Biology Life on Earth with Physiology 11th edition Audesirk Test Bank

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

1) A substance with specific properties that cannot be broken down or converted into another substance is called a(n)
   A) molecule.
   B) compound.
   C) mixture.
   D) ion.
   E) element.

   Answer: E

2) If you examined the human body on a chemical composition basis, which of the following combinations of elements would be most common?
   A) O, C, H, N
   B) O, C, N, Na
   C) C, H, Ca, Cl
   D) C, N, Ca, S
   E) O, C, P, S

   Answer: A

3) The atomic number of an atom is defined as the
   A) total number of electrons and neutrons.
   B) total number of energy shells.
   C) number of protons in the atomic nucleus.
   D) number of neutrons in the atomic nucleus.
   E) number of electrons in the outermost energy level.

   Answer: C

4) Phosphorus has an atomic number of 15, so what is the distribution of its electrons?
   A) The first, second, and third energy levels have 5 electrons each.
   B) The first energy level has 8 and the second has 7.
   C) The first energy level has 2, the second has 8, and the third has 5.
   D) The first energy level has 2 and the second has 13.
   E) The electron arrangement cannot be determined from the atomic number alone.

   Answer: C

5) Which four elements make up approximately 96% of living matter?
   A) Carbon, hydrogen, nitrogen, oxygen
   B) Carbon, oxygen, calcium, sulfur
   C) Carbon, sodium, chlorine, magnesium
   D) Carbon, phosphorus, hydrogen, sulfur
   E) Oxygen, hydrogen, calcium, sodium

   Answer: A

6) Imagine that you have been hired as a chemist and your first task is to examine a newly discovered atom. The paperwork you are given states that its atomic number is 110. What does this mean?
   A) The atom contains 55 protons and 55 neutrons.
   B) The atom contains 55 electrons.
   C) The atom is an isotope.
   D) The atom contains 110 protons.

   Answer: D

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7) Iron is an important element in human body cells. If iron has an atomic number of 26, what does this tell you about this element?
   A) An iron atom has 26 protons.
   B) An iron atom is unable to become an isotope.
   C) An iron atom has 13 electrons and 13 protons.
   D) An iron atom has 13 protons and 13 neutrons.

   Answer: A

8) Carbon–14 is often used for carbon dating, where scientists measure the rate of carbon–14 decay to determine the age of items. Carbon–14 contains six protons and eight neutrons. During the process of carbon–14 decay, one of its eight neutrons becomes a proton and an electron is emitted. Which of the following is the best explanation of what has occurred?
   A) The resulting atom is still carbon–14.
   B) The resulting atom has a more stable nucleus.
   C) An ionic bond has formed.
   D) The resulting atom is now a different element because the number of protons has changed.

   Answer: D

9) Radioactive isotopes are biological tools that are often used to
   A) detect brain tumors and other important medical technologies.
   B) build up a store of calcium in a cell.
   C) increase the pH of blood.
   D) measure the size of fossils.

   Answer: A

10) For an atom to achieve maximum stability and become chemically inert, what must occur?
   A) Ionization occurs.
   B) Its outermost energy shell must be completely filled with electrons.
   C) Electron pairs are shared.
   D) The number of electrons must equal the number of protons.

   Answer: B

11) An atom's nucleus is composed of
   A) neutrons and electrons.
   B) protons only.
   C) protons and electrons.
   D) protons and neutrons.
   E) neutrons only.

   Answer: D

12) The formation of ions involves the
   A) sharing of protons.
   B) gain or loss of protons.
   C) sharing of electrons.
   D) gain or loss of neutrons.
   E) gain or loss of electrons.

   Answer: E

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13) If a certain atom has a tendency to lose two electrons, that atom can then become a(n)
A) polar molecule.
B) ion.
C) isotope.
D) water molecule.

Answer: B

14) The formation of sodium chloride (NaCl) is the result of
A) attraction between opposite charges.
B) chemical unreactivity.
C) covalent bonding.
D) repelling between the same charges.

Answer: A

15) Atoms or molecules that have gained or lost electrons are called
A) bases.
B) ions.
C) acids.
D) buffers.
E) covalent.

Answer: B

16) Most biological molecules are joined by
A) ionic bonds.
B) peptide bonds.
C) covalent bonds.
D) hydrogen bonds.
E) disulfide bonds.

Answer: C

17) Sulfur is an essential element in the human body, and studying its characteristics is important in understanding human physiology. Sulfur atoms have six electrons in their outer shell. Based on this information, which of the following is TRUE?
A) Sulfur has eight electrons in its outer shell.
B) Sulfur is inert.
C) Sulfur is an important isotope of hydrogen.
D) Sulfur can form important molecules using covalent bonds.

Answer: D

18) Free radicals contain unpaired electrons in their outermost energy shell, so they react readily with other atoms or molecules to reach a more stable state. Which of the following could potentially be a free radical?
A) Helium (atomic number 2)
B) Magnesium (atomic number 12)
C) Neon (atomic number 10)
D) Fluorine (atomic number 9)

Answer: D

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19) Free radicals are considered dangerous because they
A) emit dangerous radiation.
B) damage oxygen and cause it to become an antioxidant.
C) steal electrons from other atoms, causing those atoms to become unstable.
D) attack the atomic nucleus.

Answer: C

20) Scientists recommend a diet rich in antioxidants to stay healthy. What occurs at the atomic level to explain this recommendation?
A) Antioxidants cause an increase in pH, which is necessary for neutrality in cells.
B) Antioxidants are inert and do not interact with free radicals.
C) Antioxidants prevent free radicals from attacking other atoms or molecules.
D) Antioxidants steal electrons, which gives cells extra energy.

Answer: C

21) Which of the following best explains why a particular atom may not form compounds easily?
A) The atom has seven electrons in its outer shell.
B) The atom has no electrons.
C) The atom has an uneven number of protons.
D) The atom's outer energy shells are completely full.

Answer: D

22) The element carbon has atomic number 6. Carbon most likely
A) forms ionic bonds with other atoms.
B) forms four covalent bonds.
C) donates two electrons to another atom.
D) shares two electrons with another atom.

Answer: B

23) Sodium (Na), atomic number 11, has a tendency to lose an electron in the presence of chlorine. After losing the electron, Na has _____ protons in its nucleus.
A) 11
B) 10
C) 12
D) 21
E) 22

Answer: A

24) Carbon has atomic number 6. Carbon most likely
A) shares protons.
B) loses protons.
C) loses electrons.
D) shares neutrons.
E) shares electrons.

Answer: E

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25) What does H–O–H represent?
A) Mixture including water
B) Molecule of water
C) Atom of water
D) Ionic bonding of water

Answer: B

26) The atomic number of hydrogen is 1. Based on this fact, all of the following must be true of hydrogen gas (H_2) EXCEPT that it
A) uses covalent bonds to form the molecule.
B) is a stable molecule.
C) is a polar molecule.
D) shares one pair of electrons between the two hydrogen atoms.

Answer: C

27) Polar covalent bonds form when
A) an acid and a base are combined.
B) electrons are shared unequally between atoms.
C) atoms from two molecules are repelling each other.
D) more than one pair of electrons is shared.
E) ions are formed.

Answer: B

28) Which of the following represents a molecule characterized by polar covalent bonding?
A) H_2
B) H_2O
C) O_2
D) CH_4
E) NaCl

Answer: B

29) What type of bond is easily disrupted in aqueous solutions (one in which the solvent is water)?
A) Covalent
B) Ionic
C) Polar covalent

Answer: B

30) If sulfur has an atomic number of 16, how many covalent bonds can it form with other atoms?
A) Eight
B) Four
C) Zero
D) Two
E) Six

Answer: D

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31) The part of the atom that has the greatest biological interest and interactions with other atoms is the
A) innermost electron shell.
B) neutron.
C) proton.
D) electron.

Answer: D

32) Which of the following pairs has the most similar chemical properties to each other?
A) $^{1}_{H}$ and $^{2}_{He}$
B) $^{12}_{C}$ and $^{28}_{Si}$
C) $^{12}_{C}$ and $^{14}_{C}$
D) $^{16}_{O}$ and $^{32}_{S}$
E) $^{1}_{H}$ and $^{22}_{Na}$

Answer: C

33) A single covalent chemical bond represents the sharing of how many electrons?
A) Three
B) Two
C) One
D) Four
E) Six

Answer: B

34) Polar molecules
A) have an overall positive electric charge.
B) have an overall negative electric charge.
C) are always ions.
D) have an unequal distribution of electric charge.
E) have an equal distribution of electric charge.

Answer: D

35) The hydrogen bond between two water molecules forms because water is
A) a large molecule.
B) polar.
C) nonpolar.
D) hydrophobic.
E) a small molecule.

Answer: B

36) Hydrogen bonding can take place between a hydrogen atom and what other atom?
A) Hydrogen
B) Oxygen
C) Nitrogen
D) Nitrogen, oxygen, and fluorine
E) Fluorine

Answer: B

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37) Which statement is an accurate description of water molecules?
A) They are uncharged and nonpolar.
B) They are slightly charged and polar.
C) They are ionically bonded.
D) They are charged and nonpolar.

Answer: B

38) Which of the following is an example of hydrogen bonding?
A) The bond between the H of a water molecule and H of a hydrogen molecule
B) The bond between H of one water molecule and H of a separate water molecule
C) The bond between O of one water molecule and H of a separate water molecule
D) The bond between O and H in a single molecule of water
E) The bond between O of one water molecule and O of a separate water molecule

Answer: C

39) Which of the following results from a transfer of electron(s) between atoms (e.g., NaCl)?
A) Nonpolar covalent bond
B) Polar covalent bond
C) Ionic bond
D) Hydrogen bond
E) Electron–proton interaction

Answer: C

40) Which of the following results from an unequal sharing of electrons between atoms?
A) Nonpolar covalent bond
B) Polar covalent bond
C) Ionic bond
D) Hydrogen bond
E) Electron–proton interaction

Answer: B

41) Which of the following best explains the attraction of water molecules to each other?
A) Nonpolar covalent bond
B) Polar covalent bond
C) Ionic bond
D) Hydrogen bond
E) Electron–proton interaction

Answer: D

42) Which of the following is LEAST affected by the presence of water?
A) Nonpolar covalent bond
B) Polar covalent bond
C) Ionic bond
D) Hydrogen bond
E) Electron–proton interaction

Answer: A

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43) What happens when hydrochloric acid (HCl) dissociates in pure water?
A) The concentration of OH^- ions increases.
B) The HCl molecules separate into H^+ and Cl^- ions.
C) The pH of the solution increases.
D) The water has a decrease of H^+ ions.
E) The HCl molecules float on top of the water.
Answer: B

44) An atom of nitrogen attracts electrons more strongly than an atom of hydrogen. In an ammonia molecule (NH_3), which of the following best describes the electrical charge of the individual atoms?
A) The nitrogen is slightly positive.
B) The nitrogen is slightly more negative.
C) The nitrogen becomes neutral.
D) The hydrogens are strongly negative.
E) Charges balance out and none of the atoms has any charge.
Answer: B

45) If a substance measures 7 on the pH scale, that substance
A) has equal concentrations of H^+ and OH^- ions.
B) has a higher concentration of OH^- than H^+ ions.
C) may be lemon juice.
D) probably lacks OH^- ions.
E) is basic.
Answer: A

46) A neutral solution
A) has equal amounts of H^+ and OH^-.
B) has no H^+.
C) is hydrophobic.
D) has a pH of 0.
E) has no OH^-.
Answer: A

47) How do buffers work?
A) They soak up extra acid and base.
B) They monitor the blood pH.
C) They accept and release H^+.
D) They accept and release OH^-.
E) They convert H^+ and OH^- to water.
Answer: C

48) The human body must maintain a constant pH. In the blood, bicarbonate serves as a(n) _____ to help maintain the necessary pH.
A) buffer
B) base
C) acid
D) solvent
Answer: A

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49) Milk of magnesia is often used to treat stomach upset. It has a pH of 10. Based on this information, milk of magnesia
A) is an acid.
B) is a base.
C) has the same pH as stomach acid.
D) is hydrophobic.

Answer: B

50) What is meant by the statement that water has a high specific heat?
A) It grows hot quickly.
B) The boiling point of water is low.
C) It can absorb a lot of energy without changing temperature.
D) Water can heat up to only a certain temperature.
E) Water freezes easily.

Answer: C

51) Which of the following properties of water enable(s) it to function as a regulator of temperature for living organisms? (Hint: Think about what happens when you are sunbathing.)
A) High specific heat
B) High specific heat and high heat of vaporization
C) Low specific heat
D) High specific heat and low heat of vaporization
E) High heat of vaporization

Answer: D

52) The fact that salt dissolves in water is best explained by the
A) hydrophobic nature of salt.
B) ionic nature of water molecules.
C) hydrophobic nature of the water.
D) slightly charged nature of water molecules.
E) polar nature of water molecules.

Answer: E

53) Hydrophilic molecules
A) readily dissolve in water.
B) do not readily dissolve in water.
C) are repelled by water.
D) form hydrogen bonds among themselves.
E) are neutral and nonpolar.

Answer: A

54) Water moves through a plant because of the property of
A) high heat of vaporization.
B) high heat of fusion.
C) cohesion.
D) high specific heat.

Answer: C

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55) Water molecules are cohesive because they
A) are repelled by nonpolar molecules.
B) contain protons.
C) form hydrogen bonds.
D) make up 60% to 90% of an organism's body weight.
E) stick to other polar molecules.

Answer: C

56) When the acidic level of human blood increases, how is the proper balance of hydrogen ions (H^+) restored?
A) H^+ ion–donor levels increase.
B) Carbonic acid eats up the extra OH^- ions.
C) Bicarbonate (HCO_3^-) accepts H^+ ions and forms carbonic acid.
D) Bicarbonate (HCO_3^-) releases H^+ ions that combine with excess OH^- ions to form H_2O.

Answer: C

57) For ice to melt, it has to
A) become less dense.
B) increase its heat of vaporization.
C) increase its property of cohesion.
D) absorb heat from its surroundings.

Answer: D

58) What determines the cohesiveness of water molecules?
A) Ionic bonds
B) Hydrophobic interactions
C) Covalent bonds
D) Hydrogen bonds

Answer: D

59) If you place a paper towel in a dish of water, the water will
A) move up the towel because water molecules move quickly as it vaporizes.
B) dissolve the towel because water is a good solvent.
C) move up the towel as the water adheres to the paper towel while the cohesive water molecules stay bound to each other.
D) separate into H^+ and OH^- ions, which will react with the paper towel molecules.
E) move away from the towel because water molecules have hydrophobic interactions.

Answer: C

60) Sweating is a useful cooling mechanism for humans because water
A) can exist in two states at temperatures common on Earth.
B) is an outstanding solvent.
C) takes up a great deal of heat in changing from its solid state to its liquid state.
D) ionizes readily.
E) takes up a great deal of heat in changing from its liquid state to its gaseous state.

Answer: E

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61) In general, a substance that carries an electric charge can dissolve in water. Given this fact, which of the following would most likely NOT dissolve in water?
A) Nonpolar molecules
B) Polar covalent molecules
C) Ionic compounds
D) NaCl

Answer: A

62) If you place a feather on the surface of a bowl of water, the feather remains suspended on the surface due to the
A) surface tension of the water.
B) polarity of the water.
C) density of the water.
D) fact that water is a good solvent.

Answer: A

63) The specific heat of water is 10 times greater than that of iron. You place a metal pot full of water on the stove to heat it up. You touch the metal handle of the pot when the water is still only lukewarm. Which of the following best describes what happens?
A) You burn your finger and pull your hand away from the hot metal handle.
B) You find that the handle is cooler than the water in the pot.
C) You find that both the water and the handle are the same temperature.
D) You determine that metal pots full of water produce acids and bases.

Answer: A

64) You drop a handful of common table salt into a glass of water. Which of the following best describes what is happening inside the glass at the molecular level?
A) Water and sodium form a covalent bond.
B) Sodium and chloride ions form a covalent bond.
C) The positively charged hydrogen ends of the water molecules are attracted to sodium ions.
D) The positively charged hydrogen ends of the water molecules are attracted to chloride ions.

Answer: D

65) Your friend does a belly flop into a swimming pool. The stinging pain he feels is most likely due to the
A) hydrophobic nature of your friend's skin.
B) fact that water is a good solvent.
C) surface tension of water (caused by the large number of hydrogen bonds that form between water molecules).
D) pH of the water.

Answer: C

66) Which of the following is the densest?
A) Steam
B) Liquid water
C) Ice

Answer: B

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67) Unlike a rock, a reptile can sit in the hot sunshine without its body temperature soaring quickly. This is because the water in its body
A) has a low specific heat.
B) is a good solvent.
C) has a high specific heat.
D) is a poor solvent.
Answer: C

68) Isotopes are atoms of the same element that have different numbers of protons.
A) True
B) False
Answer: B

69) Every atom of the same element has an equal number of electrons and protons.
A) True
B) False
Answer: A

70) Acids have pH values below 7, whereas bases have pH values above 7.
A) True
B) False
Answer: A

71) The attractive force that holds two or more water molecules together is an example of an ionic bond.
A) True
B) False
Answer: B

72) When water freezes, stable hydrogen bonds form between the water molecules that create an open, six–sided (hexagonal) arrangement.
A) True
B) False
Answer: A

73) Water surface tension is a result of the cohesive nature of water molecules.
A) True
B) False
Answer: A

74) To maintain a constant pH, buffers act to either accept or release H^+.
A) True
B) False
Answer: A

75) Most liquids become less dense upon solidification, but water is different in that it becomes denser when it solidifies.
A) True
B) False
Answer: B

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

76) The chemical properties of an element are determined by the number of _____ in its outermost energy shell.
Answer: electrons

77) Isotopes are atoms of the same element that have different numbers of _____.
Answer: neutrons

78) The second electron shell is considered to be full when it contains _____ electrons.
Answer: eight

79) A basilisk lizard can run across the surface of a pond due to a property of water called _____.
Answer: surface tension

80) Ions and polar molecules that are electrically attracted to water molecules are _____.
Answer: hydrophilic

81) What is the difference between covalent and ionic bonds?
Answer: Covalent bonds are the sharing of electrons between atoms, whereas ionic bonds are the electric charge attraction between two ions (typically a metal and a non–metal).

82) more stable than a hydrogen atom (atomic number 1)?
Answer: Two electrons completely fill the outermost electron shell of helium, but hydrogen must accept an electron before its outermost shell is filled.

83) What type of bonding exists between the slight positive charge of a hydrogen atom and the slight negative charge of a nearby oxygen atom?
Answer: hydrogen bonding

84) What property of water, in which water molecules stick to each other, is responsible for the ability of plants to get water from their roots up to their leaves?
Answer: cohesion

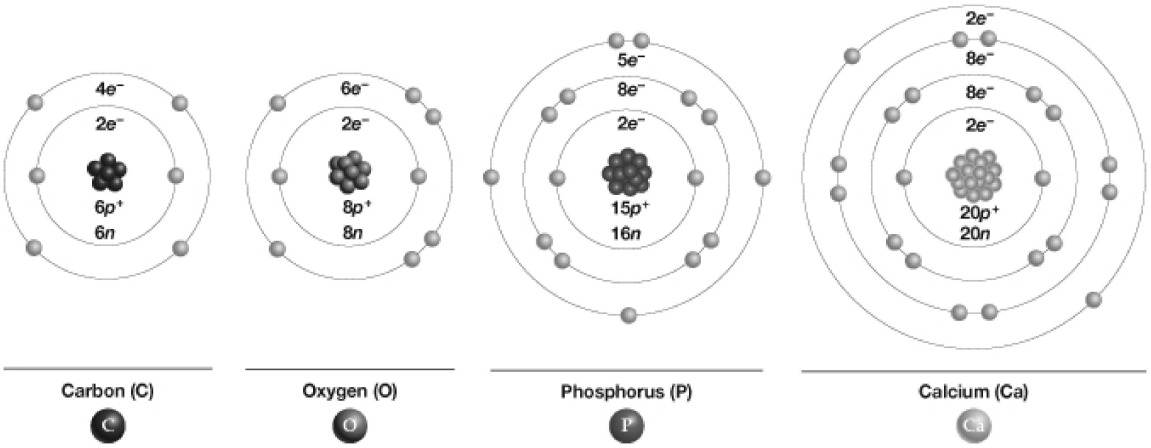
85) How does a base differ from an acid?
Answer: A base is a solution with a concentration of OH^- that is higher than the concentration of H^+ (pH greater than 7). An acid has a H^+ concentration that exceeds its OH^- concentration (pH less than 7).

86) Imagine that you are trying to make a homemade salad dressing and place several drops of olive oil into a container of water. You stir the solution, but the oil doesn't readily mix. Instead, you observe a glistening clump of oil floating on the surface. Explain what is happening at the molecular level. (Your answer should include the term *hydrophobic*.)
Answer: When oil molecules are together in water, their nonpolar surfaces are hydrophobic and nestle together. They are surrounded by water molecules that form hydrogen bonds with one another but not with the oil.

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

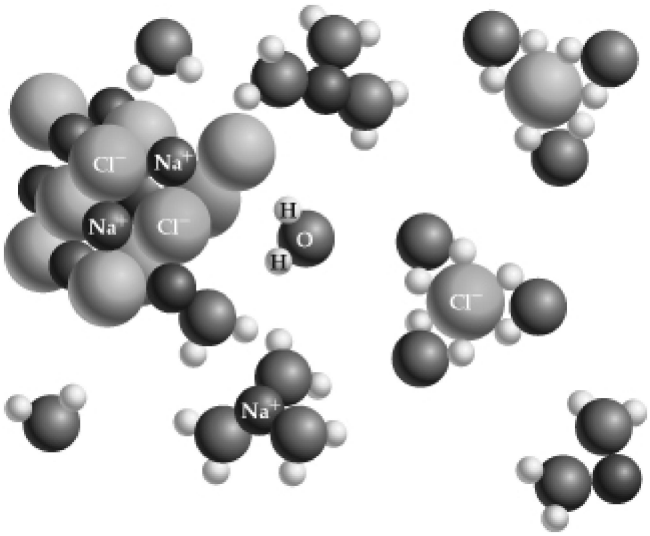
87) Which of these atoms would become inert if it accepted three electrons?



A) Carbon
B) Phosphorus
C) Oxygen
D) Calcium

Answer: B

88) Which of the following is attracted to the hydrogen "end" of a water molecule, as depicted in this figure?



A) Cl−
B) NaCl
C) H
D) Na+

Answer: A

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89) Different types of living matter often have different forms of the same elements in their bodies. For example, the nitrogen in an animal often has a slightly different atomic structure than the nitrogen in a plant. Recently, nutritionists have discovered how to deduce the diets of various animal species by examining the type of nitrogen (and other elements) inside their bodies.
What is the chemical basis behind this scenario?
A) Antioxidants buffer the potential damage that free radicals do to cells.
B) Covalent bonds result when two atoms share electrons.
C) Radioactive elements can be used to trace the paths of molecules through the body.
D) Isotopes of the same element have the same atomic number but different atomic masses.
E) Hydrophobic interactions keep water molecules from forming bonds with fats and oils.

Answer: D

90) All animals need oxygen gas (O_2) for their primary cellular–level functioning. Inside the cell, O_2 is split apart into oxygen atoms. Eventually, electrons that are flowing through the cell will be "received" by this oxygen. But first, the electrons combine with protons present in the cell to form a basic element that has a single proton and a single electron. Then this element combines with the oxygen to form a certain chemical compound.
In this scenario, what chemical compound is produced when this element combines with oxygen?
A) Water (H_2O)
B) Bicarbonate (HCO_3)
C) Carbon dioxide (CO_2)
D) Ozone (O_3)

Answer: A

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