Lesson-4-6

A Sky Full of Lights

colliding with Earth's of solar wind in the northern stream across the sky nemisphere; the result

that the sun constantly of charged particles olar wind: a stream

Earth's magnetic field

in the atmosphere and cell phones. transmissions, pagers and interfere with For example, it can disturbances on Earth cause electrical The electrical energy satellites, TV during auroras can

and a magnetic field have an atmosphere on other planets that suroras. They occur planet to experience Earth isn't the only such as Jupiter, Mars

in the northern parts Norway and Finland. Canada, Russia, and of the United States, can generally be seen The aurora borealis

What causes the northern lights, and where can they be seen?

northern lights together are known as aurora polaris, which means "polar called the aurora borealis, can usually be seen during the spring and fall in but this colorful light show is put on by nature. The northern lights, also more scientific answer is available. the sky, they have been creating myths and legends to explain them. Today, a hemisphere. There, they are called the aurora australis. The southern and northern parts of the world. The aurora can also be seen in the southern and green shimmer and dance across the sky. It might seem hard to believe, lights," Ever since human beings first caught sight of these colorful lights in Imagine looking up on a clear night and seeing streaks of red, purple,

Earth, it still takes two to three days for solar wind to travel the 93 million miles to moves extremely quickly—at speeds of more than a million miles per hour wind is a stream of gas containing electrically charged particles. Although it The sun plays an important role in the creation of the auroras. Solar

be visible. Because there are millions of collisions at once, though, enough atmosphere come in contact with the charged solar particles, a collision as a sort of shield or defense against solar wind. When the gases in the light is generated to see the aurora from Earth occurs, which produces light. If this happened only once, the light wouldn't captures the solar particles as they approach Earth. Earth's atmosphere serves magnetic poles. They create a magnetic field called the magnetosphere that Earth's core is like a giant magnet. At either end of the planet are Earth's

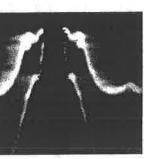
result of collisions with oxygen atoms. Blue and purple lights are usually created when the solar particles hit nitrogen atoms. Auroras can last from a an arch, a band, curtains, and streamers. The colors that are produced have to few seconds to a few hours, depending on the conditions completely of nitrogen and oxygen. Green and red auroras tend to be the the collision occurs. Remember, Earth's atmosphere is made almost do with what types of gas the particles strike and where in the atmosphere No two auroras are ever alike. They can take a number of shapes, such as

Autoras even occur on lo, one of Jupiter's

Uranus, and Neptune

taken images of these moons. The Hubble

beautiful spectacles. to witness one of nature's most with the hope that they'll get a chance of it. People often travel long distances an aurora, try to capture a photograph If you're ever lucky enough to see



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Circle the letter of the best answer to each question below

- In which of the following places would you be most likely to see the aurora borealis?
- a. Virginia
- b. New Mexico
- c. Maine
- d. Louisiana
- 2 What does a planet need to have in order for auroras to take place?
- a. a moon
- b. a magnetic field
- c. an atmosphere
- d. Both b and c
- Which of the following statements is true?
- a. The color of an aurora depends on what type of gas the solar particles hit
- b. Auroras can be seen only in the northern hemisphere
- c. It takes solar wind nearly a week to reach Earth.
- d. Another name for aurora borealis is aurora australis

Write your answers on the lines below.

- What is solar wind?
- Ņ What effect can auroras have on Earth?
- 0 What happens when solar wind approaches Earth's atmosphere?
- .1 Why do you think no two auroras are ever the same?

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esson 4.9

Cosmic Mysteries

Do we know all there is to know about the universe?

a great deal about the universe. Still, some great mysteries are yet to be solved. Here are just a few examples: Human beings have studied the skies for thousands of years and learned

- directions. It took several years and the work of many astronomers, but moving away from each other-the universe is expanding in all In 1912, careful observations of the galaxies showed that they are all actually expanding at an increasing speed. What will happen as the the Big Bang Theory was first proposed continue to support it. In the and everything else in the universe. These pieces of matter are still billions of years, the pieces of matter combined to form stars, planets began as a single point of extraordinarily dense matter. No one knows why, but this matter suddenly exploded with great force and expanded widely accepted by cosmologists today—describes how the universe this discovery eventually led to the Big Bang Theory. This theoryuniverse and everything in it continues to spread out? 1990s, research showed that the universe is not only expanding, but it's forming today. This idea is controversial, but discoveries made since almost instantly to the immense size of our universe today. Then, over
- Soon after galaxies were proven to exist, astronomers realized that they moved through space much more quickly than they should. By measuring they actually measured the speeds, though, it was as if the galaxies had would affect it, astronomers made a prediction about its speed. When a galaxy's mass, and then considering how gravity from other galaxies But what is dark matter, and will we ever be able to see it? that we can't detect, which would give the galaxies the mass they need concluded that the universe must contain huge amounts of "dark matter much greater masses than their stars would have provided. Astronomers
- In November of 2008, NASA plans to launch the Kepler Mission. It will be a space-based observatory searching for planets outside our solar system. Scientists know that a planet similar to Earth will have a greater chance of

containing life. Evidence life on Earth. Billions of be searched for because of water and carbon will we find the evidence? else in space. When will that life exists somewhere many scientists to think with billions of stars, leads galaxies, each one filled they are the basis of all



Chapter 4 Lesson 9

Circle the letter of the best answer to each question below

- The Big Bang Theory states that
- a. the universe will end with a giant explosion
- b. dark matter was created when a supernova exploded
- c. the universe began as a single particle of matter.
- d. galaxies contain billions of stars.
- 2 Scientists know that
- a. galaxies are much heavier than they appear
- b. the universe is expanding more quickly as time passes
- c. water and carbon are found in all life forms on Earth.
- d. All of the above

Write your answers on the lines below

- 3. What tells scientists that dark matter exists, even though it can't be seen?
- 4 So far, astronomers have identified 236 planets outside of our solar system. According to the selection, what evidence do scientists look for to determine whether or not a planet might have life?
- Ç Do you think human beings will ever find life in another part of the universe? Explain your answer

What's Next?

dark energy, and the shape of the universe cosmologists. Find out what is known and unknown about other cosmic mysteries, such as black holes The subjects mentioned in this selection are just three examples of many questions still facing

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