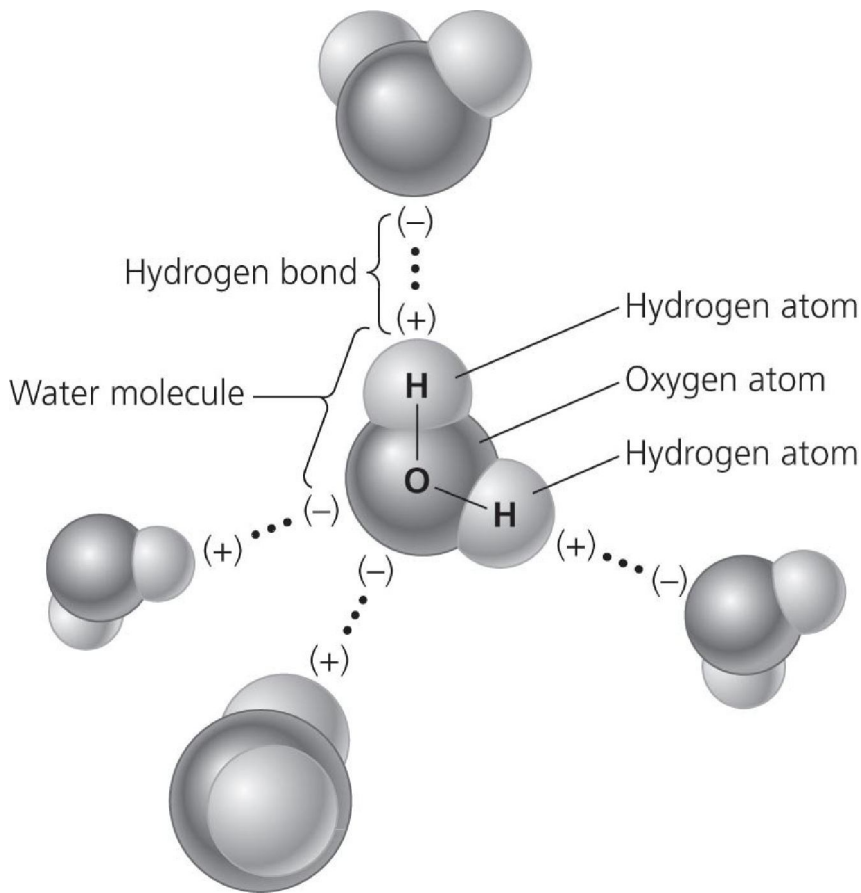


**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.



**Use the accompanying figure to answer the following questions.**

- 1) Within each water molecule, \_\_\_\_\_ connect(s) two hydrogens to every oxygen. 1) \_\_\_\_\_
  - A) covalent bonds
  - B) ionic bonds
  - C) isotopes
  - D) hydrogen bonds
  - E) magnetic force
  
- 2) Why are both ends of each water molecule positive and the middle negative? 2) \_\_\_\_\_
  - A) The two hydrogens present have a greater pull on the electrons.
  - B) Hydrogen bonds create a charge difference.
  - C) Oxygen has a greater pull on the protons.
  - D) The two hydrogens present have a greater pull on the protons.
  - E) Oxygen has a greater pull on the electrons.
  
- 3) What property of water is due to hydrogen bonds? 3) \_\_\_\_\_
  - A) ability to dissolve lipids
  - B) ability to change temperature quickly
  - C) high pH
  - D) low pH
  - E) ability to form droplets

- 4) Hydrogen bonds connect \_\_\_\_\_ 4) \_\_\_\_\_
- A) hydrogen atoms to other hydrogen atoms
  - B) oxygen atoms to other oxygen atoms
  - C) the nuclei of adjacent water molecules
  - D) hydrogen atoms to oxygen atoms within the water molecule
  - E) positive regions of one water molecule to negative regions of other water molecules

**SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.**

**Match the following.**

- A) ions
- B) neutrons
- C) protons
- D) atoms
- E) electrons
- F) isotopes
- G) molecules

- 5) The smallest components of elements that still maintain the chemical properties of the element 5) \_\_\_\_\_
- 6) Negatively charged particles 6) \_\_\_\_\_
- 7) Elements with the same atomic number but with different atomic masses 7) \_\_\_\_\_
- 8) Elements or molecules with a charge 8) \_\_\_\_\_
- 9) Charged particles located in the nucleus 9) \_\_\_\_\_
- 10) Combinations of elements held together with bonds 10) \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 11) \_\_\_\_\_ is defined as the number of protons plus the number of neutrons. 11) \_\_\_\_\_
- A) Isotopic number
  - B) Nuclear number
  - C) Ionic number
  - D) Atomic number
  - E) Mass number
- 12) \_\_\_\_\_ are composed of amino acids. 12) \_\_\_\_\_
- A) Proteins
  - B) Nucleic acids
  - C) Lipids
  - D) Bases
  - E) Carbohydrates

- 13) \_\_\_\_\_ are the primary water-insoluble components of cell membranes. 13) \_\_\_\_\_
- A) Nucleic acids
  - B) Carbohydrates
  - C) Acids
  - D) Lipids
  - E) Proteins
- 14) Skin, hair, muscles, and enzymes are all made up of \_\_\_\_\_. 14) \_\_\_\_\_
- A) carbohydrates
  - B) proteins
  - C) nucleic acids
  - D) lipids
  - E) organelles
- 15) Plastics are \_\_\_\_\_. 15) \_\_\_\_\_
- A) synthetic proteins
  - B) naturally occurring macromolecules
  - C) moldable, petroleum-based hydrocarbons
  - D) unstable and break down easily
  - E) assembled by enzymes in cells
- 16) Which of the following reactions represents cellular respiration? 16) \_\_\_\_\_
- A) nitrogen + carbon dioxide + energy → methane + oxygen
  - B) glucose + oxygen → water + carbon dioxide + energy
  - C) water + carbon dioxide → glucose + oxygen + water + energy
  - D) water + carbon dioxide + energy → glucose + oxygen + water
  - E) nitrogen + oxygen + glucose → methane + carbon dioxide
- 17) Which of the following represents chemosynthesis? 17) \_\_\_\_\_
- A) water + carbon dioxide + energy → glucose + oxygen + water
  - B) glucose + water → methane + carbon dioxide
  - C) nitrogen + carbon dioxide + energy → methane + oxygen
  - D) carbon dioxide + water + hydrogen sulfide → sugar + sulfuric acid
  - E) glucose + oxygen → water + carbon dioxide + energy
- 18) \_\_\_\_\_ cause water molecules to interact and adhere to one another. 18) \_\_\_\_\_
- A) Nonpolar covalent bonds
  - B) Hydrogen bonds
  - C) Acid-base attractions
  - D) Polar covalent bonds
  - E) Van der Waals attractions
- 19) Which of the following describes a property of pure water? 19) \_\_\_\_\_
- A) acidic pH
  - B) can hold many molecules in solution
  - C) molecules are noncohesive
  - D) changes temperature rapidly
  - E) more dense as a solid

- 20) Precipitation \_\_\_\_\_. 20) \_\_\_\_\_
- A) that is acidic has a low concentration of hydrogen ions
  - B) that measures pH = 4 is twice as acidic as precipitation that measures pH = 5
  - C) that is acidic would have a pH higher than 7
  - D) that is acidic would have a pH lower than pure water
  - E) has become increasing more basic in the last 100 years, due to industrial air pollution
- 21) We use \_\_\_\_\_ to catalyze the chemical reactions of digestion. 21) \_\_\_\_\_
- A) nucleic acids
  - B) isotopes
  - C) polycyclic aromatic hydrocarbons
  - D) enzymes
  - E) alcohol molecules
- 22) Forming the cell walls of stems, leaves, and roots, what compound is the primary structural constituent of plant tissues? 22) \_\_\_\_\_
- A) starch
  - B) chlorophyll
  - C) protein
  - D) enzymes
  - E) cellulose
- 23) Which of the following describes mass wasting? 23) \_\_\_\_\_
- A) downslope movement of soil and rock due to gravity
  - B) the destruction of sedimentary rock by earthquakes
  - C) agricultural damage resulting from a tsunami
  - D) deterioration of an atom because of radioactivity
  - E) blockage of sunlight by volcanic ash
- 24) River water held behind a dam is best described as a form of \_\_\_\_\_. 24) \_\_\_\_\_
- A) potential energy
  - B) kinetic energy
  - C) thermodynamics
  - D) chemical energy
  - E) entropy
- 25) During photosynthesis within plants, \_\_\_\_\_. 25) \_\_\_\_\_
- A) there is net consumption of water and carbon dioxide
  - B) the high-quality energy from sugar is converted to heat and light
  - C) sugars and carbon dioxide are produced
  - D) carbon dioxide and oxygen are produced
  - E) oxygen and carbon dioxide are consumed
- 26) Cellular respiration \_\_\_\_\_. 26) \_\_\_\_\_
- A) requires the green pigment chlorophyll
  - B) involves a net consumption of water
  - C) results in a net consumption of energy
  - D) represents a decrease in entropy
  - E) releases carbon dioxide and water

- 27) Undersea earthquakes and volcanic eruptions may produce \_\_\_\_\_. 27) \_\_\_\_\_  
A) hurricanes  
B) lahars  
C) tsunamis  
D) pyroclastic flow  
E) mass wasting
- 28) Earthquakes result from \_\_\_\_\_. 28) \_\_\_\_\_  
A) energy released from movement at plate boundaries and faults  
B) separation of layers within sedimentary rock  
C) surges of magma from the earth's core  
D) global climate change  
E) release of gases from the underlying mantle
- 29) What is the type of rock formed when magma or lava cools? 29) \_\_\_\_\_  
A) sedimentary  
B) metamorphic  
C) lithospheric  
D) igneous  
E) geothermal
- 30) The San Andreas Fault in California is an example of a(n) \_\_\_\_\_. 30) \_\_\_\_\_  
A) convergent plate boundary  
B) tsunami  
C) divergent plate boundary  
D) continental collision and uplift  
E) transform plate boundary
- 31) The force driving plate tectonics is \_\_\_\_\_. 31) \_\_\_\_\_  
A) solar radiation  
B) nuclear reactions in magma  
C) gravity  
D) heat in the deepest layers of the earth  
E) freezing and thawing of water in the earth's crust
- 32) Consider the following processes: respiration, chemosynthesis, combustion of firewood, and photosynthesis. How many of these result in the release of oxygen into the atmosphere? 32) \_\_\_\_\_  
A) none                      B) 1                      C) 2                      D) 3                      E) all 4
- 33) When you burn a log in your fireplace you are converting \_\_\_\_\_. 33) \_\_\_\_\_  
A) chemical to nuclear energy  
B) electromagnetic to chemical  
C) proteins to amino acids  
D) thermal to electromagnetic energy  
E) chemical to thermal energy

- 34) Rock that has undergone heat or pressure that causes it to change form is called \_\_\_\_\_. 34) \_\_\_\_\_  
A) igneous  
B) metamorphic  
C) sedimentary  
D) conglomerate  
E) deformative
- 35) The process of subduction \_\_\_\_\_. 35) \_\_\_\_\_  
A) occurs when plates pull apart  
B) is caused by volcanoes  
C) is responsible for hurricanes  
D) causes the formation of deep ocean trenches  
E) occurs when denser ocean crusts slide beneath lighter continental crusts
- 36) What are the three distinct layers of the earth? 36) \_\_\_\_\_  
A) mantle, magma, crust  
B) mantle, crust, oceanic crust  
C) core, mantle, lithosphere  
D) core, mantle, crust  
E) oceanic crust, mantle, magma
- 37) The type of tectonic plate boundary at the Mid-Atlantic Ridge is referred to as a \_\_\_\_\_. 37) \_\_\_\_\_  
A) convergent boundary  
B) divergent boundary  
C) transform fault  
D) seismic boundary  
E) subduction zone
- 38) A solution with a pH of 3 is \_\_\_\_\_ a solution with a pH of 5. 38) \_\_\_\_\_  
A) twice as acidic  
B) 4 times more acidic  
C) 100 times more acidic  
D) half as acidic  
E) 4 times less acidic

**ESSAY. Write your answer in the space provided or on a separate sheet of paper.**

- 39) Briefly explain the concept of plate tectonics and why it is important for the study of geography.
- 40) In what ways are macromolecules essential to life? Describe the structures of three and describe their major role(s) in organisms.
- 41) What is the first law of thermodynamics, and what are its implications for natural resource management?
- 42) Compare and discuss the first and second laws of thermodynamics.
- 43) Briefly explain the overall processes of photosynthesis and cellular respiration. Include a brief explanation of autotrophs and heterotrophs in your answer.

- 44) Why does chemistry play a central role in our study of environmental issues? Provide an example from the text that illustrates how chemistry helps solve environmental problems.
- 45) Describe the rock cycle, explaining how the three major types of rock form and break down.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Read the following scenario and answer the questions below.**

Many geologists have proposed naming the current time period of Earth's history the Anthropocene epoch. The rationale for doing so includes the fact that erosion rates and greenhouse gas levels in the atmosphere have increased rapidly over the past 300 years. Almost all environmental scientists agree that increases in greenhouse gases contribute to global climate change. Carbon dioxide, methane, nitrous oxide, ozone, hydrochlorofluorocarbons, and water vapor are the main culprits. Human activities, chief among them the tapping and burning of fossil fuels for energy, have significantly increased these "greenhouse gases" in our atmosphere in the last 300 years. With rising standards of living in developing countries, emissions of carbon dioxide and other greenhouse gases are expected to continue to rise. If unchecked, carbon dioxide levels will reach twice preindustrial levels by midcentury and double again by the end of the century. Computer models have shown that this rise alone could raise Earth's temperatures by 3 to 10 degrees Fahrenheit by 2100.

- 46) Which of the following is the most logical explanation for water being a greenhouse gas? 46) \_\_\_\_\_
- A) The ionic bonds holding water vapor together help it trap heat.
  - B) Water is acidic, and acids retain heat.
  - C) Hydrogen-containing compounds trap the most heat, and water contains hydrogen.
  - D) The hydrogen bonds holding molecules of water vapor together help it trap heat.
  - E) Water is a good conductor of electricity, and electricity contains heat.
- 47) Besides contributing to global warming, nitrous oxide contributes indirectly to acid precipitation because of \_\_\_\_\_. 47) \_\_\_\_\_
- A) its ability to form compounds that lower pH
  - B) the hydrogen bonds connecting the nitrogen and oxygen atoms in the molecule
  - C) the airborne nature of all compounds containing nitrogen
  - D) its ability to form compounds that raise pH
  - E) the ability of acids to raise the temperature of the substances which dissolve them
- 48) Overpopulation contributes to global warming when \_\_\_\_\_. 48) \_\_\_\_\_
- A) most people use public transportation
  - B) most of the population is vegetarian
  - C) it leads to deforestation, increased agriculture, and increased use of fossil fuels
  - D) we compromise our living standards in order to protect the environment
  - E) solar energy is used as the primary source of energy, since it is a renewable resource
- 49) The primary source of increased levels of greenhouse gases on Earth is \_\_\_\_\_. 49) \_\_\_\_\_
- A) asteroids falling to Earth
  - B) loss of heterotrophs
  - C) increased photosynthetic activity
  - D) modern human lifestyles
  - E) aerosol spray cans

- 50) Climatic change is a major concern for environmentalists because it can directly lead to \_\_\_\_\_. 50) \_\_\_\_\_
- A) an increase in the diameter of the ozone hole
  - B) an decrease in the amount of geothermal energy
  - C) a decrease in the amount of photosynthesis on Earth
  - D) extinctions
  - E) more biodiversity on Earth
- 51) Why does burning fossil fuels contribute to global warming? 51) \_\_\_\_\_
- A) Burning fossil fuels creates increased plate tectonic movement.
  - B) Fossils, if left untouched, cool Earth.
  - C) Carbon present in coal, oil, and natural gas becomes carbon dioxide when these fuels burn.
  - D) New energy is created on Earth when fossil fuels are burned.
  - E) Burning fossil fuels removes water vapor from the atmosphere.
- 52) Positive feedback loops destabilize environmental systems by creating a "snowball effect," whereby a change in the system causes further change. Which of the following represents a positive feedback loop in regard to global warming? 52) \_\_\_\_\_
- A) warming of Earth, increasing the evaporation of surface water
  - B) limiting use of fossil fuels as a source of energy
  - C) controlling development, resulting in higher population densities in urban centers
  - D) reforestation, causing a release of carbon dioxide from soil microbes
  - E) sequestering carbon dioxide underground, resulting in a drop in atmospheric carbon dioxide levels



## Answer Key

Testname: UNTITLED5

- 1) A
- 2) E
- 3) E
- 4) E
- 5) D
- 6) E
- 7) F
- 8) A
- 9) C
- 10) G
- 11) E
- 12) A
- 13) D
- 14) B
- 15) C
- 16) B
- 17) D
- 18) B
- 19) B
- 20) D
- 21) D
- 22) E
- 23) A
- 24) A
- 25) A
- 26) E
- 27) C
- 28) A
- 29) D
- 30) E
- 31) D
- 32) B
- 33) E
- 34) B
- 35) E
- 36) D
- 37) B
- 38) C
- 39) Plate tectonics is "fueled" by heat from Earth's core, which creates convection currents that flow in the mantle, pushing the soft rock upward as it heats up and downward as it cools. As the mantle moves along these giant "conveyor belts," it drags large plates of lithosphere (continental plates) along its surface. Plate tectonics make up the processes that underlie earthquakes and volcanoes, create mountain ranges, and shape shorelines. They determine much of the geography of Earth's surface.

## Answer Key

Testname: UNTITLED5

- 40) Macromolecules provide critical components of organismal structure, energy storage and mobilization, and genetic coding, to name just a few of their many roles. Carbohydrates are made of carbon, hydrogen, and oxygen and have the general formula  $\text{CH}_2\text{O}$ . Carbon and water exist in a 1:1 ratio. They are the primary components of plant cell walls and are the preferred energy source for many organisms. Proteins are chains of amino acids (amine group + carboxyl or acid group + central carbon). They are primarily structural molecules. They are blood transporters, aid in the function of the immune system, and promote metabolic reactions. Most enzymes are proteins. Nucleic acids are made of chains of nucleotides (phosphate + sugar + nitrogenous bases). They carry genetic information (genes) that coordinates all organismal functions and passes traits from generation to generation.
- 41) This law says that the total energy and mass in the universe are constant and conserved. This law is important because it says that there is a finite amount of energy on Earth. Humans cannot make new energy. This law has also saluted the balancing of all chemical reactions, where we acknowledge that mass is conserved, even though we may change its form. In terms of our management of resources, especially those that are nonrenewable, it implies that efficient and sustainable use of energy and materials is extremely important since their abundance is limited.
- 42) The first law states that energy can change from one form to another; it cannot be created or lost. The total energy in the universe remains constant. However, the second law states that the universe will change from a more ordered state to a less ordered state. Entropy in the universe is increasing, as energy is converted from high to low quality. Organisms must consume energy to maintain structure and keep entropy at bay. Low-quality energy from organisms is usually released into the environment as heat. For example, if you had a bowl of oatmeal for breakfast, your digestive systems digests the starch to glucose and your cells then burn the glucose to produce energy to run your body, but most of it is lost as heat. The low-quality exhaust products of this process are carbon dioxide and water, neither of which has any potential energy for you to use. Therefore, you have to keep taking in more chemical energy in food to keep your system running.
- 43) Photosynthesis is performed by autotrophs. In photosynthesis, light energy is converted into chemical energy (stored within the bonds of glucose). Water and carbon dioxide are consumed, and oxygen is released. In most autotrophs, photosynthesis occurs in the chloroplasts. Cellular respiration represents the reverse chemical process. It is performed by both autotrophs and heterotrophs to meet their energy needs. In cellular respiration, oxygen is consumed, and the bonds of glucose are broken to release energy, which is then used for work within the cell. Along with the energy, carbon dioxide and water are end products, and heat is produced. In most organisms, cellular respiration takes place in the mitochondria.
- 44) Chemistry is the fine structure of matter and so is crucial to understanding how gases such as carbon dioxide and methane contribute to global climate change, how pollutants such as sulfur dioxide and nitric oxides cause acid rain, and how pesticides and other artificial compounds we release into the environment affect the health of wildlife and people. Chemistry is central in understanding water pollution and sewage treatment, atmospheric ozone depletion, hazardous waste and its disposal, and energy issues. An understanding of chemistry is also crucial to developing solutions to environmental problems, such as acid rain.
- 45) All rocks can melt. At sufficiently high temperatures, rocks liquefy into magma. Magma may cool back into rock underground or may be released above ground through a volcano or vent in the form of ash or lava, which may then cool into rock on Earth's surface. Rock formed from the various types of magma is called igneous rock. Over time, wind, weather, and physical damage can erode rock into gravel, sand, silt, and clay particles.

Once rock has been broken down into small components it can be deposited, often in or along water features in layers. Over time, these are compressed into layered rock, called sedimentary rock. This, too, can erode back into smaller fragments.

Igneous or sedimentary rock buried underground and exposed to extreme forces of heat or pressure can change form into metamorphic rock, which may be quite different from its original form. This process occurs at temperatures below the melting point of the rock.

- 46) D  
47) A  
48) C

Answer Key

Testname: UNTITLED5

49) D

50) D

51) C

52) A