Name Date Class

SECTION 3 Enrichment

More About Black Holes

Scientists believe black holes to be places where matter is so dense that the gravitational field is so strong, not even light can escape its pull. This is how the black holes get their names. All we see is the absence of light. So how can we identify something we can't see? We cannot make them in the laboratory. We cannot actually see them in space. How do we know they might exist?

Event Horizon

There are a number of possible explanations. A black hole has a surface where some particles are sucked into the hole and others might still escape. This is called the *event horizon.* The inside of a black hole is called a *singularity.* At the horizon it might be possible for two particles to come very close to each other and exchange energy. When this happens one particle becomes negatively charged and the other becomes positively charged. It is most likely that the negative particle will be pulled into the black hole first. When this occurs, the brief moment of energy exchange will shoot the positive particle away from the negative and out into space. It escapes the black hole. This constant shooting out of high energy particles creates radiation. Scientists have detected radiation coming from black spaces in the universe. This might be evidence of a black hole.

Down the Drain

It is also believed that when black holes gobble up stars and planets into their mass, such as a galaxy system, that the movement of the particles will be like water pouring down a drain. A vortex, or swirling pattern, will occur. This pattern has been observed in a galaxy called ROSTAT PSPC in region LMC X-1 of the space map. It is also seen in a galaxy called M87 as a gas disk shrinking like water going down a sink into an unknown place. It is very likely that these galaxies are disappearing into a black hole. However, we still do not know for sure.

1. What is one problem with trying to learn about what goes on in black holes?

2. What is one piece of information scientists have found that support the idea of a black hole?

3. What is the outside of a black hole called? What is the inside called?

4. If scientists cannot see black holes and do not know for certain that they exist, why might studying them be important?

Name _____ Date _____ Class _____

SECTION 3 Reinforcement

Evolution of Stars

Directions: *Circle the term in the puzzle that fits each clue. Then write the term on the line. In the puzzle, the terms read across or down.*

E I B L A C K H O L E N S
H N E U T R O N S T A R T
R M A I N S E Q U E N C E
D C E I E N P R P O P O G
I O S E B L U E E D T H I
A L A T U M A S R S C A A
G O Y E L L O W G N B E N
R R C O A N V E I R T E T
A W H I T E D W A R F D I
M N T S U P E R N O V A O
E N F U S I O N T E R G Y

1. A _____ is a large cloud of dust and gas that becomes a star.
2. A graph that shows the relationship between a star's absolute magnitude and temperature is an _____.
3. A star that is a _____ has exhausted its supply of hydrogen.
4. The _____ of atoms powers the Sun and other stars.
5. The temperature and brightness of stars are indicated by their _____.
6. About 90 percent of the stars, including our Sun, are _____ stars.
7. A _____ is produced when the outer core of a star explodes after the core collapses.
8. The hottest, brightest stars are _____ and white.
9. Medium hot and bright stars like our Sun are _____ in color.
10. When a star has no fuel left and its outer layers escape into space, it is a _____.
11. As heavier elements are formed by fusion, a massive star expands into a _____.
12. When a collapsed core becomes so dense only neutrons can exist there, a _____ is formed.
13. A _____ is so dense that nothing, including light, can escape its gravity field.
14. Write the remaining letters in the puzzle in the order in which they appear to reveal a famous scientist's theory. _____

Meeting Individual Needs