

**Anatomy & Physiology, 3e (McKinley)**  
**Chapter 2 Atoms, Ions, and Molecules**

- 1) Anything that has mass and occupies space is considered to be \_\_\_\_\_.
- 2) The three forms of matter are
  - A) air, water, and solids.
  - B) solids, liquids, and gases.
  - C) blood, bone, and air.
  - D) vapor, water, and solid.
- 3) Which of the following has the smallest mass?
  - A) An electron
  - B) An atomic nucleus
  - C) A proton
  - D) A neutron
- 4) An atomic nucleus consists of protons and neutrons and is positively charged.
- 5) Which of the following statements accurately describes electrons?
  - A) They are found inside the nucleus and have a positive charge.
  - B) They are in orbitals outside the nucleus and have a positive charge.
  - C) They are found inside the nucleus and have a negative charge.
  - D) They are in orbitals outside the nucleus and have a negative charge.
- 6) An element's atomic number is determined by the number of \_\_\_\_\_ in one atom of that element.
  - A) protons
  - B) nuclei
  - C) electrons
  - D) neutrons
  - E) atomic mass units
- 7) Within the periodic table, elements are organized consecutively by
  - A) atomic mass within columns.
  - B) atomic mass within rows.
  - C) atomic number within columns.
  - D) atomic number within rows.
- 8) The number of neutrons in an atom can be determined by
  - A) subtracting the atomic number from the atomic mass.
  - B) subtracting the atomic mass from the atomic number.
  - C) adding the atomic mass to the atomic number.
  - D) adding the number of protons to the number of electrons.
  - E) adding the number of protons to the atomic number.

- 9) When diagramming an atom, the innermost shell is filled with \_\_\_\_\_ electrons.
- A) two
  - B) six
  - C) eight
  - D) ten
- 10) Explain how the structure of an oxygen atom with an atomic mass of sixteen would be diagrammed. Include the number of subatomic particles in each part of the atom.
- 11) When diagramming an atom, how many electrons can fit in each of the shells beyond the innermost shell?
- A) Two
  - B) Six
  - C) Eight
  - D) Ten
- 12) Two atoms that differ only in the number of neutrons they contain are known as
- A) anions.
  - B) isomers.
  - C) isotopes.
  - D) ions.
- 13) All isotopes of a given element have the same atomic mass.
- 14) Two atoms that have the same chemical characteristics but different atomic masses are considered \_\_\_\_\_.
- 15) Radioisotopes contain
- A) an insufficient number of neutrons.
  - B) an insufficient number of electrons.
  - C) an insufficient number of protons.
  - D) an excess of protons.
  - E) an excess of neutrons.
- 16) The half-life of a radioisotope is at least one day and at most ten years.
- 17) Biological half-life is the time required for
- A) half of an ionic compound to ionize.
  - B) half of a radioactive material to be eliminated from the body.
  - C) radioactivity levels of organic compounds to stabilize at one-half their original value.
  - D) radiation exposure that is lethal for half of a biological population.
- 18) Another name for the outer electron shell of an atom is the \_\_\_\_\_ shell.

19) On the periodic table, beryllium sits above magnesium and to the right of lithium. Given that magnesium has two electrons in its outer shell and lithium has one, how many electrons would you predict beryllium has in its outer shell?

- A) One
- B) Two
- C) Three
- D) Four

20) In general, the number of electrons that would fill an atom's outer shell and make it nonreactive is \_\_\_\_\_.

21) Elements in the first column of the periodic table contain one electron in their outer shell.

22) An atom with a positive or negative charge is known as a(n) \_\_\_\_\_.

23) An ion is an atom or group of atoms that has

- A) a different number of neutrons than most atoms of that element.
- B) lost or gained a proton.
- C) lost or gained an electron.
- D) a biological half-life due to radioactive decay.

24) The most common extracellular cation is \_\_\_\_\_.

25) Positively charged ions are called cations.

26) The molecular formula for bicarbonate ion is  $\text{HCO}_3^-$ . It is therefore a

- A) polyatomic anion.
- B) polyatomic cation.
- C) radioactive isotope.
- D) cationic compound.

27) Describe the ionic form of calcium (what is its charge?). Then describe how three physiological systems would malfunction if calcium levels were not maintained homeostatically.

28) When atoms of elements on the left side of the periodic table ionize, they tend to

- A) gain electrons and therefore become anions.
- B) gain protons and therefore become anions.
- C) lose electrons and therefore become cations.
- D) lose protons and therefore become cations.
- E) add neutrons and therefore become megaions.

29) When elements found in column VIA of the periodic table become ions, they usually have a charge of

- A) -2.
- B) -1.
- C) +1.
- D) +2.
- E) +3.

30) Phosphate ions are common anions within the body.

31) If an ionic compound formed between an element from the first column of the periodic table and another from the sixth column, you would expect the compound to include

- A) one atom from each of the two elements.
- B) one atom from the first-column element and two atoms from the sixth-column element.
- C) two atoms from the first-column element and one atom from the sixth-column element.
- D) three atoms from the first-column element and two from the sixth-column element.

32) Ionic bonds involve

- A) electrostatic interactions between anions and cations.
- B) the sharing of electrons between two atoms of the same element.
- C) the attraction between water and salts.
- D) the release of protons by negatively charged particles.

33) In the formation of a compound of sodium chloride,

- A) a chlorine atom donates an electron to a sodium atom.
- B) a chloride ion donates two protons to a sodium ion.
- C) a sodium atom donates an electron to a chlorine atom.
- D) a sodium ion donates two electrons to a chlorine atom.
- E) the sodium and chlorine atoms share a pair of electrons equally.

34) Sodium bicarbonate ( $\text{NaHCO}_3$ ) is considered an ionic compound.

35) Water contains two hydrogen atoms bound to one oxygen atom; " $\text{H}_2\text{O}$ " is therefore water's

- A) molecular formula.
- B) ionic compound.
- C) isotope ratio.
- D) stochastic isomer.

36) Which statement accurately describes isomers?

- A) They possess differing numbers of neutrons in their nuclei.
- B) They have the same molecular shape but involve different elements.
- C) They have the same structural formula but different molecular formulas.
- D) They have the same molecular formula but different structural formulas.
- E) They have gained or lost electrons at their outer shell.

- 37) The numbers and types of atoms in a molecule as well as the spatial arrangement of those atoms is provided by the \_\_\_\_\_ formula.
- 38) Isomers of the same molecule have identical chemical properties.
- 39) What is the number of covalent bonds that an atom of nitrogen can form within a molecule?  
A) 1  
B) 2  
C) 3  
D) 4
- 40) Which of the following is *not* one of the four most common elements in the body?  
A) Oxygen  
B) Nitrogen  
C) Hydrogen  
D) Carbon  
E) Calcium
- 41) A double covalent bond involves  
A) the sharing of one pair of electrons.  
B) the sharing of two pairs of electrons.  
C) the donation of one pair of electrons.  
D) the donation of two pairs of electrons.
- 42) Consider an atom with four electrons in its outer shell. If that atom is covalently bound to three other atoms within a molecule, then it is  
A) in a double bond with one atom and in single bonds with two atoms.  
B) in a single bond with one atom and in double bonds with two atoms.  
C) in a triple bond with one atom and in single bonds with two atoms.  
D) in double bonds with all three atoms.  
E) in single bonds with all three atoms.
- 43) If an element from the first column of the periodic table entered into a covalent bond with one from the sixth column, then the bond would be a  
A) polar bond, with the element from the first column developing a partial negative charge.  
B) polar bond, with the element from the sixth column developing a partial negative charge.  
C) nonpolar bond, with the element from the first column developing a partial positive charge.  
D) nonpolar bond, with the element from the sixth column developing a partial positive charge.  
E) nonpolar bond, with neither element developing any partial charges at all.
- 44) When two atoms with very different electronegativity share electrons a polar covalent bond is formed.
- 45) Oxygen is more electronegative than carbon.
- 46) Any molecule that contains a polar bond within it is a polar molecule.

47) Fatty acids consist mainly of carbon and hydrogen, and so fatty acids are

- A) nonpolar and do not dissolve in water.
- B) nonpolar and dissolve in water.
- C) polar and do not dissolve in water.
- D) polar and dissolve in water.

48) Phospholipids are described as

- A) polar.
- B) nonpolar.
- C) amphipathic.
- D) amphiprotic.

49) An individual hydrogen bond in a sample of water would be described as

- A) strong and intramolecular.
- B) strong and intermolecular.
- C) weak and intramolecular.
- D) weak and intermolecular.

50) Hydrogen bonds form between molecules containing \_\_\_\_\_ bonds; the hydrogen bond is between a hydrogen atom of one molecule and a partially \_\_\_\_\_ charged atom of another.

- A) polar covalent; negatively
- B) polar covalent; positively
- C) nonpolar covalent; positively
- D) nonpolar covalent; negatively
- E) ionic; positively

51) Intermolecular forces between nonpolar molecules are weaker attractions than covalent bonds.

52) The molecular formula of chlorine gas is  $\text{Cl}_2$ . One molecule of this gas would be attracted to another by

- A) polar covalent bonds.
- B) intermolecular forces between nonpolar molecules.
- C) ionic bonds.
- D) hydrogen bonds.
- E) intramolecular forces.

53) Explain the attractive forces within and between molecules. In your answer, distinguish between polar and nonpolar bonds, and distinguish between single, double, and triple bonds. Also be sure to explain three types of intermolecular attractions.

54) An individual water molecule contains \_\_\_\_\_ atoms and enters into \_\_\_\_\_ hydrogen bonds with other water molecules.

- A) two; two
- B) three; two
- C) three; three
- D) three; four
- E) three; six

55) Water has a

- A) high specific heat, and this tends to cause large amounts of sweating.
- B) high specific heat, and this tends to keep body temperature relatively constant.
- C) low specific heat, and this tends to lead to variability in body temperature.
- D) low specific heat, and this tends to minimize sweating.
- E) low specific heat, and this tends to result in chills and shivering.

56) The hydrogen bonds in a sample of water result in \_\_\_\_\_ cohesion and a \_\_\_\_\_ heat of vaporization.

- A) increased; high
- B) increased; low
- C) decreased; high
- D) decreased; low

57) Surfactant is necessary to prevent collapse of the alveoli in the lung because in its absence, water molecules

- A) vaporize and take up much less space.
- B) are more strongly attracted to each other by van der Waals forces.
- C) are more strongly attracted to each other by cohesive forces.
- D) congregate around nearby proteins to which they adhere.

58) The amount of energy (measured in calories) required to increase the temperature of 1 gram of a substance by 1 degree Celsius is known as \_\_\_\_\_.

59) Water is the main solute of the body.

60) When a strong acid is placed in water, it

- A) does not dissolve or dissociate.
- B) dissolves but does not dissociate.
- C) dissolves and dissociates.
- D) dissociates, but does not dissolve.

61) When a nonpolar molecule is placed in water, it will

- A) neither dissolve nor carry electrical current.
- B) dissolve and carry electrical current.
- C) dissociate and carry electrical current.
- D) carry electrical current but not dissolve or dissociate.

62) "Hydrophobic exclusion" refers to the chemical interactions that prevent nonpolar molecules from dissolving in water.

63) Steroid hormones are nonpolar molecules that travel in the blood. Explain how such molecules interact with the water of the plasma.

64) A molecule with polar and nonpolar parts that only partially dissolves in water is described as \_\_\_\_\_.

65) Chemical barriers composed of phospholipid bilayers form within biological systems because

A) cells expend ATP to position the phospholipid tails close together.

B) hydrophobic exclusion results in the close positioning of the nonpolar tails.

C) van der Waals forces attract the polar heads to the water inside the cell.

D) the inability of the polar heads to dissolve in water causes the heads to adhere to one another.

66) In a sample of distilled water, a water molecule that has picked up an extra hydrogen ion is called a(n)

A) amphipathic macromolecule.

B) hydroxide ion.

C) hydronium ion.

D) proteinaceous water molecule.

67) A hydroxide ion carries a negative charge.

68) A base is described as a proton donor.

69) Bicarbonate ( $\text{HCO}_3^-$ ) is a

A) strong proton donor.

B) strong proton acceptor.

C) weak proton donor.

D) weak proton acceptor.

70) Given a watery solution in which 1/1,000,000 particles are free  $\text{H}^+$  ions, what will the pH be?

A) 2

B) 5

C) 6

D) 7

E) 10

71) The higher the concentration of  $\text{H}^+$  is, the lower the pH is.



- 72) Compared to a solution with a pH of 7, a solution with a pH of 4 is
- A) more acidic and has a 1,000-fold increase in  $[H^+]$ .
  - B) more acidic and has a 300-fold increase in  $[H^+]$ .
  - C) more basic and has a 1,000-fold increase in  $[H^+]$ .
  - D) more basic and has a 300-fold increase in  $[H^+]$ .
  - E) more basic and has a 300-fold decrease in  $[H^+]$ .
- 73) The addition of a buffer to liquid such as blood with a pH of 7.4 causes the pH to drop to 7.0 (chemically neutral).
- 74) When the pH of an acidic solution is brought to 7.0, that change is called \_\_\_\_\_.
- 75) To neutralize a base, a(n) \_\_\_\_\_ must be added.
- A) acid
  - B) buffer
  - C) weak base
  - D) hydroxide ion
- 76) Generally, a chemical buffer is described as
- A) a strong acid or strong base that brings the pH of a solution to 7.0.
  - B) a weak acid and weak base that help prevent big changes in pH.
  - C) a neutral molecule that does not influence the pH in any way.
  - D) a weak acid that makes a solution slightly more basic by its presence.
- 77) When a protein of 50 nanometers is mixed with water, the opaque result is called a(n)
- A) suspension.
  - B) emulsion.
  - C) solution.
  - D) colloid.
- 78) When water mixtures are formed, the components are chemically altered and the new molecular bonds can be separated only by chemical means.
- 79) Which of the following statements accurately describes the solutes within a solution?
- A) Water is the universal solute, and solutes are more abundant in solutions than solvents are.
  - B) The solutes are not visible, do not scatter light, and do not settle if the solution is left standing.
  - C) Solute are greater than 1 millimeter in size, and will settle out of solution if the mixture is left standing.
  - D) Solute are between 1 nanometer and 1 millimeter in size; they do not scatter light but will settle out of solution if left standing.
- 80) An emulsion is a combination of water and a nonpolar liquid that have been forcibly mixed.

81) Blood has been described as an example of a suspension, and soda has been described as a solution. Define these two categories of mixtures and provide different examples of each type. In the examples you provide, explain the molecular properties (approximate size, polarity) of the substances that mix with water.

82) When solution concentration is measured in moles of solute per kilogram of solvent, that measurement is known as \_\_\_\_\_.

83) A technician is asked to make up a solution of physiological saline and is told that it should be a 0.9% NaCl solution using the mass/volume percent measurement of concentration. If the technician is making 100 milliliters of solution, how much NaCl should be included?

- A) 9 micrograms
- B) 9 kilograms
- C) 9 grams
- D) 0.9 grams
- E) 90 grams

84) Molarity is measured in the units of moles solute/L solution.

85) How many osmoles are in a solution of 1M NaOH?

- A) 1 osm
- B) 2 osm
- C) 3 osm
- D) 4 osm

86) Given that the mass of an oxygen atom is 16 amu and that of a hydrogen atom is 1 amu, 1 mole of water would be equal to

- A) 17 amu.
- B) 18 amu.
- C) 15 grams.
- D) 18 grams.
- E)  $6.02 \times 10^{23}$  grams.

87) All inorganic molecules contain carbon.

88) Water and sodium chloride are examples of inorganic molecules.

89) Which of the following is an accurate description of hydrocarbons?

- A) Most of them contain phosphorus.
- B) They are nonpolar molecules.
- C) Most of them contain sulfur.
- D) They are polar molecules.

- 90) Like most functional groups, carboxyl groups are
- A) nonpolar and therefore increase a biomolecule's solubility in water.
  - B) nonpolar and therefore decrease a biomolecule's solubility in water.
  - C) polar and therefore increase a biomolecule's solubility in water.
  - D) polar and therefore decrease a biomolecule's solubility in water.
- 91) Proteins are
- A) polymers made up of amino acid monomers.
  - B) monomers.
  - C) monomers made of repeating subunits of polymers.
  - D) neither monomers nor polymers.
  - E) polymers made of repeating units of carbohydrates.
- 92) A polymer is made up of several subunits called \_\_\_\_\_.
- 93) When biological molecules engage in condensation, such reactions are \_\_\_\_\_ reactions.
- A) synthesis
  - B) hydrolysis
  - C) catabolic
  - D) amphipathic
  - E) ergonomic
- 94) When a large biological molecule is digested by the addition of water, the reaction is termed \_\_\_\_\_.
- 95) In general, lipids are water insoluble.
- 96) Which of the following is a list of three types of lipids?
- A) Riboses, purines, and pyrimidines
  - B) Eicosanoids, steroids, and triglycerides
  - C) Fatty acids, proteins, and nucleotides
  - D) Glucose, starch, and triglycerides
  - E) Steroids, peptides, and sugars
- 97) The most common lipids in the body are
- A) triglycerides, and they are used for energy storage in adipose.
  - B) glycoproteins, and they are used as backbones for cell membranes.
  - C) eicosanoids, and they are used as hormonal messengers.
  - D) steroids, and they are used as signaling molecules in inflammatory responses.
  - E) phospholipids, and they are used as key ingredients of bile salts.
- 98) The two fatty acids within a phospholipid molecule make up its
- A) nonpolar heads.
  - B) polar heads.
  - C) nonpolar tails.
  - D) polar tails.

99) Name and describe the four main categories of lipids, and compare and contrast their structures and functions.

100) For every atom of carbon in a carbohydrate

- A) there is approximately one atom of hydrogen.
- B) there are approximately two atoms of hydrogen.
- C) there are approximately three atoms of hydrogen.
- D) there are approximately four atoms of hydrogen.

101) The simple sugar glucose is an example of a

- A) monosaccharide.
- B) lipid.
- C) polysaccharide.
- D) polymer.
- E) glycogen.

102) While a runner is in a marathon, his or her liver will have to free some stored energy to keep blood sugar levels adequate; the liver will liberate this energy by way of a process called

- A) dehydration synthesis.
- B) glycogenesis.
- C) glycogenolysis.
- D) polysaccharide synthesis.
- E) dialysis.

103) Starch and cellulose are examples of polysaccharides found in plants.

104) Nucleic acids are made up of

- A) nucleotides joined by covalent, phosphodiester bonds.
- B) nitrogenous bases joined by ionic, disulfide bonds.
- C) ribose sugars joined by intermolecular, hydrogen bonds.
- D) proteins and sugars joined by polar, covalent, double bonds.

105) The three parts making up a nucleotide are

- A) a purine, a pyrimidine, and a ribose sugar.
- B) a five-carbon sugar, a phosphate group, and a nitrogenous base.
- C) an adenine, a guanine, and a cytosine.
- D) a double helix, a single strand, and a chromosome.
- E) a phosphorous, a deoxygenated ribose, and an amino acid.

106) Adenine and thymine are examples of double-ring nitrogenous bases called pyrimidines.

107) RNA is

- A) single-stranded and contains thymine.
- B) single-stranded and contains uracil.
- C) double-stranded and contains thymine.
- D) double-stranded and contains uracil.

108) Within DNA, adenine makes hydrogen bonds with thymine, and guanine makes hydrogen bonds with cytosine.

109) ATP is a nucleotide that is composed of

- A) adenine, ribose, and three covalently bonded phosphate groups.
- B) adenine, thymine, and three covalently bonded phosphate groups.
- C) adipose, thymine, and three phosphate groups linked by ionic bonds.
- D) adenosine, deoxyribose, and three phosphorous atoms.
- E) arginine, thymidine and three phosphorous atoms.

110) FAD and NAD<sup>+</sup> are examples of nucleotides.

111) Imagine you are trying to create a living, artificial cell in a lab. Considering their role in human cells, explain how you would try to use each of the four types of biological molecules in your artificial cell. For example, explain how you would use one type of molecule to establish a boundary between the water in your test tube and the inside of your artificial cell.

112) Hemoglobin in blood, collagen in tendons, and enzymes in the digestive system are all examples of

- A) proteins.
- B) lipids.
- C) amino acids.
- D) carbohydrates.
- E) catalysts.

113) Which of the following lists describes three of the main functions served by proteins?

- A) Waterproofing, energy storage, and transmission of the genetic code
- B) Cushioning of organs, thermal insulation, and establishing cell boundaries
- C) Catalysis of chemical reactions, body defenses, and movement
- D) Energy storage, body defenses, thermal insulation

114) A protein consists of

- A) an amine group, a carboxyl group, and an R group.
- B) more than 200 amino acids.
- C) between 3 and 20 amino acids.
- D) a C-terminal, several nucleic acids, and an N-terminal.

- 115) Which statement accurately describes amino acids?
- A) There are twenty varieties, with each type having a different R group.
  - B) There are twenty varieties, with each type having a different C-terminal end.
  - C) There are over 200 varieties, with each type having a different R group.
  - D) There are over 200 varieties, with each type having a different C-terminal end.
- 116) When dehydration synthesis occurs between two amino acids, a covalent bond called a \_\_\_\_\_ bond forms between them.
- 117) Which list contains all four types of amino acids?
- A) Ionic, covalent, hydrogen, and intramolecular
  - B) Charged, polar, nonpolar, and those with special functions
  - C) Glutamate, aspartate, arginine, and thymine
  - D) Polar, nonpolar, ionic, and hydrophobic
- 118) Amino acids such as alanine contain hydrocarbons as side groups, and these amino acids engage in hydrophobic interactions with each other. Such amino acids are
- A) charged.
  - B) hydrostatic.
  - C) polar.
  - D) nonpolar.
  - E) polyunsaturated.
- 119) A charged amino acid tends to decrease a protein's solubility in water.
- 120) In some proteins, an ionic bond may form between an amino acid with
- A) a positive R group and an amino acid with a negative R group.
  - B) a negative R group and a nonpolar amino acid.
  - C) a sulfhydryl group and an amino acid with an amine group.
  - D) a carboxyl group and an amino acid with a C-terminal.
  - E) a glycine and another with a tryptophan.
- 121) The first amino acid put in place when a protein is being synthesized at a ribosome is
- A) glycine.
  - B) tryptophan.
  - C) methionine.
  - D) cysteine.
  - E) proline.
- 122) In some proteins, disulfide covalent bonds form between two \_\_\_\_\_ amino acids.
- 123) The three-dimensional shape of a protein is known as its primary structure.

124) When two or more polypeptide chains come together to give a protein its ultimate shape, that structure is described as the \_\_\_\_\_ structure.

- A) micro-
- B) secondary
- C) quaternary
- D) tertiary
- E) heme group

125) A beta sheet is an example of a secondary structure of a protein.

126) Polar R groups of closely positioned amino acids often enter into \_\_\_\_\_ with each other, which helps give a protein its three-dimensional shape.

- A) hydrophobic interactions
- B) ionic bonds
- C) hydrogen bonds
- D) van der Waals repulsions
- E) sulfur-carbon bonds

127) When extreme temperature changes a protein's shape so much that it can no longer perform its usual function, that change is known as \_\_\_\_\_.

128) Which statement accurately describes how pH is related to denaturation?

- A) Either a large increase or a large decrease in pH can lead to denaturation.
- B) Neither a large increase nor a large decrease in pH can lead to denaturation.
- C) A large increase but not a large decrease in pH can lead to denaturation.
- D) A large decrease but not a large increase in pH can lead to denaturation.

129) Explain the mechanisms by which certain changes in environmental conditions can denature proteins.

130) Ions with a negative charge are called \_\_\_\_\_.

131) In the formation of an ionic bond between Na and Cl to form common table salt, sodium (Na) \_\_\_\_\_ an electron and chlorine (Cl) \_\_\_\_\_ an electron.

- A) loses; gains
- B) gains; loses
- C) loses; also loses
- D) gains; also gains

132)  $\text{MgCl}_2$  fully dissociates into  $\text{Mg}^{2+}$  and  $\text{Cl}^-$  ions when mixed with water. Therefore, the bonds between  $\text{Mg}^{2+}$  and  $\text{Cl}^-$  in  $\text{MgCl}_2$  can be described as

- A) ionic.
- B) polar covalent.
- C) nonpolar covalent.
- D) hydrogen bonds.

133)  $C_6H_{12}O_6$  is an example of a \_\_\_\_\_ formula.

- A) molecular
- B) structural

134) A covalent bond forms when both atoms require electrons to become stable.

135) Which of the following are among the top four most common elements in the human body? (Select all that apply.)

- A) Carbon
- B) Sulfur
- C) Oxygen
- D) Phosphorus

136) Fatty acids in soap have a polar end and a nonpolar end. Which of the following best describes these molecules?

- A) Amphipathic
- B) Hydrophilic
- C) Hydrophobic
- D) Charged

137) In a water molecule, each oxygen can form up to \_\_\_\_\_ hydrogen bonds with other water molecules.

- A) 2
- B) 3
- C) 4
- D) 5

138) An emulsion is classified as a specific type of

- A) colloid.
- B) suspension.
- C) solution.

139) Glycogen is a polymer of \_\_\_\_\_ molecules.

- A) glucose
- B) starch
- C) fructose
- D) amino acid

140) Like glucose, ribose and deoxyribose are monosaccharides, but they are composed of five carbons rather than six.