LESSON 6

Express Scientific Information

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

1 Learn the Skill

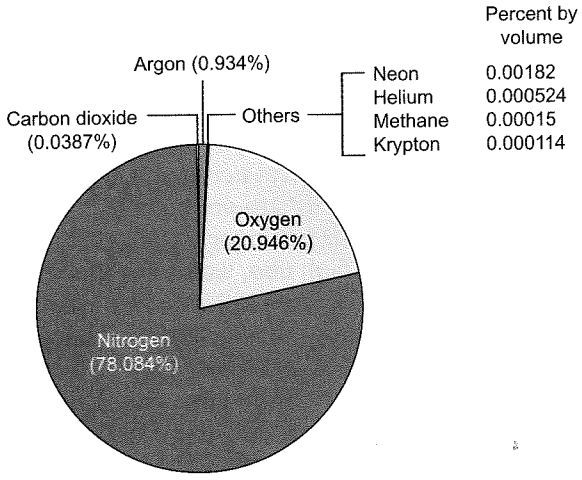
You demonstrate your understanding of science concepts by expressing scientific information. You can **express scientific information** verbally, visually, numerically, or symbolically. To effectively express this information, you first have to understand the scientific content that is being presented.

2 Practice the Skill

By practicing the skill of expressing scientific information, you will improve your study and test-taking abilities, especially as they relate to the GED® Science Test. Study the information and graph below. Then answer the question that follows.

THE ATMOSPHERE

The atmosphere is made up of the layers of gases that surround Earth. Without the atmosphere, life would not exist on Earth. The atmosphere provides the oxygen that animals, including people, need to breathe. It also provides the carbon dioxide plants use to make food during photosynthesis. It shields all living things on Earth from the harmful radiation of the sun. Earth's temperature, warm enough to support a diverse range of organisms, is also maintained by the ability of the greenhouse gases, such as carbon dioxide and methane, to trap heat near Earth's surface and warm the planet. The graph below shows the gases that are present in the atmosphere.



a Examining the ways in which scientific concepts are presented can help you express information about those concepts. This paragraph gives information about the gases found in Earth's atmosphere.

b The graph contributes content by providing additional data about these gases. By interpreting all the material presented, you can express the scientific information effectively.

CONTENT PRACTICES

Expressing scientific information is a practice addressed by the GED® Science Test. Knowing how to express such information effectively will help you succeed on the test.

1. The greenhouse gases carbon dioxide and methane are part of Earth's atmosphere. Which phrase expresses numerically the percentage of Earth's atmosphere made up of these gases?

   A. about 78 percent
   B. more than 20 percent
   C. exactly 0.0387 percent
   D. less than 1.0 percent

UNIT 3

LESSON 6

Express Scientific Information

Use with *Student Book* pp. 92–93

SCIENCE CONTENT TOPICS: ES.b.1, ES.b.3
SCIENCE PRACTICES: SP.1.a, SP.1.b, SP.1.c, SP.5.a, SP.6.a, SP.6.c

1 Review the Skill

Scientific information can be communicated in numerous ways. Certain types of information might be best communicated in one particular way. For instance, scientific data often are best expressed numerically. The ability to **express scientific information** in a variety of ways will help you choose the most effective way to communicate your knowledge and understanding of science concepts.

2 Refine the Skill

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

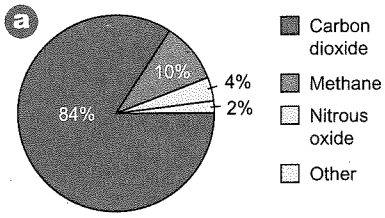
GREENHOUSE GAS EMISSIONS

Greenhouse gases in the atmosphere hold in heat and warm the planet. Some of the release of greenhouse gases into the atmosphere is natural. For example, the burning of forests due to lightning strikes releases carbon dioxide. However, since the start of the Industrial Revolution, human activities have released huge additional amounts of greenhouse gases into the atmosphere through the burning of fossil fuels. Most scientists think that this increase has contributed to a gradual warming of Earth.

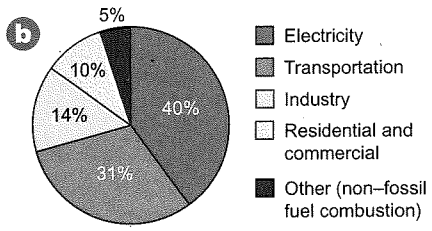
a After interpreting the first graph, you can express scientific information about how individual gases relate to total U.S. greenhouse gas emissions.

b The second graph seems simple but can be interpreted to express a great deal of scientific information.

U.S. GREENHOUSE GAS EMISSIONS, 2010



U.S. CARBON DIOXIDE EMISSIONS BY SOURCE, 2010



USING LOGIC

When using content from a visual to express scientific information, consider how its parts relate to its main idea or theme. Also, look for ways to compare or connect the individual parts of the visual.

1. Expressed numerically, what proportion of greenhouse gases is carbon dioxide, according to 2010 data?

   A. 10 percent
   B. 16 percent
   C. 84 percent
   D. 100 percent

2. Expressed numerically, which proportion of carbon dioxide emissions in 2010 resulted from electricity production, transportation, or industry?

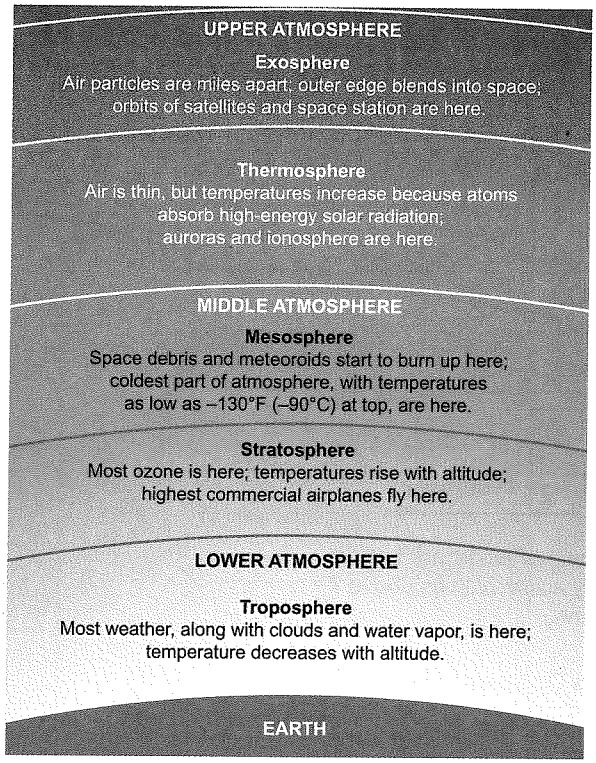
   A. 14 percent
   B. 31 percent
   C. 40 percent
   D. 85 percent

3 Master the Skill

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

LAYERS OF THE ATMOSPHERE

The atmosphere might look like one uniform substance, but it is not. It changes in relation to distance from Earth's surface. In general, particles of air are fairly close together near Earth's surface but can be kilometers apart at the atmosphere's upper edge. The atmosphere is also warmer near Earth's surface than at its upper edge, where it merges into outer space. Scientists use the way the atmosphere changes with altitude to organize it into the layers shown in the diagram.



3. To express information about layers of the atmosphere in which people **most likely** are found, you would discuss

   A. the exosphere and the thermosphere.
   B. the thermosphere and the mesosphere.
   C. the mesosphere and the stratosphere.
   D. the stratosphere and the troposphere.

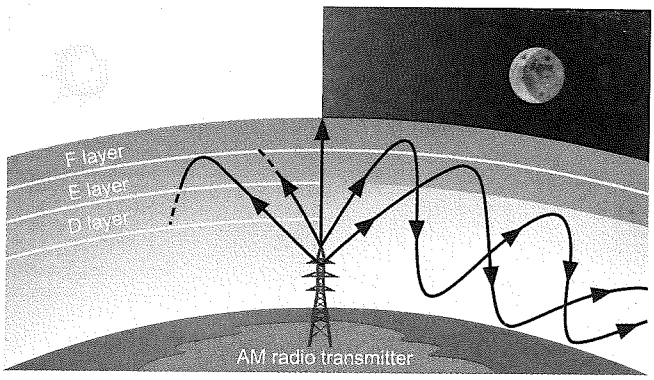
4. Which statement expresses a difference between the troposphere and the other layers?

   A. It is the coldest part of the atmosphere.
   B. It contains most clouds, rain, and wind.
   C. It is the only layer in which airplanes fly.
   D. It contains particles that are miles apart.

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

IONOSPHERE

The ionosphere is a layer of electrically charged particles in the lower part of the thermosphere. As they absorb high-energy radiation from the sun, nitrogen molecules and oxygen atoms are stripped of electrons, becoming ions or other charged particles. The freed electrons form electrical currents in the upper atmosphere. The ionosphere has three layers. From the closest to Earth outward, they are D, E, and F. During daylight hours, the D layer absorbs radio signals, so AM radio signals stay within a limited number of kilometers from the radio transmitter. Without solar energy to ionize particles, the D and E layers disappear at night, leaving only the highest F layer. The diagram shows why this means that late at night you can pick up radio signals from unusually distant locations.



5. What do the black arrows in the diagram express?

   A. charged particles
   B. radio signals
   C. nitrogen molecules and oxygen atoms
   D. radiation from the sun

6. Which statement expresses the reason why AM radio signals from faraway stations can be heard only at night?

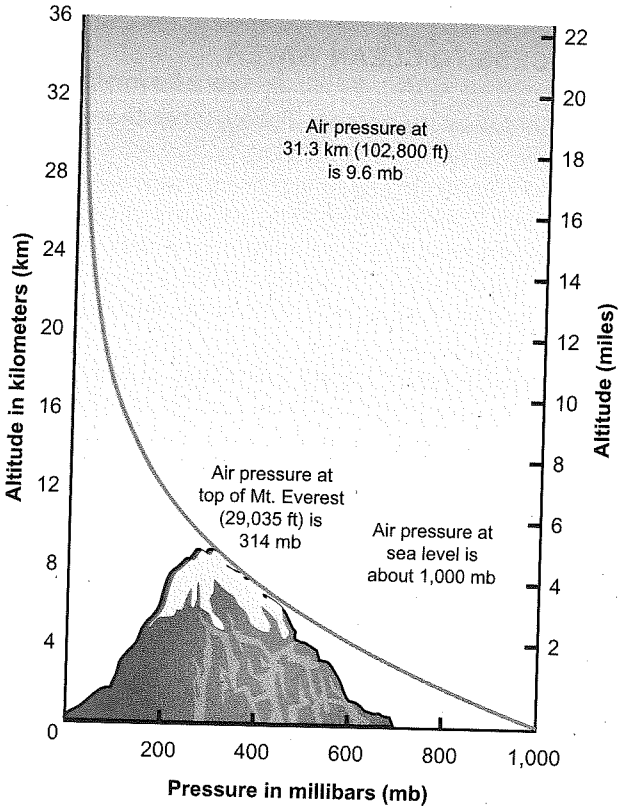
   A. Transmitters send out more powerful signals at night.
   B. The ionosphere gives radio signals more energy at night.
   C. Radio waves bouncing off the ionosphere travel longer distances at night.
   D. Sunlight during the daylight hours blocks radio signals.

UNIT 3

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

AIR PRESSURE

Air pressure is the force of the atmosphere pressing down on Earth's surface. Gravity's downward force compresses air molecules the most at sea level. As a result, the density of the air—and, therefore, the air pressure—is greater closer to sea level. As altitude increases, such as on a high mountain, the force of gravity decreases, and the pressure decreases as well. Air pressure is not usually felt, because it is exerted in all directions at once. The graph below shows the relationship between air pressure and altitude.



9. Which statement expresses the relationship between air pressure and altitude?

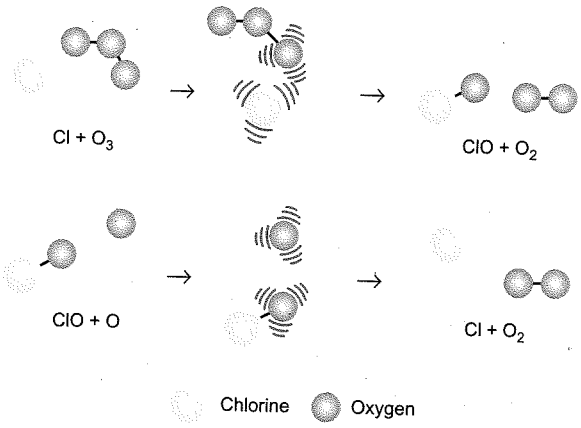
   A. Air pressure is lowest at sea level.
   B. Air pressure decreases as distance from mountains increases.
   C. Air pressure increases as altitude increases.
   D. Air pressure increases as altitude decreases.

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

OZONE LAYER

The atmosphere contains oxygen molecules (O_2), oxygen atoms (O), and ozone molecules (O_3). Ozone is a form of oxygen that is produced when oxygen molecules and oxygen atoms bond. Ozone production in the atmosphere is a continually occurring process.

Atmospheric ozone is important because it blocks most of the sun's harmful ultraviolet radiation. That is why scientists were alarmed to discover during the mid-1970s that Earth's layer of ozone was thinning in places. The source of the problem was chlorine atoms (Cl) from chemicals called chlorofluorocarbons (CFCs). To protect atmospheric ozone, more than 180 countries agreed to phase out products that used or contained substances such as CFCs in the late 1980s.



10. What information about ozone is expressed by the model?

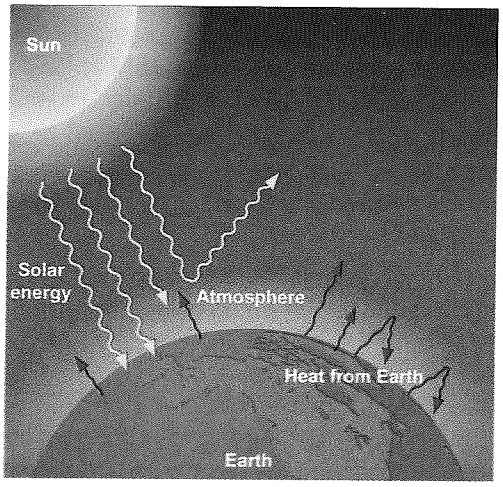
    A. Ozone is produced when oxygen molecules and oxygen atoms bond.
    B. Chlorine combines with ozone in the atmosphere to break down the ozone.
    C. Ozone production in the atmosphere is a continually occurring process.
    D. Ozone is a form of oxygen found in the atmosphere.

3 Apply the Skill

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

GREENHOUSE GASES

Earth's average temperature is 14 degrees Celsius, or 57 degrees Fahrenheit. Without the greenhouse gases in Earth's atmosphere, the planet's temperature would be much lower—too cold for the survival of people and most other living organisms. The greenhouse gases—such as carbon dioxide, methane, and nitrous oxide—make up less than 1 percent of Earth's atmosphere. Yet, as the diagram suggests, they are important in warming Earth's surface and atmosphere. After Earth absorbs solar energy, it emits infrared radiation, some of which is kept within the atmosphere by greenhouse gases.



2. Which statement expresses what happens to the energy from the sun?

   A. All of it reaches Earth and is absorbed by Earth's surface.
   B. All of it reaches Earth and is reflected into the atmosphere.
   C. Some is absorbed by Earth's surface, and some is reflected by Earth.
   D. Some is absorbed by Earth's surface, and some is reflected by the atmosphere.

3. Which parts of the diagram express visually the effect of greenhouse gases?

   A. the arrows from Earth that bend back toward Earth
   B. the arrows from the sun to Earth's surface
   C. the arrows from the sun that bend at Earth's atmosphere
   D. the arrows pointing away from Earth