity?

Skills Focus

graphing, interpreting data

Materials

graph paper ruler

Procedure

1. Use the data in the table to plot a line graph of sunspot activity between 1972 and 2002. Use the next page or graph paper.
2. On the graph, label the *x*-axis "Year." Use a scale with 2-year intervals, from 1972 to 2002.
3. Label the *y*-axis "Sunspot Number." Use a scale of 0 through 160 in intervals of 10.
4. Graph a point for the Sunspot Number for each year.
5. Complete your graph by drawing lines to connect the points.

Sunspots			
Year	**Sunspot Number**	**Year**	**Sunspot Number**
1972	68.9	1988	100.2
1974	34.5	1990	142.6
1976	12.6	1992	94.3
1978	92.5	1994	29.9
1980	154.6	1996	8.6
1982	115.9	1998	64.3
1984	45.9	2000	119.6
1986	13.4	2002	104.0

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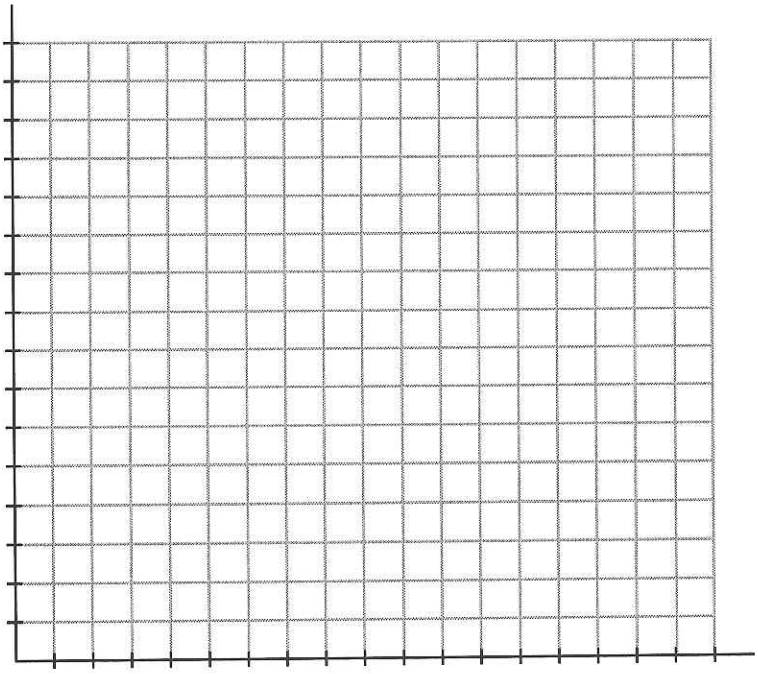
The Solar System ▪ *Skills Lab*

Line Graph



Analyze and Conclude

Write your answers on a separate sheet of paper.

1. **Graphing** Based on your graph, which years had the highest average Sunspot Number? The lowest average Sunspot Number?
2. **Interpreting Data** How often does the cycle of maximum and minimum activity repeat?
3. **Interpreting Data** When was the most recent maximum sunspot activity? The most recent minimum sunspot activity?
4. **Inferring** Compare your sunspot graph with the magnetic storms graph in your textbook. What relationship can you infer between periods of high sunspot activity and magnetic storms? Explain.
5. **Communicating** Suppose you are an engineer working for an electric power company. Write a brief summary of your analysis of sunspot data. Explain the relationship between sunspot number and electrical disturbances on Earth.

More to Explore

Using the pattern of sunspot activity you found, predict the number of peaks you would expect in the next 30 years. Around which years would you expect the peaks to occur?