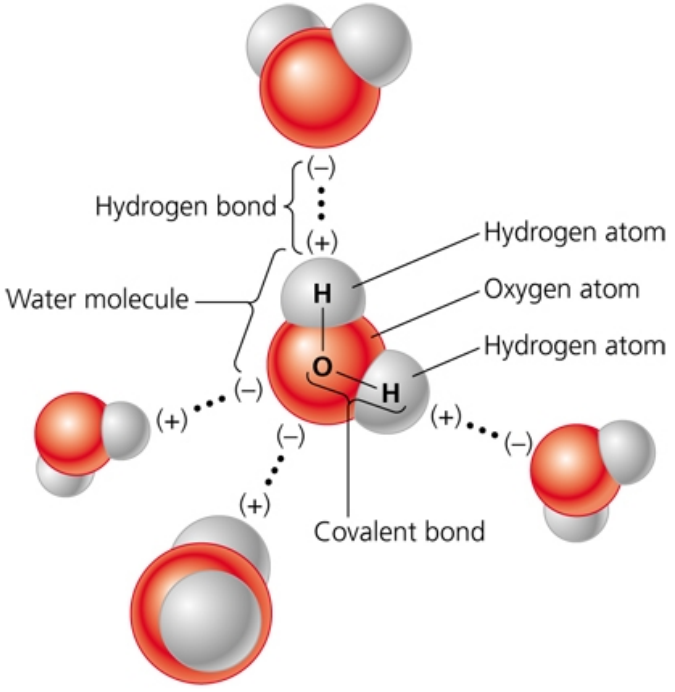
Exam

Name_____

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) isotopes
B) magnetic force
C) covalent bonds
D) ionic bonds
E) hydrogen bonds

Answer: C

2) Why are both ends of each water molecule positive and the middle negative? 2) _____
A) Protons are more attracted to oxygen than they are to hydrogen.
B) Protons are more attracted to hydrogen than they are to oxygen.
C) Electrons are more attracted to hydrogen than they are to oxygen.
D) Electrons are more attracted to oxygen than they are to hydrogen.
E) Hydrogen bonds create a charge difference.

Answer: D

3) Hydrogen bonds give water which of the following properties? 3) _____
A) the ability to resist temperature changes
B) the ability to dissolve lipids
C) low pH
D) the ability to freeze into ice, which is denser than liquid water
E) high pH

Answer: A

4) A hydrogen bond connects _____. 4) _____
A) a hydrogen atom to another hydrogen atom
B) a hydrogen atom to an oxygen atom within a water molecule
C) a positive region of one water molecule to a negative region of another water molecule
D) the nuclei of adjacent water molecules
E) an oxygen atom in one water molecule to an oxygen atom in another water molecule

Answer: C

MATCHING. Choose the item in column 2 that best matches each item in column 1.

Match the following.

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

5) The smallest components of elements that still maintain the chemical properties of the elements 5) _____

Answer: D

6) Negatively charged particles 6) _____

Answer: B

7) Elements with the same atomic number but different atomic masses 7) _____

Answer: A

8) Atoms or molecules with a charge 8) _____

Answer: C

9) Uncharged particles that contribute to an atom's mass number 9) _____

Answer: E

10) Combinations of elements held together with bonds 10) _____

Answer: F

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) Atomic number
C) Ionic number
D) Mass number
E) Nuclear number
Answer: D

12) An atom has 2 electrons, 3 protons, and 3 neutrons. What is the atom's mass number? 12) _____
A) 3
B) 5
C) 6
D) 8
E) Cannot be determined from the information given
Answer: C

13) An atom has 2 electrons, 3 protons, and 3 neutrons. What is the atom's charge? 13) _____
A) -1 B) +8 C) -2 D) +1 E) +3
Answer: D

14) _____ are composed of amino acids. 14) _____
A) Bases
B) Proteins
C) Nucleic acids
D) Lipids
E) Carbohydrates
Answer: B

15) _____ are the main water-insoluble components of cell membranes. 15) _____
A) Acids
B) Nucleic acids
C) Phospholipids
D) Proteins
E) Carbohydrates
Answer: C

16) Reddish hair in children is often a sign of malnourishment in developing nations such as Haiti. What biomolecule is needed for hair growth and is probably lacking in the diets of these children? 16) _____
A) proteins
B) DNA
C) carbohydrates
D) lipids
E) nucleic acids
Answer: A

17) Plastics are _____. 17) _____

A) unstable and break down easily
B) moldable, petroleum-based hydrocarbons
C) naturally occurring macromolecules
D) synthetic proteins
E) assembled by enzymes in cells

Answer: B

18) Which of the following reactions represents cellular respiration? 18) _____

A) sugar + oxygen → water + carbon dioxide + energy
B) nitrogen + oxygen + sugar → methane + carbon dioxide
C) water + carbon dioxide → sugar + oxygen + water + energy
D) water + carbon dioxide + energy → sugar + oxygen + water
E) sugar + carbon dioxide + energy → water + oxygen

Answer: A

19) Which of the following describes a property of pure water? 19) _____

A) changes temperature rapidly
B) molecules are noncohesive
C) can hold many molecules in solution
D) acidic pH
E) more dense as a solid

Answer: C

20) Many organisms that undergo chemosynthesis use _____ instead of _____ to fuel the processes that convert carbon dioxide into sugars. 20) _____

A) sunlight; carbohydrates
B) energy; sunlight
C) hydrogen sulfide (H_2S); sunlight
D) sunlight; sulfuric acid
E) sunlight; water

Answer: C

21) We use _____ to catalyze the chemical reactions of digestion. 21) _____

A) alcohol molecules
B) polycyclic aromatic hydrocarbons
C) nucleic acids
D) isotopes
E) enzymes

Answer: E

22) What compound is the primary structural constituent of plant tissue, forming the cell walls of stems, leaves, and roots? 22) _____

A) starch
B) chlorophyll
C) cellulose
D) protein
E) enzymes

Answer: C

23) Which of the following describes mass wasting? 23) _____
A) the destruction of sedimentary rock by earthquakes
B) deterioration of an atom because of radioactivity
C) blockage of sunlight by volcanic ash
D) flood damage resulting from a tsunami
E) downslope movement of soil and rock due to gravity
Answer: E

24) River water stored behind a dam is best described as a form of _____. 24) _____
A) chemical energy
B) kinetic energy
C) thermodynamics
D) potential energy
E) entropy
Answer: D

25) During photosynthesis within plants, _____. 25) _____
A) sugars and carbon dioxide are produced
B) carbon dioxide and oxygen are produced
C) water and carbon dioxide are consumed
D) the high-quality energy from sugar is converted to heat and light
E) oxygen and carbon dioxide are consumed
Answer: C

26) Cellular respiration _____. 26) _____
A) results in a net consumption of energy
B) represents a decrease in entropy
C) requires the green pigment chlorophyll
D) releases carbon dioxide and water
E) involves a net consumption of water
Answer: D

27) Undersea earthquakes and volcanic eruptions may produce _____. 27) _____
A) tsunamis
B) lahars
C) hurricanes
D) pyroclastic flow
E) mudslides
Answer: A

28) Earthquakes result from _____. 28) _____
A) surges of magma from the earth's core
B) global climate change
C) release of gases from the underlying mantle
D) separation of layers within sedimentary rock
E) energy released from movement at plate boundaries and faults
Answer: E

29) What is the type of rock formed when magma or lava cools? 29) _____
A) geothermal
B) igneous
C) lithospheric
D) metamorphic
E) sedimentary
Answer: B

30) Which of the following statements about the rock cycle is TRUE? 30) _____
A) Sedimentary rock forms metamorphic rock as it erodes.
B) Weathering and erosion can cause all three rock types to become sediments.
C) Sediments form igneous rock via lithification.
D) The cooling of magma forms metamorphic rock.
E) Sedimentary rock forms metamorphic and igneous rock via the process of lithification.
Answer: B

31) The force driving plate tectonics is _____. 31) _____
A) solar radiation
B) nuclear reactions in magma
C) freezing and thawing of water in the earth's crust
D) heat in the inner layers of the earth
E) gravity
Answer: D

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
Answer: B

33) When you burn a log in your fireplace you are converting _____. 33) _____
A) proteins to amino acids
B) chemical to thermal energy
C) thermal to electromagnetic energy
D) electromagnetic to chemical
E) chemical to nuclear energy
Answer: B

34) _____ rock has undergone heat or pressure, causing it to change form. 34) _____
A) Metamorphic
B) Sedimentary
C) Igneous
D) Deformative
E) Conglomerate
Answer: A

35) Geologists have divided the geologic time scale using evidence compiled using stratigraphy, which is the study of _____. 35) _____

A) tree rings
B) layers of sedimentary rock
C) plate tectonics
D) ancient cave drawings
E) layers of igneous rock

Answer: B

36) What are the three distinct layers of the earth? 36) _____

A) oceanic crust, continental crust, mantle
B) mantle, magma, crust
C) mantle, crust, lithosphere
D) core, mantle, crust
E) core, mantle, lithosphere

Answer: D

37) At a _____, tectonic plates push apart from one another as magma rises upward to the surface. 37) _____

A) transform boundary
B) strike-slip fault
C) divergent boundary
D) subduction fault
E) convergent boundary

Answer: C

38) A solution of pH 5 has _____ times _____ hydrogen ions than a solution of pH 7. 38) _____

A) 20; more
B) 100; more
C) 20; fewer
D) 100; fewer
E) Cannot be determined from the information given

Answer: B

39) The "ring of fire" is _____. 39) _____

A) a belt of earthquakes and volcanoes that occur around the Pacific Ocean
B) the underground layer of the earth's crust that is most prone to volcanic activity
C) the region around the Pacific Ocean most prone to catastrophic wildfires
D) the most visible, major ring of Saturn
E) the "wing" of the supervolcano found in Yellowstone National Park

Answer: A

40) Why was the earthquake that struck Haiti in 2010 so much more deadly than the earthquake that struck Tohoku, Japan, in 2011? 40) _____

A) The Tohoku earthquake struck a rural area, whereas the Haiti earthquake centered on the capital city.
B) The Haiti earthquake was much more powerful than the Tohoku quake.
C) Japan has a stricter building code.
D) The Haiti earthquake created a tsunami that killed tens of thousands of people.
E) Buildings in Japan are more rigidly built and less flexible than those in Haiti.

Answer: C

41) You live in the Pacific Northwest and hear a news story about the dangers associated with pyroclastic flow. Which of the following is the news story about? 41) _____

A) mudslides
B) tsunamis
C) volcanic eruptions
D) floods
E) geysers

Answer: C

42) Approximately 40 grams of the radioisotope iodine-131 were accidentally released into the atmosphere during the Fukushima nuclear accident. The half-life of iodine-131 is 8 days. How long would it take for there to be 10 grams of iodine-131 left in the environment? 42) _____

A) 8 days B) 12 days C) 14 days D) 16 days E) 23.7 days

Answer: D

43) All of the following are compounds EXCEPT _____. 43) _____

A) glucose
B) table salt
C) methane
D) oxygen gas
E) water

Answer: D

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

44) Briefly explain the concept of plate tectonics and why it is important for the study of geography.

Answer: 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 moves 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.

45) In what ways are macromolecules essential to life? Describe the structures of three macromolecules, and describe their major role(s) in organisms.

Answer: 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 CH_2O. Carbohydrates are the primary components of plant cell walls and are the preferred energy source for many organisms. Proteins are chains of amino acids that form structural molecules, aid in the function of the immune system, serve as hormones, and act as enzymes, which promote metabolic reactions. 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. DNA is a double-stranded form of nucleic acid.

46) What is the first law of thermodynamics, and what are its implications for natural resource management?

Answer: This law says that the total energy and matter 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 or create new mass, and the energy and mass in all chemical reactions are equal between reactants and products (reactants = products). Matter and energy change form in chemical reactions, but they are neither created nor destroyed in those reactions. 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.

47) Compare and discuss the first and second laws of thermodynamics.

Answer: The first law states that energy can change from one form to another but cannot be created or destroyed. 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 internal 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 released to the environment 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.

48) Briefly explain the overall processes of photosynthesis and cellular respiration. Include a brief explanation of autotrophs and heterotrophs in your answer.

Answer: 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, much of 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 autotrophs and heterotrophs, cellular respiration takes place in organelles called mitochondria.

49) 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.

Answer: Chemistry is the study of matter, including how matter interacts with other matter. An understanding of chemistry is crucial in 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 also central in understanding water pollution and sewage treatment, atmospheric ozone depletion, hazardous waste and its disposal, and energy issues. An understanding of nuclear chemistry has been crucial in the remediation efforts at the Fukushima Daiichi nuclear power plant to minimize ongoing effects of the radiation released as a result of the nuclear accident in 2011.

50) Describe the rock cycle, explaining how the three major types of rock form and break down.

Answer: 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.

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, hydrochlorofluorocarbons, and water vapor are the main culprits. Human activities, chief among them the extraction 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 by midcentury and double again by the end of the century. Computer models have shown that this rise alone could raise Earth temperatures by 3 to 10 degrees Fahrenheit by 2100.

51) Which of the following is the most logical explanation for water being a greenhouse gas? 51) _____

A) Water is acidic, and acids retain heat.
B) Hydrogen-containing compounds trap the most heat, and water contains hydrogen.
C) The hydrogen bonds holding molecules of water vapor together help it trap heat.
D) Water is a good conductor of electricity, and electricity contains heat.
E) The ionic bonds holding water vapor together help it trap heat.

Answer: C

52) Besides contributing to global warming, nitrous oxide contributes indirectly to acid precipitation because of _____. 52) _____

A) its ability to form compounds that lower the pH of rainwater
B) the hydrogen bonds connecting the nitrogen and oxygen atoms in the molecule
C) its ability to form compounds that raise the pH of rainwater
D) the airborne nature of all compounds containing nitrogen
E) the ability of acids to raise the temperature of the substances which dissolve them

Answer: A

53) Overpopulation contributes to global warming when _____. 53) _____

A) solar energy is used as the primary source of energy, since it is a renewable resource
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) most people use public transportation

Answer: C

54) The primary source of increased levels of greenhouse gases on Earth is _____. 54) _____
A) loss of heterotrophs
B) modern human lifestyles
C) increased photosynthetic activity
D) asteroids falling to Earth
E) aerosol spray cans

Answer: B

55) Climatic change is a major concern for environmentalists because it can directly lead to _____. 55) _____
A) a decrease in the amount of photosynthesis on Earth
B) an increase in the diameter of the ozone hole
C) extinctions
D) more biodiversity on Earth
E) an decrease in the amount of geothermal energy

Answer: C

56) How does burning fossil fuels contribute to global warming? 56) _____
A) New energy is created on Earth when fossil fuels are burned.
B) Burning fossil fuels creates increased plate tectonic movement.
C) Fossils, if left untouched, cool Earth.
D) Carbon present in coal, oil, and natural gas becomes carbon dioxide when these fuels burn.
E) Burning fossil fuels removes water vapor from the atmosphere.

Answer: D

57) Preindustrial levels of atmospheric carbon dioxide have been estimated to be approximately 275 ppm (parts per million). If unchecked, carbon dioxide levels are expected to reach _____ ppm by the year 2100. 57) _____
A) 825 B) 775 C) 550 D) 2750 E) 1100

Answer: E