

SNE 1D1

31 Sunspots

It's not surprising that sunspots were observed by ancient astronomers. The largest sunspots on the sun can be seen without a telescope. It was not until the invention of the telescope in the early 17th century, however, that systematic studies of sunspots could be undertaken. The great astronomer Galileo was among the first to make telescopic observations of sunspots.

Sunspots are regions of extremely strong magnetic fields found on the sun's surface. A sunspot has a dark central core known as the *umbra*. The umbra is surrounded by a dark ring called the *penumbra*, where the magnetic field spreads outward. Sunspots appear dark because they are giving off less radiation than the areas around them. Sunspots are cooler than the rest of the sun's surface.

Sunspots are frequently observed in pairs or in paired groups. The members of a spot pair are identified as the leading spot and the following spot. They are identified by their position in the pair in terms of the direction in which the sun rotates.

The number of sunspots at any one time varies. Sometimes there may be as many as 10 groups and 300 spots across the sun. A large spot group may consist of as many as 200 spots. The number of spots changes in a fairly regular pattern called the *sunspot cycle*. The largest number occurs about every 11 years. At sunspot minimum, there are at most just a few small spots.

The average lifetime of an individual spot group is roughly one solar rotation, which is about 25 days. The most persistent large spots, however, can survive for two to three months.

Main Idea	1	Answer	Score
Mark the <i>main idea</i>		<input type="checkbox"/> M	15
Mark the statement that is <i>too broad</i>		<input type="checkbox"/> B	5
Mark the statement that is <i>too narrow</i>		<input type="checkbox"/> N	5
a. Sunspots appear on the sun.		<input type="checkbox"/>	___
b. Sunspots, regions of magnetic fields on the sun's surface, occur at fairly regular intervals.		<input type="checkbox"/>	___
c. Large sunspots can be seen without a telescope.		<input type="checkbox"/>	___

Name:
Date:
Section:

Score 15 points for each correct answer.

Score

- Subject Matter 2 This passage is mainly
 a. a description of sunspots.
 b. a discussion of why sunspots occur.
 c. an explanation of the sun's movements.
 d. a biography of Galileo.
- Supporting Details 3 Leading spot and following spot are
 a. the names of spots in a spot pair.
 b. the direction of the sun's rotation.
 c. names of the two largest sunspots.
 d. names of a sunspot's central core and the ring around the core.
- Conclusion 4 If there had been heavy sunspot activity in 1857, the next heavy outbreak would have been in
 a. 1858.
 b. 1862.
 c. 1865.
 d. 1868.
- Clarifying Devices 5 The first paragraph presents sunspots through
 a. an explanation of how they work.
 b. a descriptive perspective.
 c. a historical perspective.
 d. a cause and effect perspective.
- Vocabulary in Context 6 In this passage, persistent means
 a. quickly disappearing.
 b. large.
 c. lasting.
 d. having a dark, reddish brown color.

Add your scores for questions 1-6. Enter the total here and on the graph on page 159. Total Score

Sunspots

Approximately every 11 years, scientists observe problems that occur with our radio and other communication systems. Problems also occur with the distribution of electricity.

Scientists have discovered that these problems occur just after violent (magnetic) storms on the Sun's surface. These storms appear to occur when there are many dark regions on the Sun, called sunspots (Figure 5). These are the darker, cooler regions of the photosphere.

Sunspot activity seems to occur in cycles. Astronomers have been keeping a record of sunspot activity since 1700.

- (j) Graph the sunspot data from Table 1. Label the vertical axis (y-axis) as number of sunspots. Label the horizontal axis (x-axis) as year. Write a title for your graph. Connect the points.

Table 1 Sunspot Data

Year	Number of sunspots
1979	155
1980	155
1981	141
1982	116
1983	67
1984	46
1985	18
1986	13
1987	29
1988	100
1989	146
1990	142
1991	156
1992	95



Figure 5

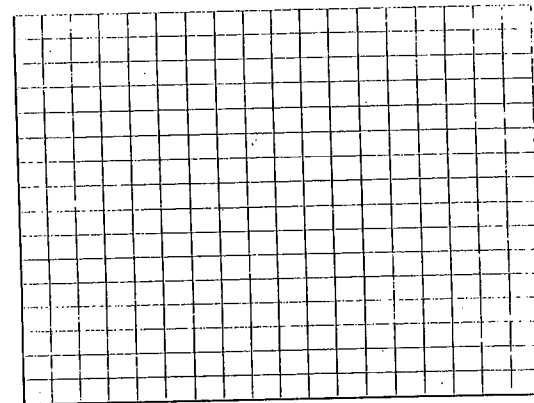
The small, dark regions in this photograph of the Sun are called sunspots.

Did You Know?

Sunspots are huge cooler areas in the Sun's photosphere. Even the smallest sunspots observed.

- (j) Graph the sunspot data from Table 1. Label the axes. c. Write a title for your graph. Connect the points.

Graph 1: _____



- (k) In what years was sunspot activity at a peak? _____
 (l) In what years was sunspot activity the least? _____

(m) What is a cycle?

- (n) How many years is one cycle? _____

(o) When is the next year of predicted maximum sunspot activity? (Show how you got your answer.)