LESSON 3

Understand Patterns in Science

Use with *Student Book* pp. 86–87

SCIENCE CONTENT TOPICS: ES.c.1, ES.c.2
SCIENCE PRACTICES: SP.1.a, SP.1.b, SP.1.c, SP.3.b, SP.3.c, SP.6.c, SP.7.a

1 Review the Skill

Some **patterns in science**, such as the passage of day and night or the changing seasons, are easily observed. Others are more difficult to identify. In fact, some patterns can be examined and explained only through mathematical formulas. For example, scientists have devised formulas for the shape of planetary orbits and the speed with which the planets move around the sun. To fully grasp science topics, you must **understand patterns in science**—both those that are easily observed and those that are more complex.

2 Refine the Skill

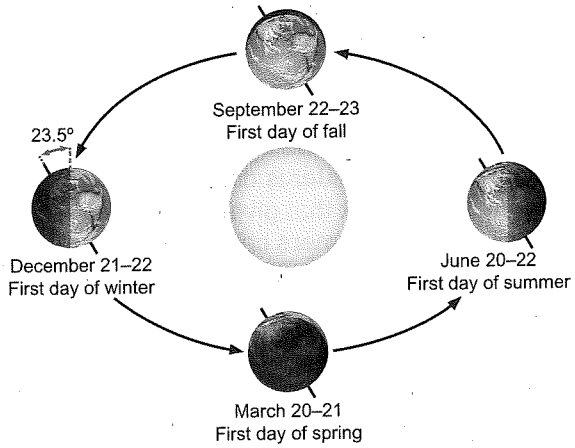
By refining the skill of understanding patterns in science, you will improve your study and test-taking abilities, especially as they relate to the GED® Science Test. Study the information and diagram below. Then answer the questions that follow.

SEASONS

The seasons make up a pattern that repeats year after year. The seasons result from Earth's tilt and revolution around the sun. Although Earth's tilt on its axis stays the same, its tilt, or orientation, toward or away from the sun changes during the year. During winter in the northern hemisphere, for example, Earth is tilted its farthest away from the sun. The sun's energy is less direct, and temperatures are colder. The diagram shows the seasonal effect of Earth's tilt on the northern hemisphere.

a A diagram can depict a pattern by showing the same object at different times. Here, Earth is shown at four different points in its orbit around the sun.

b Consider the ways in which changing a variable might affect a pattern.



1. The northern hemisphere gets the most solar energy during

   A. fall.
   B. winter.
   C. spring.
   D. summer.

2. Which statement would describe the pattern of seasons if Earth did not tilt on its axis?

   A. Seasons would be the same because of Earth's revolution.
   B. The seasons would be much shorter than they are now.
   C. It would be either summer or winter all year.
   D. There would be no seasons without Earth's tilt.

USING LOGIC

Think about the effect of Earth's tilt on the pattern of seasons. Then predict how the pattern would be changed without this factor.

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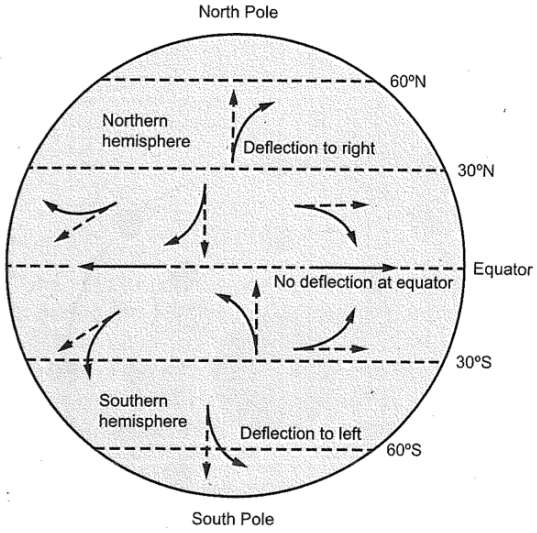
The air pressure of Earth's atmosphere varies from place to place. This uneven distribution of air pressure causes wind and weather patterns. Storms are associated with lower air pressure, whereas fair weather is associated with higher air pressure. Trade winds occur in a wind zone that circles Earth from about 30 degrees latitude North to about 30 degrees latitude South. In a band around Earth's middle, trade winds from the north blowing southeasterly meet trade winds from the south blowing northeasterly. This band of low pressure is the Intertropical Convergence Zone (ITCZ).

11. Based on the information and the concept of wind, which statement describes the trade winds that meet in the ITCZ?

A. They originate in areas of lower air pressure.
B. They originate in areas of higher air pressure.
C. They move to areas of higher pressure.
D. They rarely produce storms.

THE CORIOLIS EFFECT



The Coriolis effect is the deflection of fluids (air and water) to the left or to the right due to Earth's rotation. Consider its effect on wind. If the Earth did not rotate, winds would blow straight from areas of high pressure to areas of low pressure. Because of the Coriolis effect, air is deflected to the right in the northern hemisphere and to the left in the southern hemisphere, as shown in the diagram.

5. What do the dotted arrows in the diagram represent?

A. wind direction with the Coriolis effect
B. the rotation of Earth
C. wind direction without the Coriolis effect
D. winds at the equator and the poles

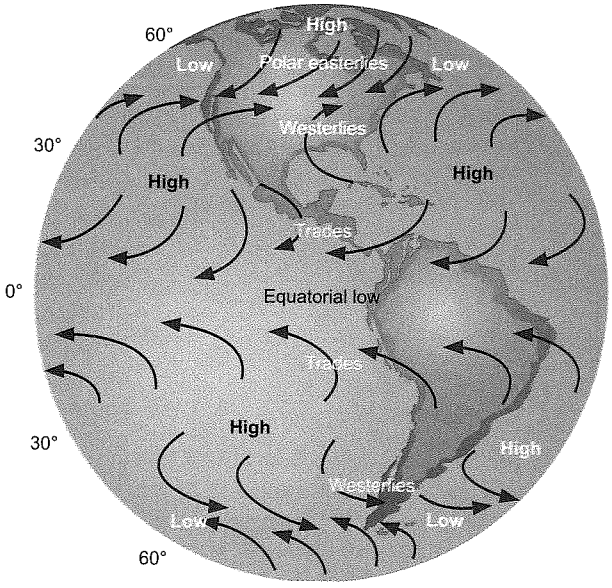
6. Which statement describes the pattern produced by the Coriolis effect?

A. It causes straight-line winds.
B. It creates high air pressure at Earth's poles.
C. It deflects winds and ocean currents.
D. It makes Earth rotate.

DIRECTIONS: Study the information and map, read each question, and choose the **best** answer.

PRESSURE AND WIND ZONES

Because of its diverse natural environments, Earth's surface absorbs the heat of the sun unevenly. For example, a dark tropical forest absorbs a different amount of solar energy than a white snowfield near the North Pole. Unequal heating causes unequal distribution of air pressure from one place on Earth's surface to another. This condition helps cause wind, which is the movement of air from areas of higher air pressure to areas of lower air pressure. Unequal heating produces huge belts of high and low pressure across Earth. These pressure belts are important in determining global wind zones.



4. To express information about the wind belt that covers most of the United States, you would discuss

A. the polar easterlies.
B. the westerlies.
C. the trades (or trade winds).
D. the equatorial low.

5. Which statement expresses the relationship between high and low pressure areas as conveyed by the map?

A. Air moves toward Earth's equatorial low.
B. Air moves from areas of high pressure to areas of lower pressure.
C. Air moves in toward high pressure.
D. Air moves from areas of low pressure to areas of higher pressure.

LESSON 5

Apply Science Concepts

Use with *Student Book* pp. 90–91

SCIENCE CONTENT TOPICS: ES.a.1, ES.b.1, ES.b.2
SCIENCE PRACTICES: SP.1.a, SP.1.b, SP.1.c, SP.3.a, SP.3.b, SP.3.c, SP.7.a

1 Review the Skill

A **concept** is a body of information related to a particular subject. It can be expressed as a topic, such as "sources of energy" or "heat transfer in matter." A concept also can be a statement about one aspect of a topic. When you **apply science concepts**, you interpret new content by relating it to ideas you already understand.

2 Refine the Skill

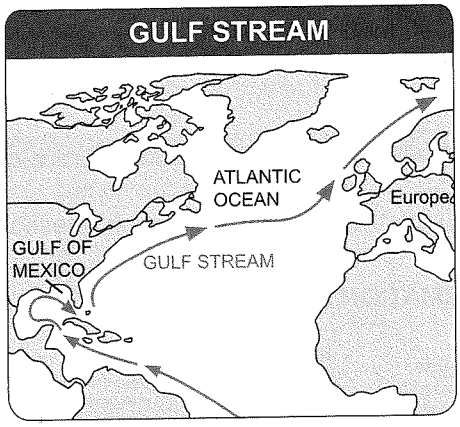
By refining the skill of applying concepts, you will improve your study and test-taking abilities, especially as they relate to the GED® Science Test. Study the information and map below. Then answer the questions that follow.

a Consider what you know about the concept of sources of energy to determine how the Gulf Stream waters are warmed.

b You know that when a warmer substance is in contact with a cooler substance, a transfer of heat occurs. Apply the concept of heat transfer to deepen your understanding of this statement.

EFFECTS OF THE GULF STREAM

Ireland and Newfoundland are both located at about 50 degrees north latitude. Yet they do not have similar climates. The average winter temperature in Ireland is about 20 degrees Celsius warmer than the average winter temperature in Newfoundland. Most scientists think this difference is caused primarily by the Gulf Stream, which is shown in the map. The Gulf Stream is a warm ocean current that originates in the Gulf of Mexico and then crosses the North Atlantic to graze the northern edge of Western Europe, where Ireland is located. The current warms the atmosphere above it. Then the prevailing westerly winds bring that warm air with them as they travel across Western Europe, making the climate milder.



1. What is the source of energy that warms the Gulf Stream?

   A. the atmosphere
   B. nearby shores
   C. the sun
   D. precipitation

2. Why does the Gulf Stream warm the atmosphere above it?

   A. Its waters are warmer than the air with which they have contact.
   B. Its particles produce energy in chemical reactions.
   C. When particles in the air come in contact with its waters, their movement slows.
   D. It has internal kinetic energy, and the atmosphere does not.

USING LOGIC

When applying concepts, look for logical connections between new facts and what you already know. Keep in mind that many Earth and space science concepts relate to physical science concepts.

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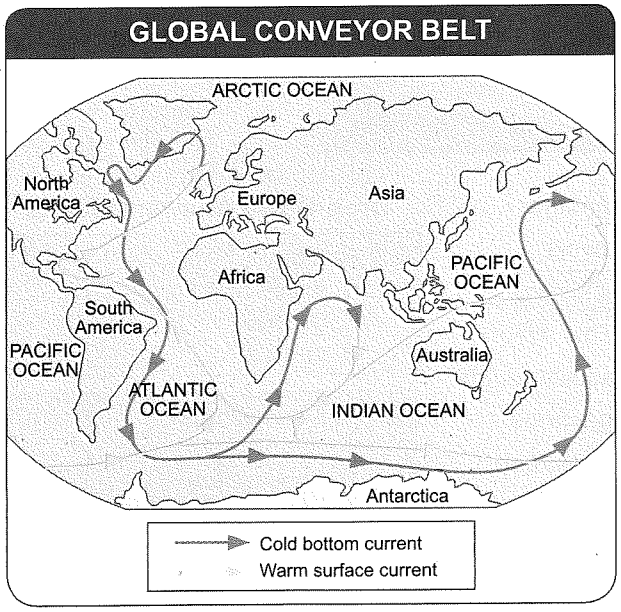
3 Master the Skill

DIRECTIONS: Study the information and map, read each question, and choose the **best** answer.

EFFECTS OF THE GLOBAL CONVEYER BELT

The global conveyer belt, shown in the map, is a worldwide underwater current. It is driven by differences in water density and temperature. Near the poles, extremely cold temperatures cause ocean water to freeze. The frozen sea ice that forms is virtually salt free because when water molecules in the saltwater solution freeze, salt remains. As a result, the water near the sea ice has a higher salinity, or concentration of salt, making it denser than normal seawater. This denser water sinks, forming a cold and dense water current that flows along the ocean floor. It flows south toward Antarctica, where it turns north again and splits. As the two separate currents approach the equator, they warm and rise toward the surface, continuing to loop around the oceans until they return to the Atlantic again as a warm surface current that cools, sinks, and starts the cycle once more.



4. Based on the information and concepts related to solutions, why does salt remain when ocean water near the poles freezes?

   A. Salt is not evenly distributed in the water before the water freezes.
   B. As the temperature of the ocean water decreases, its solubility increases.
   C. As the temperature of the ocean water decreases, its solubility decreases.
   D. Ocean water becomes saturated at a temperature above its freezing point.

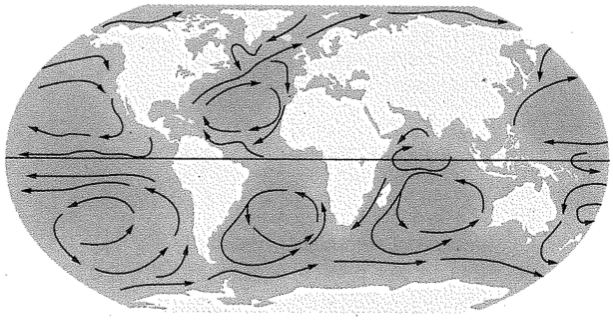
5. Based on concepts related to the properties of matter, why is ocean water with higher salinity denser than ocean water with lower salinity?

   A. Ocean water with higher salinity has a greater ratio of mass to volume than ocean water with lower salinity.
   B. Ocean water with higher salinity has a greater ratio of volume to mass than ocean water with lower salinity.
   C. Ocean water with higher salinity has more mass than ocean water with lower salinity.
   D. Ocean water with higher salinity has more volume than ocean water with lower salinity.

DIRECTIONS: Read the passage. Then read each question, and choose the **best** answer.

SURFACE OCEAN CURRENTS

An ocean current is a distinct ribbon of water that moves within the larger ocean. There are two major types of currents. Deep ocean currents move along the ocean floor. Surface currents move through a thin layer of water at the surface. The flow of ocean currents is caused by a combination of factors. These include surface winds, the shape of nearby landforms, and the Coriolis effect. The map below shows Earth's surface ocean currents.



11. What concept **most likely** explains how the Coriolis effect determines the path of ocean currents?

   A. Earth's revolution causes fluids to move in circles.
   B. The sun's gravitational attraction causes currents to curve on Earth.
   C. Earth's rotation causes currents to be deflected from a straight path.
   D. Ocean currents shift direction of movement with weather changes.