Name: _____ Date: _____

1. _____ make up the nucleus of an atom, whereas _____ surround the nucleus.
   A) Protons; electrons
   B) Neutrons; protons
   C) Electrons; neutrons
   D) Neutrons and electrons; neutrons
   E) Protons and neutrons; electrons

2. When an atom loses an electron, what happens?
   A) It becomes positively charged.
   B) It becomes negatively charged.
   C) It becomes neutral.
   D) Nothing happens.
   E) Atoms cannot lose electrons.

3. Glucose (a monosaccharide) has the molecular formula $C_6H_{12}O_6$. How many carbon atoms are in each glucose molecule?
   A) 1
   B) 3
   C) 5
   D) 4
   E) 6

4. How are lipids unique when compared to other macromolecule groups?
   A) Lipids are not polymers.
   B) Lipids are hydrophilic.
   C) Lipids are comprised of structurally distinct compounds.
   D) Lipids do not contain monomers and they are comprised of compounds.
   E) Lipids are water-soluble.

5. A cell is unable to take up or make sugars. Which molecules will it be unable to take up or make?
   A) carbohydrates and lipids
   B) proteins and nucleic acids
   C) lipids and proteins
   D) nucleic acids and lipids
   E) carbohydrates and nucleic acids

6. The ability to _____ is not a generally recognized characteristic of most (if not all) living organisms?
   A) reproduce
   B) maintain homeostasis
   C) obtain energy directly from sunlight
   D) sense and respond to the environment
   E) grow

7. What are the four types of organic molecules that make up all living things on Earth?
   A) carbohydrates, lipids, fats, nucleic acids
   B) carbon, hydrogen, oxygen, sulfur
   C) atoms, elements, matter, carbon
   D) lipids, nucleic acids, carbohydrates, proteins
   E) carbohydrates, proteins, sugars, lipids

8. Humans' ability to shiver is an attempt to increase the body's internal temperature and maintain _____.
   A) stimuli
   B) carbon dioxide
   C) energy
   D) growth
   E) homeostasis

9. Which of the characteristics of life does a virus display, even though its characterization as being alive is controversial?
   A) the ability to reproduce
   B) the ability to maintain homeostasis
   C) the ability to grow
   D) the abilities to reproduce and grow
   E) the abilities to reproduce, maintain homeostasis, and grow

10. Which of the following does NOT give researchers hope that life may exist on Mars?
    A) Life on Earth survives in extreme conditions.
    B) Life on Earth adapted to extreme conditions.
    C) Life on Earth uses macromolecule manipulations to survive in unique environments.
    D) Versions of life may come in a form that does not contain all the hallmarks of life, such as viruses.
    E) Rovers have captured images of bacterial cells within rocks.

11. Identify the smallest subunits of life that can also sometimes be considered living organisms on their own.
    A) DNA molecules
    B) cells
    C) proteins
    D) phospholipids
    E) inorganic molecules

12. The cell membrane is made of _____.
    A) water
    B) proteins
    C) phospholipids
    D) nucleotides
    E) phospholipids and proteins

13. Which of the following statements about carbon is FALSE?
    A) Carbon can bond with up to four elements at one time.
    B) Covalent bonds allow carbon to share electrons with other elements.
    C) Carbon is an important element in organic molecules.
    D) Carbon can form inorganic molecules.
    E) Soil samples containing carbon must contain life.

14. Which part of the cell membrane acts as a barrier to hydrophilic molecules entering the cell?
    A) hydrophilic heads
    B) hydrophilic tails
    C) hydrophobic heads
    D) hydrophobic tails
    E) hydrophobic heads and tails

15. Olive oil is _____ because _____.
    A) hydrophobic; it does not interact with water
    B) hydrophilic; it interacts with water
    C) hydrophobic; it interacts with water
    D) hydrophilic; it does not interact with water
    E) both hydrophilic and hydrophobic; it interacts with water and oil

16. The "stickiness" of water results from the _____ bonding of water molecules.
    A) hydrogen
    B) ionic
    C) covalent
    D) acidic
    E) hydrophobic

17. Coffee or tea with sugar dissolved in it is an example of a water-based solution. Coffee in this case is the _____, sugar is the _____, and this means that the sugar molecules must be _____.
    A) solvent; solute; hydrophobic
    B) solute; solvent; hydrophobic
    C) solvent; solute; hydrophilic
    D) solute; solvent; hydrophilic
    E) solution; solute; hydrophilic

18. As an acidic compound dissolves in water, the pH of the water _____.
    A) increases
    B) remains neutral
    C) decreases
    D) does not change
    E) becomes basic

19. The bond between the oxygen atom and a hydrogen atom in a water molecule is a(n) _____ bond)
    A) covalent
    B) hydrogen
    C) ionic
    D) hydrophobic
    E) noncovalent

20. In terms of bond strength, which of the following is the weakest?
    A) covalent
    B) hydrogen
    C) ionic
    D) covalent and hydrogen
    E) Bonds cannot be strong or weak.

21. Which of the following are most likely to dissolve in olive oil?
    A) a polar molecule
    B) a nonpolar molecule
    C) a hydrophilic molecule
    D) both nonpolar and polar molecules
    E) both nonpolar and hydrophilic molecules

22. What is homeostasis? Why is it important to living organisms?

23. What does it mean to say that a macromolecule is a polymer? Give an example.

24. How would you assess whether or not a possibly living organism from another planet were truly alive?

25. Which of the characteristics of living organisms (if any) allow you to distinguish between living and formerly living (that is, dead) organisms? Explain your answer.

26. You are searching for life in a sample of dirt. If you had evidence that carbon dioxide was being consumed and converted to glucose, what could you conclude about the presence of a living organism in your sample? Explain your answer.

27. Consider the types of lipid.

    a. How does a sterol, such as cholesterol, differ from a triglyceride?
    b. Structurally, what do triglycerides and phospholipids have in common?

28. What are the arguments for and against considering viruses living organisms?

29. Why do phospholipids form a bilayer in water-based solutions?

30. Is olive oil hydrophobic or hydrophilic? What about salt? Explain your answer.

31. Coffee or tea with sugar dissolved in it is an example of a water-based solution.

    a. What is the solvent in such a beverage?
    b. What is the solute in such a beverage?
    c. Given that the sugar has dissolved in the beverage, are sugar molecules hydrophobic or hydrophilic?

32. How do ionic bonds compare to hydrogen bonds? What are the similarities and differences?

33. Why do olive oil and vinegar (a water-based solution) tend to separate in salad dressing? Will added salt dissolve in the oil or in the vinegar? Explain your answer.

34. Look at Infographic 2.9. For the substances drain cleaner, coffee, and soda, answer the following questions: Is the substance an acid or a base? What is the hydrogen ion concentration relative to a solution with a neutral pH?

35. One approach to finding out if there is life on Mars is to bring Martian dirt samples to Earth for analysis. What are possible considerations for science and society if a Martian life form is released on Earth? Given that *Curiosity* has landed on Mars, what are the possible consequences if an Earth life form is released on Mars? What steps can mission control take to minimize these risks?

36. Your tax dollars are being invested in projects such as the *Curiosity* rover project. Investigate the NASA website to learn more about NASA's rationale for the investment in this mission. Now draft a letter to your congressional representative that expresses your opinion about this expenditure of taxpayer dollars. If you agree, state specific reasons why you think this a good investment of your money. If you disagree, state your reasons, and describe at least two other scientific programs that you would prefer to see funded, providing a rationale for why these are more important.

37. Glucose (a monosaccharide) has the molecular formula $C_6H_{12}O_6$. How many carbon atoms are in each glucose molecule: _____? Provide your answer in numeric form.

38. Which of the following is *not* a generally recognized characteristic of most (if not all) living organisms?
    A) the ability to reproduce
    B) the ability to maintain homeostasis
    C) the ability to obtain energy directly from sunlight
    D) the ability to sense and respond to the environment
    E) the ability to grow

39. A collection of amino acids could be used to build a
    A) protein.
    B) complex carbohydrate.
    C) triglyceride.
    D) nucleic acid.
    E) cell.

40. What subatomic particles are located in the nucleus of an atom?
    A) protons
    B) neutrons
    C) electrons
    D) protons, neutrons, and electrons
    E) protons and neutrons

41. When an atom loses an electron, what happens?
    A) It becomes positively charged.
    B) It becomes negatively charged.
    C) It becomes neutral.
    D) Nothing happens.
    E) Atoms cannot lose an electron because atoms have a defined number of electrons.

42. If a cell were unable to take up or make sugars, which class of molecule(s) would it be unable to make?
    A) carbohydrates
    B) proteins
    C) lipids
    D) nucleic acids
    E) both carbohydrates and nucleic acids

43. The basic building blocks of life are
    A) DNA molecules.
    B) cells.
    C) proteins.
    D) phospholipids.
    E) inorganic molecules.

44. The cell membrane is made of
    A) water.
    B) proteins.
    C) phospholipids.
    D) nucleotides.
    E) both proteins and phospholipids.

45. The “stickiness” of water results from the _____ bonding of water molecules.
    A) hydrogen
    B) ionic
    C) covalent
    D) acidic
    E) hydrophobic

46. As an acidic compound dissolves in water, the pH of the water
    A) increases.
    B) remains neutral.
    C) decreases.
    D) doesn't change.
    E) becomes basic.

47. In a water molecule, the bond between the oxygen atom and a hydrogen atom is a(n) _____ bond.
    A) covalent
    B) hydrogen
    C) ionic
    D) hydrophobic
    E) noncovalent

48. Which of the following is/are most likely to dissolve in olive oil?
    A) a polar molecule
    B) a nonpolar molecule
    C) a hydrophilic molecule
    D) either a polar molecule or a hydrophilic molecule
    E) either a nonpolar molecule or a hydrophilic molecule

49. What is the atomic mass of calcium (atomic number = 20)?

50. The six most abundant elements in the human body are

51. The four elements that make up most of your body are

52. The six most abundant elements in the human body, listed from most common to least common (highest percentage to lowest percentage), are

53. Why is CO_2 classified as an inorganic molecule and not as an organic molecule?

54. What are the four categories of organic macromolecules found in living organisms?

55. Distinguish between organic and inorganic molecules.

56. What structural motif is shared among complex carbohydrates, DNA, and proteins?

57. Match up macromolecules with their structural units.

A. Carbohydrates	a. Nucleotides
B. Proteins	b. Hydrophobic molecules
C. Lipids	c. Amino acids
D. Nucleic Acids	d. Monosaccharides

58. Match up each category of macromolecule with the correct example.

A. Carbohydrates	a. Cholesterol or fat
B. Proteins	b. DNA or RNA
C. Lipids	c. Hemoglobin or enzyme
D. Nucleic Acids	d. Glycogen or starch

59. Match up each macromolecule with the correct example of its function.

A. Carbohydrates	a. Genetic material
B. Proteins	b. Speed up chemical reactions
C. Lipids	c. Insulation
D. Nucleic Acids	d. Energy storage

60. What are the four types of large complex organic molecules that are found in living organisms?

61. Label each of the following as either a monomer (M) or a polymer (P).

_____ Monosaccharide
_____ Protein
_____ Lipid
_____ Amino acid
_____ Nucleic acid
_____ Carbohydrate

62. Name the five functional traits of all living organisms.

63. Whether or not viruses are alive is frequently debated. Name one characteristic of viruses that makes them similar to other living organisms and one characteristic that challenges our understanding of life.

64. Viruses contain genetic material. They can make copies of themselves, but only by using the services of a living host cell. Viruses are assembled in their final form and size by the host cell. Viruses use the host cell's energy mechanisms; they lack any of their own. Is a virus alive? Support your answer.

65. Describe what happens when phospholipids are put into water. How do they arrange themselves?

66. Which part of the cell membrane is a barrier to the movement of water into or out of the cell?

67. Why do phospholipids form bilayers in water?

68. Write A (hydrophobic) or B (hydrophilic) after each term.

A. Will not dissolve in water __
B. Will dissolve in water __
C. Polar molecule __
D. Ionic molecule __
E. Wax __
F. Oil __
G. NaCl __
H. Nonpolar molecule __

69. Why does ice float on water?

70. Why doesn't oil dissolve in water?

71. Why do cities add salt to their roads either before or after an ice storm? What does the salt do?

72. Why do frozen water pipes break?

73. Which form (state of matter) of water do scientists consider to be required for the presence of life?

74. If you add salt to water, how does that affect the freezing point?

75. What physical feature makes a water molecule polar?

76. Why does rain fall in drops containing many water molecules, instead of individual molecules?

77. Why can a water strider walk across the surface of a pond, or why can you skip a flat stone across a pond?

78. Water is sometimes called the "universal solvent" because so many things dissolve in it. Why is this term misleading? Use specific examples.

79. Which has the most free H^+ ions: bases, acids, or pure water?

80. Which has the greatest amount of free OH^- ions: bases, acids, or pure water?

81. Solution A has 100,000,000 free H^+ ions/liter.
    Solution B has 1,000,000 free H^+ ions/liter.
    Solution C has 200,000,000 free H^+ ions/liter.
    Solution D has 2,000,000 free H^+ ions/liter.

    Which solution is the weakest acid and which solution has the lowest pH?

82. Solution A has 100,000,000 free H^+ ions/liter.
    Solution B has 1,000,000 free H^+ ions/liter.
    Solution C has 200,000,000 free H^+ ions/liter.
    Solution D has 2,000,000 free H^+ ions/liter.

    Which solution is the strongest acid and which solution has the highest pH?

83. Which is worse for you to spill on your hands, a strong acid or a strong base?

84. The nucleus of an atom contains _____ called protons and neutrons.

85. The pH scale goes from _____ to_____. A pH of 7 is considered_____, a pH <7 is considered _____, and a pH >7 is considered_____.
    A) 0; 14; neutral; acidic; basic
    B) 0; 14; neutral; basic; acidic
    C) 0; 14; basic; neutral; acidic
    D) 0; 7; neutral; acidic; basic
    E) 0; 7; neutral; basic; acidic

86. The periodic table is a chart describing
    A) the known elements ordered by their atomic number.
    B) the number of electrons of each element.
    C) the size of an element.
    D) the elements that are found in living organisms.
    E) the abundance of each element on Earth.

87. Each element is made up of a unique type of
    A) atom.
    B) protein.
    C) neutron.
    D) proton and neutron.
    E) macromolecule.

88. Atoms are made up of
    A) positively charged protons, negatively charged neutrons, and neutral electrons.
    B) positively charged electrons, negatively charged neutrons, and neutral protons.
    C) positively charged protons, negatively charged electrons, and neutral neutrons.
    D) negatively charged protons, positively charged electrons, and neutral neutrons.
    E) positively charged neutrons, negatively charged electrons, and neutral neutrons.

89. Elements are ordered in the periodic table by their
    A) atomic weight or electron and neutron number.
    B) atomic mass or electron and proton number.
    C) atomic number or electron number.
    D) atomic number or proton number.
    E) atomic number or proton and neutron number.

90. For an element to have no charge, which must be equivalent in number?
    A) subatomic particles and electrons
    B) subatomic particles and protons
    C) electrons and neutrons
    D) neutrons and protons
    E) protons and electrons

91. The smallest unit of an element that still retains the property of an element is
    A) a proton.
    B) a neutron.
    C) an electron.
    D) an atom.
    E) a molecule.

92. Which of the following statements is TRUE?
    A) Protons, neutrons, and electrons are found inside the nucleus of an atom.
    B) Protons and electrons are found in the nucleus and neutrons orbit around them.
    C) Protons and neutrons are found in the nucleus and electrons orbit around them.
    D) Electrons are relatively heavy compared to protons and neutrons.
    E) Protons are positively charged whereas electrons are neutral.

93. An element's identity is defined by its
    A) protons.
    B) neutrons.
    C) electrons.
    D) protons and neutrons.
    E) protons and electrons.

94. The _____ is the smallest unit of matter that exhibits the characteristics of an element and cannot be chemically divided into a smaller unit.
    A) atom
    B) electron
    C) proton
    D) nucleus
    E) neutron

95. An element's atomic number refers to its number of
    A) protons.
    B) neutrons.
    C) electrons.
    D) protons and neutrons.
    E) protons and electrons.

96. The atomic mass is equal to
    A) the number of protons.
    B) the number of neutrons.
    C) the number of electrons.
    D) the number of protons plus the number of neutrons.
    E) the number of protons plus the number of electrons.

97. The number of protons plus the number of neutrons equals
    A) the atomic number.
    B) the atomic mass.
    C) the number of electrons.
    D) the number of bonds the atom can form.
    E) the electrical charge of the atom.

98. What is the atomic mass of lithium (atomic number = 3)?
    A) 1
    B) 3
    C) 4
    D) 6
    E) 9

99. An isotope is the form of an element that has more or fewer neutrons than its most common form. Knowing this, what is the atomic number of an isotope with one extra neutron, if its atomic mass is 15?
    A) 7
    B) 8
    C) 14
    D) 16
    E) 30

100. The atomic particles responsible for forming bonds with other atoms are
    A) protons.
    B) neutrons.
    C) electrons.
    D) protons and neutrons.
    E) protons and electrons.

101. Which of the following statements about neutrons is CORRECT?
    A) An atom has the same number of neutrons and electrons.
    B) Most neutrons are found in the last two shells of the atom.
    C) All neutrons are found in the valence shell of the atom.
    D) One-half of neutrons are positive and one-half are negative, giving them an overall neutral charge.
    E) All neutrons are found in the nucleus of the atom.

102. Potassium (K) has an atomic number of 19, and it has 20 neutrons. What is its atomic mass?
    A) 19
    B) 20
    C) 38
    D) 39
    E) 40

103. How many electrons does carbon (atomic number = 6) contain in its outer valence shell?
    A) 1
    B) 2
    C) 3
    D) 4
    E) 6

104. How many electrons does carbon (atomic number = 6) contain in its first and second valence shells?
    A) 1; 5
    B) 2; 4
    C) 3; 3
    D) 4; 2
    E) 5; 1

105. What is the maximum number of atoms to which a single carbon can bind?
    A) 1
    B) 2
    C) 3
    D) 4
    E) 6

106. A covalent bond is formed by
    A) the donation of an electron from one atom to another.
    B) the acceptance of an electron from one atom to another.
    C) both donation and acceptance of an electron between atoms.
    D) the sharing of electrons between atoms.
    E) a weak interaction between two atom's electrons.

107. Which of the following is considered an inorganic molecule?
    A) carbon dioxide
    B) glucose
    C) protein
    D) sugar
    E) a hydrocarbon skeleton

108. An organic molecule must have
    A) carbon.
    B) a hydrogen-carbon bond.
    C) hydrogen.
    D) covalent bonds.
    E) ionic bonds.

109. In addition to carbon, hydrogen, oxygen, and nitrogen, which elements make up the bulk of the human body?
    A) water, phosphorus, and calcium
    B) phosphorus and calcium
    C) potassium and sodium
    D) phosphate and sodium
    E) water, potassium, and sodium

110. Which of the following lists the most abundant elements in the human body from most abundant to least abundant?
    A) Oxygen→hydrogen→nitrogen→carbon
    B) Oxygen→carbon→hydrogen→nitrogen
    C) Hydrogen→oxygen→carbon→nitrogen
    D) Hydrogen→carbon→oxygen→nitrogen
    E) Nitrogen→carbon→oxygen→hydrogen

111. A covalent bond can best be described as
    A) two atoms sharing electrons.
    B) two atoms sharing protons.
    C) one atom losing an electron to another, then sticking to it due to the attraction between opposite charges.
    D) one atom losing a proton to another, then sticking to it due to the attraction between opposite charges.
    E) a bond between atoms of two different elements.

112. Organic molecules are defined as having
    A) a carbon backbone.
    B) at least one carbon-oxygen bond.
    C) at least one carbon-hydrogen bond.
    D) A and B, but not C.
    E) A and C, but not B.

113. Organic molecules contain at least
    A) three carbon to hydrogen bonds.
    B) one carbon to oxygen bond.
    C) one ionic bond.
    D) one carbon to hydrogen bond.
    E) one hydrogen to oxygen bond.

114. Carbon has _____ potential bonding sites.
    A) 1
    B) 2
    C) 4
    D) 8
    E) 3

115. A bond formed by atoms sharing electrons is known as
    A) an ionic bond.
    B) an electric bond.
    C) a covalent bond.
    D) a shared bond.
    E) a hydrogen bond.

116. _____ provide(s) a way to store large amounts of energy and provide thermal insulation and padding in animals.
    A) Sterols
    B) Phospholipids
    C) Fats
    D) Water
    E) Proteins

117. DNA, deoxyribonucleic acid, has a “backbone” of sugars and
    A) phosphate groups.
    B) starch.
    C) acids.
    D) glycogen.
    E) glycerol.

118. There are _____ different amino acids.
    A) 12
    B) 73
    C) 21
    D) 5
    E) 20

119. Sterols are
    A) lipids.
    B) carbohydrates.
    C) proteins.
    D) nucleic acids.
    E) important solvents.

120. Which of the following macromolecules are insoluble in water?
    A) carbohydrates
    B) proteins
    C) lipids
    D) nucleic acids
    E) amino acids

121. Nucleotides are composed of
    A) sugar, phosphate group, and a base.
    B) sugar, amino acid, and a base.
    C) lipid, phosphate group, and a base.
    D) ribose, phosphate group, and an amino acid.
    E) deoxyribose, lipid, and a base.

122. The monomers of proteins are
    A) nucleic acids.
    B) amino acids.
    C) nucleotides.
    D) lipids.
    E) monosaccharides.

123. An example of a nucleic acid is
    A) DNA.
    B) protein.
    C) glucose.
    D) fat.
    E) sugar.

124. Which of the following are energy-storing polymers?
    A) proteins
    B) carbohydrates
    C) lipids
    D) proteins and lipids
    E) carbohydrates and lipids

125. When you eat more food than your body requires, you will store the extra energy as
    A) proteins.
    B) carbohydrates.
    C) lipids.
    D) proteins and lipids.
    E) carbohydrates and lipids.

126. Lipids may function in all of the following ways EXCEPT
    A) hormones.
    B) energy storage.
    C) components of cell membranes.
    D) structural support.
    E) insulation.

127. All of the following are true of proteins EXCEPT
    A) they help speed up chemical reactions.
    B) their function is dependent on their shape.
    C) they serve as energy-storage molecules.
    D) they help move things around inside of cells.
    E) they contain peptide bonds.

128. DNA differs from RNA because
    A) RNA is not made up of nucleotides, but DNA is.
    B) RNA is a nucleotide, whereas DNA is a nucleic acid.
    C) RNA does not contain a sugar molecule, but DNA does.
    D) RNA is only one linear chain, whereas DNA consists of two chains bonded together.
    E) RNA has an attached lipid, but DNA does not.

129. Which of the following is NOT a functional trait of a living organism?
    A) growing and reproducing
    B) moving from place to place
    C) responding to their environment
    D) obtaining and using energy
    E) maintaining a stable internal environment

130. When a plant bends toward sunlight, the bending is an example of which characteristic of life?
    A) growth
    B) reproduction
    C) responding to their environment
    D) obtaining and using energy
    E) maintaining a stable internal environment

131. The ability of living organisms to maintain a stable internal environment is termed
    A) feedback inhibition.
    B) anabolism.
    C) catabolism.
    D) homeostasis.
    E) metabolism.

132. Which functional trait does a mule NOT share with all living organisms?
    A) growth
    B) reproduction
    C) responding to their environment
    D) obtaining and using energy
    E) maintaining a stable internal environment

133. Which of the following do NOT share all of the functional traits of a living organism?
    A) bacteria
    B) mushrooms
    C) plants
    D) dogs
    E) viruses

134. Which of these is NOT a necessary characteristic of life?
    A) ability to grow
    B) ability to move around in the environment
    C) ability to reproduce
    D) ability to respond to stimuli
    E) ability to use energy

135. Maintaining a separate and distinct internal environment from the external environment is called
    A) life.
    B) cell exclusion.
    C) metabolism.
    D) hydrophobicity.
    E) homeostasis.

136. If life exists on Mars, what form is it likely to be?
    A) microscopic
    B) silicon based
    C) large and mobile
    D) the same as on Earth
    E) intelligent

137. The NASA rover *Curiosity* is looking for signs of life on Mars by analyzing soil for what substance?
    A) inorganic molecules
    B) organic molecules
    C) carbon dioxide
    D) water
    E) oxygen

138. Scientists have strong evidence that water on Mars
    A) is in liquid form.
    B) forms a cloud of vapor.
    C) is absent in frozen form.
    D) was present in liquid form in the past.
    E) has a different molecular structure than water on Earth.

139. Cyanobacteria
    A) first evolved about 2.5 billion years ago.
    B) are sensitive to extreme conditions.
    C) added carbon dioxide to Earth's early atmosphere.
    D) are multicellular organisms.
    E) require a warm environment to grow.

140. Which of the following are considered by most scientists to be nonliving?
    A) viruses and bacteria that grow in arsenic
    B) cyanobacteria and viruses
    C) prions and mules
    D) cyanobacteria and bacteria that grow in arsenic
    E) prions and viruses

141. Cell membranes are made up of
    A) phospholipids.
    B) phosphates.
    C) potassium.
    D) phosphorus.
    E) proteins.

142. Which part of a cell membrane phospholipid is exposed to the aqueous (watery) exterior?
    A) hydrophilic head and tail
    B) hydrophilic tail
    C) hydrophilic head
    D) hydrophobic head
    E) hydrophobic tail

143. Which part of a cell membrane phospholipid is exposed to the aqueous (watery) interior?
    A) hydrophilic head and tail
    B) hydrophilic tail
    C) hydrophilic head
    D) hydrophobic head
    E) hydrophobic tail

144. Why is a cell membrane like a phospholipid sandwich?
    A) The lipid is the bread and proteins are the spread.
    B) It is a two-layered semipermeable structure with heads on the outside, tails in the middle, and heads on the inside.
    C) It is a two-layered semipermeable structure with tails on the outside, heads in the middle, and tails on the inside.
    D) It is a two-layered semipermeable structure with tails on the outside, tails on the inside, and heads in the middle.
    E) It is a one-layered semipermeable structure with heads on the outside and heads on the inside.

145. What protects a cell from the environment?
    A) hydrophobic tails and hydrophilic heads of phospholipids
    B) a phospholipid bilayer
    C) a semipermeable phospholipid barrier
    D) the cell membrane
    E) All of the above.

146. All of the following are true of phospholipids EXCEPT
    A) they are the primary components of cell membranes.
    B) part of the molecule is hydrophobic.
    C) the tails of the molecule are hydrophilic.
    D) they form a bilayer when placed in water.
    E) the tails congregate in the middle.

147. Hydrophobic means
    A) not quite alive, like a virus.
    B) something that will not dissolve in water.
    C) water loving.
    D) a solute.
    E) something with a negative charge.

148. What is the basic structural unit of life?
    A) membranes
    B) molecules
    C) cells
    D) organisms
    E) atoms

149. If you were to dissect a plant into smaller and smaller units, what is the smallest unit that would still be considered alive?
    A) whole plant
    B) leaves
    C) cells
    D) cell membranes
    E) cell DNA

150. A substance that is dissolved in water is called a
    A) solute.
    B) solution.
    C) solvent.
    D) suspension.
    E) salt.

151. Because of the polar nature of water, it is a universal
    A) solute.
    B) solution.
    C) solvent.
    D) suspension.
    E) salt.

152. The hydrogen bonds between water molecules are
    A) ionic.
    B) covalent.
    C) strong.
    D) weak.
    E) repellent.

153. The surface tension of water is an example of
    A) capillary action.
    B) adhesion.
    C) cohesion.
    D) covalent bonding.
    E) strong hydrogen bonds.

154. When making sugar water, the sugar is the _____ whereas the water is the _____.
    A) solute; solvent
    B) solvent; solute
    C) solute; solution
    D) solution; solute
    E) solvent; solution

155. An ion can be formed by
    A) the loss of a proton.
    B) the gain of a proton.
    C) the loss of an electron.
    D) the gain of an electron.
    E) the loss or gain of an electron.

156. In a water molecule, hydrogen atoms are bonded to oxygen by _____ bonds, whereas neighboring water molecules are held together by _____ bonds.
    A) polar covalent; hydrogen
    B) hydrogen; polar covalent
    C) ionic; polar covalent
    D) polar covalent; ionic
    E) ionic; hydrogen

157. All of the following are true of water EXCEPT
    A) neighboring molecules are held together by hydrogen bonds.
    B) it is less dense as a solid than as a liquid.
    C) it is a polarized molecule, where the oxygen is slightly positive and the hydrogens are slightly negative.
    D) it is the basis for all life as we know it.
    E) it can dissolve molecules with electrical charges.

158. A solution with a pH less than 7 is called a(n) _____ and has a higher number of _____ than a solution with a pH greater than 7.
    A) base; H^+
    B) acid; H^+
    C) base; OH^-
    D) acid; OH^-
    E) base; both H^+ and OH^-

159. If 1 liter of a solution with pH = 5 is added to 1 liter of a solution with pH = 9, what will the pH of the mixture be?
    A) 5
    B) 6
    C) 7
    D) 8
    E) 9

160. The attraction water molecules have for other water molecules is called _____, whereas the attraction water molecules have for non-water molecules is called _____.
A) ionic bonding; cohesion
B) adhesion; ionic bonding
C) cohesion; ionic bonding
D) adhesion; cohesion
E) cohesion; adhesion

161. The _____ of water molecules explains how some insects can walk on water.
A) solubility
B) cohesion
C) aversion
D) adhesion
E) movement

162. Which of the following is NOT a property of water?
A) All biological molecules will dissolve in water.
B) Water molecules adhere to charged surfaces.
C) Water molecules are cohesive to other water molecules.
D) Due to unequal sharing of electrons, water molecules are polar.
E) Water is liquid at 4°C.

163. Which is an example of a molecule that has polar covalent bonds?
A) salt
B) phosphorus
C) carbon dioxide
D) methane
E) water

164. A solution with a pH of 3.5 would be considered
A) basic.
B) neutral.
C) acidic.
D) buffered.
E) saline.

165. A solution with a pH of 8.5 would be considered
    A) basic.
    B) neutral.
    C) acidic.
    D) buffered.
    E) saline.

166. Acidosis of blood occurs at what pH?
    A) 8
    B) >7.35
    C) <7.35
    D) 2
    E) 4

167. If coffee has a pH of 5 and soda a pH of 4, which is more acidic and by how much?
    A) Coffee is slightly more acidic than soda.
    B) Coffee is 10 times more acidic than soda.
    C) Soda is 10 times less acidic than coffee.
    D) Soda is 10 times more acidic than coffee.
    E) Soda is slightly less acidic than coffee.

168. pH is a measure of the
    A) acidity of a solution.
    B) neutrality of a solution.
    C) alkalinity of a solution.
    D) amount of free electrons in a solution.
    E) concentration of hydrogen ions in a solution.

169. Pure water has a pH of
    A) 7.
    B) 6.
    C) 12.
    D) 0.
    E) 14.

Answer Key

1. E
2. A
3. E
4. D
5. E
6. C
7. D
8. E
9. D
10. E
11. B
12. E
13. E
14. D
15. A
16. A
17. C
18. C
19. A
20. B
21. B
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37. 6
38. C
39. A
40. E
41. A
42. E
43. B
44. E

45. A
46. C
47. A
48. B
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84. atomic particles
85. A
86. A
87. A
88. C
89. D
90. E

91. D
92. C
93. A
94. A
95. A
96. D
97. B
98. D
99. A
100. C
101. E
102. D
103. D
104. B
105. D
106. D
107. A
108. B
109. B
110. B
111. A
112. E
113. D
114. C
115. C
116. C
117. A
118. E
119. A
120. C
121. A
122. B
123. A
124. E
125. E
126. D
127. C
128. D
129. B
130. C
131. D
132. B
133. E
134. B
135. E
136. A

137. B
138. D
139. A
140. E
141. A
142. C
143. C
144. B
145. E
146. C
147. B
148. C
149. C
150. A
151. C
152. D
153. C
154. A
155. E
156. A
157. C
158. B
159. C
160. E
161. B
162. A
163. E
164. C
165. A
166. C
167. D
168. E
169. A