Name_____

Telling Time Without a Clock

Telling time without a clock may seem like an impossible task, but with a little bit of practice, you can use the sun, moon, and stars to gauge the approximate time of day (or night).

During the day, the sun appears to travel across the sky. If you are in the northern hemisphere, face the south. As you look south, the sun rises in the east (from your left) and sets in the west (to your right). If the sun is halfway between your left and right, it is noon. If it is before noon, you can approximate how far the sun is between the east and the center. If it is after noon, look for the position of the sun between the center and the right. Knowing the time of sunrise and sunset will help you to be more accurate.

At night, you can also tell time by using the stars. To do this, we use the North Star. Locate the two stars that are at the edge of the Big Dipper, farthest away from the end of the handle. Those two stars line up with the North Star. That line also acts as the hour hand on a 24-hour clock, where midnight (0) is straight up and noon (12) is straight down. Just to the left of 0 is sunset to midnight, and to the right is midnight to sunrise. If it is winter, deduct one hour for each month before March 7 to adjust. If it is after March 7, add one hour per month. The reason for this is that March 7 is the date on which the star clock points to exactly midnight.

It gets a little more complex during certain times of the year, especially if daylight saving time must be considered. Although using constellations and planets to tell time is an interesting and potentially useful skill, next time you need to know the time, it may be easier to just look at your watch!

Text Questions

1. What background knowledge would be helpful to better understand this passage?
   a. living in a place where the skies are clear
   b. understanding what causes day and night and how it is affected by the time of year
   c. knowing the names of the constellations
   d. having a precise watch
2. Based on what you read, how could you find east and west if you didn't have a compass?
   a. observe the position of the sun
   b. look at the Big Dipper
   c. wait until lunchtime, and look directly overhead
   d. look at a map of the constellations
3. What does the word *gauge* mean as it is used in the text?
   a. a standard scale of measurement
   b. the thickness or capacity of something
   c. a device for measuring something
   d. a way of estimating something
4. Which of the following affects our ability to tell time by looking at the sky?
   a. where we live
   b. the time of year
   c. the time of day
   d. the position of the north star
5. Why do you suppose we adjust the time when looking at the stars at different times of the year?

_____

_____

_____

Name_____

Physics for Our Amusement

Amusement parks are full of science—the science of physics. The rides we enjoy are machines that operate under the laws of force and motion. A ride called Gravitron gives us a clue as to which principles of science are at work.

A vector describes distance as well as direction, such as two meters northeast or five miles northwest. For a vector quantity, the direction is measured in terms of an angle. In this case, the angle is between zero degrees (north) and 90 degrees (east). Velocity measures the distance per unit of time or how far an object travels in a specific amount of time. If something accelerates, it changes speed during that period of time, affecting the total distance traveled.

These principles apply to the Gravitron ride in terms of how force is applied and how it affects the riders. Newton's first law of motion states that if an object is moving with a constant velocity, the forces exerted on that object will add up to zero. During the ride, the machine moves in a circle, so that riders are constantly changing direction. As they change direction, the velocity constantly adjusts, resulting in acceleration, even though the machine maintains a constant speed.

The second law of motion states that if there is acceleration of an object, force will be exerted on that object. Therefore, when the ride speeds up, the riders experience force. In the spinning chamber, the net acceleration force is toward the center of the room.

At this point, Newton's third law of motion becomes a factor. It states that if one object exerts force on another object, that object will exert an equal and opposite force. The spinning chamber exerts the force of circular acceleration on the riders. However, their bodies exert an equal and opposite force on the wall in such a way that they don't move away from the wall.

Contrary to what some believe, physics can be fun!

Text Questions

1. In which direction is the force of acceleration on the ride?
   a. toward the center of the room
   b. away from the center of the room
   c. in the direction the room spins
   d. toward the floor of the room

2. What is the main idea of the second paragraph?
   a. It introduces how an amusement park operates on the laws of physics.
   b. It explains terms that are used to discuss force and motion.
   c. It defines the laws of motion.
   d. It explains the effect of the ride on the people who ride it.

3. Which law of motion explains why the riders are forced back against the wall of the spinning chamber?
   a. Newton's first law of motion
   b. Newton's second law of motion
   c. Newton's third law of motion
   d. the law of velocity

4. What does it mean to say the riders experience *acceleration*?
   a. They feel as if they are changing direction.
   b. They feel as if they are going faster.
   c. They feel as if they are going slower.
   d. They feel as if they are getting heavier.

5. In what other amusement park rides might one observe the laws of force and motion? Give examples to support your answer.

_____

_____

Name_____

Antarctic Ice Sheet

The South Pole is on the continent of Antarctica. On average, this land mass is windier, drier, and colder than any other place on Earth. It also has some of the highest elevations on Earth. The polar ice cap is larger than that of the North Pole. The ice cap covers almost the entire continent, stretching across millions of square miles. The permanent ice is thousands of feet deep.

Scientists believe the icing of Antarctica is ancient. The ice has glaciated, which means it has formed from snow. Snow falls onto the ice, which is compacted, and then becomes glacial ice. Ice streams flow downhill towards the ocean. Large amounts of glacial ice move out over the ocean creating ice shelves. The ice shelves can break off, creating icebergs that eventually melt. The glacial ice floating on the ocean surface is called sea ice. In contrast, land ice covers the continent.

Recently, researchers have been trying to determine if the ice of Antarctica is growing in size or shrinking. They want to understand what factors might be causing any changes in the ice.

For several years, the amount of land ice has been decreasing. Scientists attribute part of this to recent record warm winter events. A section of the northern ice shelf recently collapsed, alarming scientists. The Antarctic sea ice has grown over that same time period. While both the growth and loss of ice is occurring at a very slow rate, the exact reasons for the changes are not fully known. Changes in temperature and winds play an important role. It is also possible this is a normal Earth weather cycle, and the loss of ice is typical. It's too early for scientists to be certain about long-term causes and effects.

Generally, scientific observations indicate lower temperatures in the Antarctic than in the Arctic. For now, climate changes appear to be affecting the South Pole more slowly than the North Pole.

Text Questions

1. What is the primary comprehension skill you need to understand this passage?
   a. compare and contrast
   b. making inferences
   c. making connections
   d. cause and effect

2. What does the word *collapsed* mean as it is used in the text?
   a. suddenly broken into pieces
   b. lost its defenses
   c. shrunk in size
   d. melted quickly

3. Which statement best summarizes the current state of land ice in Antarctica?
   a. The Antarctic sea ice has grown over that same time period.
   b. The exact reasons are not fully known, but changes in temperature and winds play an important role.
   c. Both the growth and loss of ice is occurring at a very slow rate.
   d. For several years, the amount of land ice has been decreasing.

4. Which of the following statements is an opinion?
   a. The polar ice cap is larger than that of the North Pole.
   b. It is also possible this is a normal Earth weather cycle, and the loss of ice is typical.
   c. Large amounts of glacial ice move out over the ocean creating ice shelves.
   d. The glacial ice floating on the ocean surface is called sea ice, as opposed to land ice, which covers the continent.

5. What do you predict will happen next in the study of climate changes in the Antarctic?

_____

_____