

Patton, Thibodeau & Douglas: Essentials of Anatomy and Physiology

Chapter 02: The Chemistry of Life

Test Bank

TRUE/FALSE

1. Biochemistry deals with the chemical makeup of living organisms and the underlying process of life activities.

ANS: T DIF: Memorization REF: Page 21
TOP: Introduction

2. The number of protons in the nucleus of an atom determines its atomic mass.

ANS: F DIF: Memorization REF: Page 23
TOP: Atoms and Their Characteristics

3. The positively charged electrons are found in clouds outside the nucleus of an atom.

ANS: F DIF: Memorization REF: Page 23
TOP: Atoms and Their Characteristics

4. Two shared pairs of electrons represent a single covalent bond.

ANS: F DIF: Application REF: Page 25 (Figure 2-7)
TOP: Chemical Bonds

5. The digestion of food is an example of a decomposition reaction.

ANS: T DIF: Application REF: Page 26
TOP: Chemical Reactions

6. The number and arrangement of electrons orbiting in an atom's outer shell determine its chemical activity.

ANS: T DIF: Application REF: Page 23
TOP: Chemical Interactions

7. An atom is chemically inert if its outermost shell has two pairs of electrons.

ANS: F DIF: Application REF: Page 23
TOP: Chemical Interactions

8. An isotope of an element contains the same number of neutrons but different numbers of protons.

ANS: F DIF: Memorization REF: Page 23
TOP: Atoms and Their Characteristics

9. Polar bonds are formed by ions with different charges.

ANS: F DIF: Application REF: Page 25 (Figure 2-7)
TOP: Polar Molecules and Hydrogen Bonds

10. Radioactivity can change the number of protons in an atom.

ANS: T DIF: Memorization REF: Page 23
TOP: Atoms and Their Characteristics

11. Radioactivity can cause an atom of one element to change to that of another element.

ANS: T DIF: Memorization REF: Page 23
TOP: Radioactivity

12. In water, as the temperature gets lower, the number of hydrogen bonds gets fewer.

ANS: F DIF: Memorization
REF: Page 25 (Figure 2-7) TOP: Polar Molecules and Hydrogen Bonds

13. A substance that minimizes changes in pH when acids or bases are added is called a *buffer*.

ANS: T DIF: Application REF: Page 29 TOP: Buffers

14. The chemical reaction of an acid with a base always produces a salt and water.

ANS: T DIF: Application REF: Page 30 TOP: Salts

15. Water is a very effective solvent.

ANS: T DIF: Memorization REF: Page 27
TOP: Water

16. Electrolytes include acids, bases, and salts.

ANS: T DIF: Memorization REF: Page 28
TOP: Electrolytes

17. If a substance contains carbon atoms, it must be an organic compound.

ANS: F DIF: Memorization REF: Page 27
TOP: Organic and Inorganic Compounds

18. Electrolytes are characterized by having either a positive or a negative charge.

ANS: T DIF: Memorization REF: Page 28
TOP: Electrolytes

19. Acids are electrolytes that produce OH⁺ ions.

ANS: F DIF: Memorization REF: Page 28
TOP: Acids and Bases

20. *pH* is an abbreviation for the phrase meaning “the power of hydrogen.”

ANS: T DIF: Memorization REF: Page 29
TOP: The pH Scale

21. All proteins contain carbon, hydrogen, nitrogen, and sulfur.

ANS: F DIF: Memorization REF: Page 34
TOP: Proteins

22. Glycogen is an example of polysaccharides.

ANS: T DIF: Memorization REF: Page 32
TOP: Carbohydrates

23. There are a total of 20 essential amino acids.

ANS: F DIF: Memorization REF: Page 35
TOP: Amino Acids

24. Steroids are often called *tissue hormones*.

ANS: F DIF: Synthesis REF: Page 34 TOP: Steroids

25. A strong covalent bond joins the two chains of a DNA molecule.

ANS: F DIF: Memorization REF: Page 37
TOP: Nucleic Acids and Related Molecules

26. If a nucleic acid molecule contains Adenine, it must be DNA.

ANS: F DIF: Memorization REF: Page 37
TOP: Nucleic Acids and Related Molecules

27. Metabolism includes the processes of both anabolism and catabolism.
- ANS: T DIF: Memorization REF: Page 26
TOP: Metabolism
28. The ability of proteins to perform their function depends on their shape.
- ANS: T DIF: Application REF: Page 37
TOP: Levels of Protein Structure
29. Enzymes are proteins that have a unique shape that allows them to fit together with other molecules.
- ANS: T DIF: Memorization REF: Page 35
TOP: Proteins
30. ATP is broken down in an anabolic reaction.
- ANS: F DIF: Application REF: Page 26 TOP: Catabolism
31. At the end of a catabolic reaction, you would expect that there would be less ATP than when the reaction started.
- ANS: F DIF: Application REF: Page 26 TOP: Metabolism
32. Sodium chloride is an example of an ionic bond.
- ANS: T DIF: Application REF: Page 24 TOP: Chemical Bonds
33. The digestion of food is an example of a synthesis reaction.
- ANS: F DIF: Synthesis REF: Page 26
TOP: Chemical Reactions
34. The pH scale indicates the degree of acidity or alkalinity of a solution.
- ANS: T DIF: Memorization REF: Page 29
TOP: Acids and Bases
35. If a solution of hydrogen ions had a pH of 4 and the hydrogen ion concentration had been reduced by 100-fold, the new pH of the solution would be 2.
- ANS: F DIF: Application REF: Page 29 TOP: The pH Scale

36. High-density lipoprotein (HDL) is sometimes called the “bad” cholesterol.
ANS: F DIF: Application REF: Page 34 (Box 2-2)
TOP: Blood Lipoproteins
37. The nonessential amino acids cannot be produced from the other amino acids or from simple organic molecules.
ANS: F DIF: Memorization REF: Page 35
TOP: Amino Acids
38. The atomic weight of an atom is equal to the number of protons plus the number of neutrons.
ANS: T DIF: Memorization REF: Page 23
TOP: Atoms and Their Characteristics
39. The mass of a proton is almost exactly equal to the mass of an electron.
ANS: F DIF: Memorization REF: Page 23
TOP: Atoms and Their Characteristics
40. Hydrogen will react with other atoms to get 8 electrons in its outer energy level.
ANS: F DIF: Application REF: Page 23
TOP: Chemical Interactions
41. A double covalent bond involves the sharing of 2 electrons.
ANS: F DIF: Application REF: Page 25 (Figure 2-7)
TOP: Chemical Bonds
42. Synthesis reactions release energy for use by the cell.
ANS: F DIF: Memorization REF: Page 26
TOP: Chemical Reactions
43. Electrolytes dissociate to form ions.
ANS: T DIF: Application REF: Page 28 TOP: Electrolytes
44. As the hydrogen ion concentration increases, the pH value increases.
ANS: F DIF: Application REF: Page 29 TOP: Acids and Bases

45. Sugar and glycogen are considered carbohydrates.

ANS: T DIF: Memorization REF: Page 30
TOP: Carbohydrates

46. Glucose is a hexose, and ribose is a pentose.

ANS: T DIF: Memorization REF: Page 30
TOP: Carbohydrates

47. Nonessential amino acids are rarely used in the making of proteins in the human body.

ANS: F DIF: Application REF: Page 35 TOP: Amino Acids

48. Fats, steroids, and prostaglandins are all considered lipids.

ANS: T DIF: Memorization REF: Page 32 | Page
33
TOP: Lipids

49. Fats are composed of three fatty acids joined to a molecule of glycerol.

ANS: T DIF: Memorization REF: Page 32
TOP: Triglycerides or Fats

50. Saturated fats are more likely than unsaturated fats to be liquids at room temperature.

ANS: F DIF: Memorization REF: Page 32
TOP: Triglycerides or Fats

51. Phospholipids have a fat-soluble end and a water-soluble end.

ANS: T DIF: Memorization REF: Page 32 | Page
33
TOP: Phospholipids

52. Prostaglandins are associated with the prostate gland and therefore are not found in women.

ANS: F DIF: Application REF: Page 34 TOP: Prostaglandins

53. Virtually all elements are born in stars.

ANS: T DIF: Memorization REF: Page 21
TOP: Introduction

54. The nucleus of the atom will always have a positive charge.

ANS: T DIF: Application REF: Page 22
TOP: Atoms and Their Characteristics

55. If an atom has an atomic number of 12 and an atomic weight of 25, it must have 13 neutrons.

ANS: T DIF: Application REF: Page 23
TOP: Atoms and Their Characteristics

56. For an atom that has an atomic mass of 18 to be electrically neutral, it must have 18 electrons.

ANS: F DIF: Application REF: Page 22 | Page 23
TOP: Atoms and Their Characteristics

57. Atoms become positively charged by gaining protons.

ANS: F DIF: Memorization REF: Page 24
TOP: Chemical Bonds

58. Inorganic compounds do not play an important role in living systems.

ANS: F DIF: Application REF: Page 27
TOP: Organic and Inorganic Compounds

59. Acids release protons in solution.

ANS: T DIF: Memorization REF: Page 28
TOP: Acids

60. Amino acids are joined by peptide bonds to form proteins.

ANS: T DIF: Memorization REF: Page 35
TOP: Amino Acids

61. RNA never exists in a double-stranded form.

ANS: F DIF: Memorization
REF: Page 37 (Table 2-5) TOP: DNA and RNA (Table 2-5)

62. A protein that has been denatured has changed its conformation and may be unable to function.

ANS: T DIF: Memorization REF: Page 37

TOP: Amino Acids

63. The terms *molecule* and *compound* mean the same thing.

ANS: F DIF: Memorization REF: Page 26
TOP: Chemical Reactions

64. Four elements are considered to be the major elements in the body.

ANS: F DIF: Memorization REF: Page 22
TOP: Elements and Compounds

65. Matter can be defined as anything that takes up space and has mass.

ANS: T DIF: Memorization REF: Page 21
TOP: Elements and Compounds

66. A neutral atom that has 22 protons must have 22 electrons.

ANS: T DIF: Application REF: Page 22 | Page 23
TOP: Atoms and Their Characteristics

67. A neutral atom that has 22 protons must have 22 neutrons.

ANS: F DIF: Application REF: Page 22 | Page 23
TOP: Atoms and Their Characteristics

68. A neutral atom that has 22 protons could have 25 neutrons.

ANS: T DIF: Application REF: Page 22 | Page 23
TOP: Atoms and Their Characteristics

69. Oxygen would need 8 valance electrons to be chemically stable.

ANS: T DIF: Application REF: Page 23
TOP: Chemical Interactions

70. Hydrogen bonds between atoms do not form molecules or compounds.

ANS: T DIF: Memorization REF: Page 25
TOP: Polar Molecules and Hydrogen Bonds

71. According to the general formula, in synthesis reactions, the number of reactants is usually greater than the number of products.

ANS: T DIF: Application REF: Page 26

TOP: Chemical Reactions

72. According to the general formula, in decomposition reactions, the number of reactants is usually greater than the number of products.

ANS: F DIF: Application REF: Page 26

TOP: Chemical Reactions

73. According to the general formula, in exchange reactions, the number of reactants and the number of products are usually equal.

ANS: T DIF: Application REF: Page 26

TOP: Chemical Reactions

74. A solution with fewer hydrogen ions than pure water would have a pH lower than 7.

ANS: F DIF: Application REF: Page 29

TOP: Acids and Bases and the pH Scale

75. A solution with a pH of 3 has 100 times more hydrogen ions than a solution with a pH of 5.

ANS: T DIF: Application REF: Page 29 TOP: The pH Scale

76. A sucrose molecule is formed by the synthesis reaction between glucose and fructose.

ANS: T DIF: Application REF: Page 30 TOP: Carbohydrates

77. The quaternary structure of a protein contains more than one polypeptide chain.

ANS: T DIF: Application REF: Page 36

TOP: Levels of Protein Structure

78. Both phospholipids and steroids are found in cell membranes.

ANS: T DIF: Memorization REF: Page 33

TOP: Phospholipids and Steroids

79. Steroids are the only lipid that contains a ring structure.

ANS: F DIF: Memorization REF: Page 33 | Page

34

TOP: Prostaglandins

80. Nucleotides are only used to make RNA or DNA molecules.

ANS: F DIF: Memorization REF: Page 38

TOP: Nucleotides and Related Molecules

81. If a nucleic acid contains uracil, it must be RNA.

ANS: T DIF: Application REF: Page 37 TOP: Nucleic Acids

82. When ATP is in short supply, muscles can use creatine phosphate for extra energy.

ANS: T DIF: Memorization
REF: Page 31 (Table 2-2)
TOP: Nucleotides and Related Molecules (Table 2-2)

83. Glycoproteins are made up of large proteins with small carbohydrate groups attached.

ANS: T DIF: Application REF: Page 31 (Table 2-2)
TOP: Combined or Altered Forms (Table 2-2)

84. Muscle filaments and tendons are considered structural proteins.

ANS: T DIF: Memorization
REF: Page 31 (Table 2-2) TOP: Proteins (Table 2-2)

MULTIPLE CHOICE

1. Which of the following represents a trace element in the body?

- a. Sulfur
- b. Chlorine
- c. Iron
- d. Phosphorus

ANS: C DIF: Memorization
REF: Page 22 (Figure 2-1) TOP: Basic Chemistry (Figure 2-1)

2. The name of the element is determined by the number of:

- a. protons.
- b. neutrons.
- c. mesotrons.
- d. electrons.

ANS: A DIF: Application REF: Page 23
TOP: Atoms and Their Characteristics

3. Atomic weight is determined by the number of:

- a. protons and electrons.
- b. neutrons and electrons.
- c. neutrons, protons, and electrons.
- d. protons and neutrons.

ANS: D DIF: Application REF: Page 23
TOP: Atoms and Their Characteristics

4. Carbon has an atomic number of 6. The number of electrons found in the first shell is:
- 2.
 - 4.
 - 6.
 - 8.

ANS: A DIF: Application REF: Page 24 (Figure 2-5)
TOP: Chemical Interactions

5. The atomic number of carbon is 6. If it is a neutral atom, how many electrons does it have?
- 2
 - 4
 - 6
 - 8 (an octet)

ANS: C DIF: Application REF: Page 22 | Page 23
TOP: Atoms and Their Characteristics

6. A negatively charged subatomic particle that moves around the nucleus is a(n):
- orbital.
 - proton.
 - neutron.
 - electron.

ANS: D DIF: Memorization REF: Page 22
TOP: Atoms and Their Characteristics

7. When atoms combine, they may gain, lose, or share:
- electrons.
 - protons.
 - neutrons.
 - nuclei.

ANS: A DIF: Application REF: Page 24 TOP: Chemical Bonds

8. An ionic bond is formed by:
- two or more positive ions combining.
 - two or more negative ions combining.
 - a positive and a negative ion attracting each other.
 - sharing of a pair of electrons.

ANS: C DIF: Application REF: Page 24 TOP: Chemical Bonds

9. An example of an element would be:
- Ne.
 - CO₂.
 - C₆H₁₂O₆.
 - H₂O.

ANS: A DIF: Application REF: Page 21
TOP: Elements and Compounds

10. An isotope of an element contains a different number of _____ than other atoms of the same element.
- electrons
 - protons
 - neutrons
 - protons and neutrons

ANS: C DIF: Application REF: Page 23
TOP: Atoms and Their Characteristics

11. Which of the following elements is least likely to combine with another element?
- Hydrogen
 - Helium
 - Oxygen
 - Carbon

ANS: B DIF: Synthesis REF: Page 23
TOP: Atoms and Their Characteristics

12. The hydrogen isotope *tritium* consists of:
- one proton.
 - one proton and one neutron.
 - two protons and one neutron.
 - one proton and two neutrons.

ANS: D DIF: Application REF: Page 23
TOP: Atoms and Their Characteristics

13. Which of the following bonds are the weakest?
- Ionic bonds
 - Hydrogen bonds
 - Electrovalent bonds
 - Covalent bonds

ANS: B DIF: Memorization REF: Page 25
TOP: Polar Molecules and Hydrogen Bonds

14. The type of reaction in which substances are combined to form more complex substances is called a(n):
- reversible reaction.

- b. exchange reaction.
- c. synthesis reaction.
- d. decomposition reaction.

ANS: C DIF: Memorization REF: Page 26
TOP: Chemical Reactions

15. The process of the digestion of food is an example of which type of reaction?
- a. Synthesis
 - b. Decomposition
 - c. Exchange
 - d. Reversible

ANS: B DIF: Application REF: Page 26
TOP: Chemical Reactions

16. Substances that accept protons are called:
- a. acids.
 - b. bases.
 - c. buffers.
 - d. salts.

ANS: B DIF: Memorization REF: Page 28
TOP: Acids and Bases

17. Acids:
- a. are proton acceptors.
 - b. will lower the pH of a solution.
 - c. will raise the pH of a solution.
 - d. Both A and C.

ANS: D DIF: Synthesis REF: Page 28 TOP: Acids and Bases

18. A solution that contains a greater concentration of hydroxide ions (OH^-) than hydrogen ions (H^+):
- a. an acidic solution.
 - b. an alkaline (basic) solution.
 - c. a neutral solution.
 - d. has a lower pH than pure water.

ANS: B DIF: Application REF: Page 28 | Page 29
TOP: Acids and Bases

19. If the pH of a solution moves from 10 to 12:
- a. the OH^- concentration has increased by 10-fold.
 - b. the OH^- concentration has increased by 100-fold.
 - c. the H^+ concentration has increased by 10-fold.
 - d. the H^+ concentration has increased by 100-fold.

ANS: B DIF: Application REF: Page 28 | Page 29
TOP: The pH Scale

20. The most abundant and important compound(s) in the body is/are:
- air.
 - water.
 - proteins.
 - nucleic acids.

ANS: B DIF: Memorization REF: Page 27
TOP: Water

21. Decomposition reactions:
- usually require the input of energy.
 - produce simpler products.
 - usually release energy.
 - Both B and C.

ANS: D DIF: Memorization REF: Page 26
TOP: Chemical Reactions

22. $AB + CD \leftrightarrow AD + CB$ is an example of a(n):
- synthesis reaction.
 - exchange reaction.
 - decomposition reaction.
 - reversible reaction.

ANS: B DIF: Application REF: Page 26
TOP: Chemical Reactions

23. Which of the following represent(s) properties of water?
- Cohesion
 - High heat of vaporization
 - Strong polarity
 - All of the above.

ANS: D DIF: Synthesis REF: Page 27 | Page 28
TOP: Properties of Water

24. The approximate pH of gastric fluid (stomach acid) is:
- 10.
 - 8.
 - 4.
 - 2.

ANS: D DIF: Memorization
REF: Page 29 (Figure 2-13) TOP: The pH Scale

25. Which of the following is not one of the major groups of organic substances in the human body?
- Proteins
 - Salts
 - Lipids
 - Nucleic acids

ANS: B DIF: Memorization REF: Page 30
TOP: Organic Molecules

26. This term refers to a pure substance that cannot be broken down into simpler substances by chemical means.
- Compound
 - Molecule
 - Salt
 - Element

ANS: D DIF: Memorization REF: Page 21
TOP: Elements and Compounds

27. Peptide bonds join together molecules of:
- glycerol.
 - glucose.
 - amino acids.
 - water.

ANS: C DIF: Application REF: Page 35 TOP: Amino Acids

28. A substance that is made up of more than one atom is called a(n):
- element.
 - compound.
 - molecule.
 - Both B and C.

ANS: D DIF: Memorization REF: Page 21
TOP: Elements and Compounds

29. All of the following substances are organic except:
- lipids.
 - electrolytes.
 - carbohydrates.
 - proteins.

ANS: B DIF: Application REF: Page 30
TOP: Organic Molecules

30. The simple sugars that are the building blocks for other carbohydrates are:
- disaccharides.
 - monosaccharides.

c. polysaccharides.

ANS: B DIF: Memorization REF: Page 30
TOP: Carbohydrates

31. The element that is present in all proteins but not in carbohydrates is:
- carbon.
 - hydrogen.
 - oxygen.
 - nitrogen.

ANS: D DIF: Synthesis REF: Page 30 | Page 34
TOP: Carbohydrates and Proteins

32. The formation of sucrose involves the removal of a molecule of water. This is called:
- hydrolysis.
 - oxidation.
 - decomposition.
 - dehydration synthesis.

ANS: D DIF: Synthesis REF: Page 26 TOP: Anabolism

33. Humans can synthesize 12 of 20 basic amino acids. The remaining 8, which must be included in the diet, are called:
- enzymes.
 - essential amino acids.
 - structural proteins.
 - peptide bonds.

ANS: B DIF: Application REF: Page 28 TOP: Amino Acids

34. The basic building blocks of fats are:
- monosaccharides.
 - disaccharides.
 - amino acids.
 - fatty acids and glycerol.

ANS: D DIF: Memorization REF: Page 32
TOP: Triglycerides or Fats

35. A structural lipid found in the cell membrane is a:
- triglyceride.
 - phospholipid.
 - steroid.
 - Both B and C.

ANS: D DIF: Application REF: Page 22 | Page 23
TOP: Phospholipids and Steroids

36. DNA:
- is a single strand of nucleotides.
 - contains the sugar ribose.
 - contains thymine.
 - contains uracil.

ANS: C DIF: Application REF: Page 37
TOP: Nucleic Acids and Related Molecules

37. The study of metabolism includes examination of:
- catabolism.
 - anabolism.
 - all chemical reactions that occur in the body.
 - All of the above.

ANS: D DIF: Memorization REF: Page 26
TOP: Metabolism

38. The bonds that exist between phosphate groups of the ATP molecule are:
- hydrogen bonds.
 - high-energy bonds.
 - ionic bonds.
 - Both B and C.

ANS: B DIF: Application REF: Page 38 (Figure 2-26)
TOP: Metabolism

39. Which of the following is not true of hydrogen bonds?
- The number of hydrogen bonds in water increases as water gets colder.
 - The number of hydrogen bonds in water increases as water gets hotter.
 - D Hydrogen bonds help maintain the structure of DNA.
- Neither A nor C is true of hydrogen bonds.

ANS: A DIF: Memorization REF: Page 25
TOP: Polar Molecules and Hydrogen Bonds

40. The type of lipid found in hormones is:
- triglycerides.
 - phosphoglycerides.
 - steroids.
 - prostaglandins.

ANS: C DIF: Application REF: Page 31 (Table 2-2)
TOP: Steroids (Table 2-2)

41. Which of the following is not one of the three major ingredients of a DNA molecule?
- Sugar
 - Nitrogenous bases
 - Phosphate

d. Lipid

ANS: D DIF: Memorization REF: Page 37
TOP: Nucleic Acids and Related Molecules

42. Which of the following is not one of the major elements present in the human body?
- Oxygen
 - Zinc
 - Carbon
 - Potassium

ANS: B DIF: Application REF: Page 22 (Figure 2-1)
TOP: Basic Chemistry

43. Which of the following is not a subatomic particle?
- Proton
 - Electron
 - Radon
 - Neutron

ANS: C DIF: Memorization REF: Page 22
TOP: Atoms and Their Characteristics

44. The total number of electrons in a neutral atom equals the number of:
- neutrons orbiting the atom.
 - protons plus the number of neutrons in its nucleus.
 - protons in its nucleus.
 - ions in its nucleus.

ANS: C DIF: Application REF: Page 22 | Page 23
TOP: Atoms and Their Characteristics

45. An atom can be described as chemically inert if its outermost electron shell contains:
- 8 electrons.
 - 9 electrons.
 - 2 electrons.
 - Both A and C.

ANS: D DIF: Synthesis REF: Page 23
TOP: Chemical Interactions

46. Ionic bonds are chemical bonds formed by the:
- sharing of electrons between molecules.
 - donation of protons from one atom to another.
 - transfer of electrons from one atom to another.
 - acceptance of neutrons from one atom to another.

ANS: C DIF: Application REF: Page 24 TOP: Chemical
Bonds

47. Chemical bonds formed by the sharing of electrons are called:
- ionic.
 - covalent.
 - hydrogen.
 - isotopic.

ANS: B DIF: Memorization REF: Page 24
TOP: Covalent Bonds

48. The type of chemical reaction most likely to require energy is:
- synthesis reaction.
 - decomposition reaction.
 - exchange reaction.
 - All of the above reactions are equally likely to require energy.

ANS: A DIF: Memorization REF: Page 26
TOP: Chemical Reactions

49. Proteins are composed of ____ commonly occurring amino acids.
- 10
 - 18
 - 20
 - 22

ANS: C DIF: Memorization REF: Page 35
TOP: Proteins

50. Amino acids frequently become joined by:
- peptide bonds.
 - catabolic reactions.
 - atrophic reactions.
 - All of the above.

ANS: A DIF: Application REF: Page 35 TOP: Amino Acids

51. The elements carbon, hydrogen, oxygen, and nitrogen make up which percentage of the human body?
- 50%
 - 69%
 - 78%
 - 96%

ANS: D DIF: Memorization REF: Page 22
TOP: Elements and Compounds

52. Which subatomic particles carry a charge?
- Protons and neutrons
 - Neutrons and electrons

- c. Protons and electrons
- d. Only neutrons carry a charge.

ANS: C
23

DIF: Memorization

REF: Page 22 | Page

TOP: Atomic Structure

53. The element oxygen has an atomic number of 8, which means it contains:
- a. 4 protons and 4 neutrons.
 - b. 8 protons.
 - c. 8 neutrons.
 - d. 4 protons and 4 electrons.

ANS: B

DIF: Memorization

REF: Page 23

TOP: Atoms and Their Characteristics

54. For sodium to go from a neutral atom to a positive ion, it must:
- a. gain an electron.
 - b. gain a proton.
 - c. lose an electron.
 - d. lose a proton.

ANS: C
Bonds

DIF: Application REF: Page 24

TOP: Chemical

55. A molecule that is polar:
- a. can form a hydrogen bond.
 - b. must be ionic.
 - c. has an unequal charge.
 - d. is both A and C.

ANS: D

DIF: Application REF: Page 25

TOP: Polar Molecules and Hydrogen Bonds

56. The reaction between hydrogen and oxygen needed to form water is an example of a:
- a. hydrogen bond.
 - b. synthesis reaction.
 - c. decomposition reaction.
 - d. None of the above.

ANS: B

DIF: Application REF: Page 26

TOP: Chemical Reactions

57. Electrolytes are:
- a. organic compounds.
 - b. called *anions* if they have a negative charge.
 - c. called *cations* if they have a positive charge.
 - d. both A and B.

ANS: C DIF: Memorization REF: Page 28
TOP: Electrolytes

58. A weak acid:
- dissociates very little in solution.
 - dissociates almost completely in solution.
 - will cause the pH of the solution to rise above 7.
 - Both B and C.

ANS: A DIF: Application REF: Page 28 TOP: Acids and Bases

59. Salts:
- can form as the result of a chemical reaction between acids and bases.
 - are electrolytes.
 - will form crystals if the water is removed.
 - are all of the above.

ANS: D DIF: Application REF: Page 30 TOP: Salts

60. Hydrolysis:
- joins compounds by removing a water molecule.
 - breaks down compounds by removing a water molecule.
 - joins compounds by adding a water molecule.
 - breaks down compounds by adding a water molecule.

ANS: C DIF: Memorization
REF: Page 26 (Figure 2-10) TOP: Amino Acids

61. Unsaturated fats:
- contain all the hydrogen atoms they can hold.
 - contain only single bonds between carbon atoms.
 - are usually solids at room temperature.
 - will kink or bend because of the double bonds between the carbon atoms.

ANS: D DIF: Application REF: Page 32
TOP: Triglycerides or Fats

62. As the concentration of hydrogen ions (H^+) increases, the:
- solution becomes more basic.
 - solution becomes more acidic.
 - pH rises.
 - Both A and C.

ANS: B DIF: Application REF: Page 28 | Page 29
TOP: Acids and Bases

63. As the concentration of hydroxide ions (OH^-) increases, the:
- solution becomes more basic.

- b. solution becomes more acidic.
- c. pH rises.
- d. Both A and C.

ANS: D DIF: Application REF: Page 28 | Page 29
TOP: Acids and Bases

64. Which lipid acts as a “tissue hormone”?
- a. Triglyceride
 - b. Prostaglandin
 - c. Steroid
 - d. Phospholipid

ANS: B DIF: Memorization REF: Page 34
TOP: Prostaglandins

65. A magnesium atom has an atomic number of 12, an atomic mass of 25, and a +2 charge. This atom would contain:
- a. 12 protons, 25 neutrons, and 2 electrons.
 - b. 12 protons, 13 neutrons, and 14 electrons.
 - c. 12 protons, 13 neutrons, and 10 electrons.
 - d. Not enough information is given to answer the question.

ANS: C DIF: Application REF: Page 22 | Page 23
TOP: Atoms and Their Characteristics

66. The octet rule refers to:
- a. the stability of the nucleus when the protons are in a multiple of 8.
 - b. the stability of the atom when there are 8 electrons in the outermost energy level.
 - c. the stable configuration of the nucleus when there are 8 more neutrons than protons.
 - d. the principle that one atom can combine with a maximum of 8 other atoms.

ANS: C DIF: Application REF: Page 23
TOP: Chemical Interactions

67. The type of reaction most likely to release energy is a(n):
- a. synthesis reaction.
 - b. decomposition reaction.
 - c. exchange reaction.
 - d. All of the above reactions are equally likely to release energy.

ANS: B DIF: Application REF: Page 26
TOP: Chemical Reactions

68. Which of the following is not true about oxygen and carbon dioxide?
- a. They are both important organic compounds.
 - b. Molecular oxygen is present as O₂ in the body.
 - c. Oxygen is needed for energy release in cellular respiration.
 - d. Carbon dioxide is important in maintaining the proper acid-base balance in the body.

ANS: A DIF: Application REF: Page 28
TOP: Oxygen and Carbon Dioxide

69. The alpha helix is an example of which level of protein structure?
- Primary
 - Secondary
 - Tertiary
 - Quaternary

ANS: B DIF: Memorization REF: Page 36
TOP: Levels of Protein Structure

70. Which of the following is not true of RNA?
- It contains ribose sugar.
 - It contains adenine.
 - It is smaller than DNA
 - All of the above are true of RNA.

ANS: D DIF: Memorization
REF: Page 37 (Table 2-5) TOP: DNA and RNA (Table 2-5)

71. Hydrogen bonds are important in the attractive forces between:
- water molecules.
 - large protein molecules.
 - nucleic acids.
 - All of the above are true.

ANS: D DIF: Memorization REF: Page 25
TOP: Polar Molecules and Hydrogen Bonds

72. A strong acid:
- holds on strongly to its hydrogen atoms, releasing very few in solution.
 - would cause a drop in the pH of a solution.
 - would cause a rise in the pH of a solution.
 - is both A and C.

ANS: B DIF: Application REF: Page 28 TOP: Acids

73. Which of the following is not true of protein?
- Provides structure for the body
 - Acts as an accelerator for chemical reactions
 - Is composed of amino acids
 - All of the above are functions of protein.

ANS: D DIF: Memorization REF: Page 34 | Page
35
TOP: Proteins

74. Which level of protein structure refers to the number, kind, and sequence of amino acids?
- Primary
 - Secondary
 - Tertiary
 - Quaternary

ANS: A DIF: Memorization REF: Page 36
TOP: Levels of Protein Structure

75. Which level of protein structure is one that contains several polypeptide chains?
- Primary
 - Secondary
 - Tertiary
 - Quaternary

ANS: D DIF: Memorization REF: Page 36
TOP: Levels of Protein Structure

76. Which of the following is not true of both triglycerides and phospholipids?
- They both contain glycerol.
 - They both contain fatty acids.
 - They both contain a hydrophobic and hydrophilic end.
 - All of the above are true of both triglycerides and phospholipids.

ANS: C DIF: Application REF: Page 32 | Page 33
TOP: Triglycerides and Phospholipids

77. Prostaglandins and steroids share which of the following characteristics?
- Both are found in the cell membrane.
 - Both have a ring structure in their molecule.
 - Both have a saturated fat in their structure.
 - None of the above are shared characteristics.

ANS: B DIF: Application REF: Page 32 | Page 33
TOP: Steroids and Prostaglandins

78. The twisted, double-strand arrangement of nucleotides in a DNA molecule is a(n):
- deoxyribose.
 - double helix.
 - guanine.
 - uracil.

ANS: B DIF: Application REF: Page 37 TOP: RNA and DNA

79. If the pH of a person's blood was 7.4, it would be described as:
- strongly acidic.
 - neutral.
 - slightly acidic.
 - slightly alkaline.

ANS: D DIF: Application REF: Page 28 TOP: Bases

80. When sodium (Na) gives up an electron to chlorine, the result is the formation of a sodium ion (Na^+) with a positive charge. This happens because there is then:
- one more proton (+) than electron (-).
 - one more electron (-) than proton (-).
 - one more proton (+) than neutron.
 - one more electron (-) than neutron.

ANS: A DIF: Application REF: Page 24 TOP: Chemical Bonds

MATCHING

Match each term to its corresponding descriptive phrase.

- Proton
 - Neutron
 - Electron
 - Isotopes
 - Ionic bonds
 - Covalent bonds
 - Octet rule
 - Atomic number
 - Atomic weight
 - Hydrogen bonds
- ___ Number of protons an atom has
 - ___ Subatomic particle with no charge
 - ___ Bond formed between atoms when they share electrons
 - ___ Subatomic particle with a positive charge
 - ___ Atoms with the same number of protons but a different number of neutrons
 - ___ Value determined by adding the number of protons and neutrons in an atom
 - ___ Bond that requires a polar molecule
 - ___ Subatomic particle that has a negative charge and is found in a shell surrounding the nucleus of the atom
 - ___ Bond that is formed by the transfer of an electron from one atom to another
 - ___ Reaction of an atom that results in 8 electrons in the outer energy level

- ANS: H DIF: Memorization REF: Page 23
TOP: Atoms and Their Characteristics
- ANS: B DIF: Memorization REF: Page 23
TOP: Atoms and Their Characteristics
- ANS: F DIF: Memorization REF: Page 24
TOP: Chemical Bonds
- ANS: A DIF: Memorization REF: Page 23

- TOP: Atoms and Their Characteristics
5. ANS: D DIF: Memorization REF: Page 23
TOP: Atoms and Their Characteristics
6. ANS: I DIF: Memorization REF: Page 23
TOP: Atoms and Their Characteristics
7. ANS: J DIF: Memorization REF: Page 25
TOP: Polar Molecules and Hydrogen Bonds
8. ANS: C DIF: Memorization REF: Page 22
TOP: Atoms and Their Characteristics
9. ANS: E DIF: Memorization REF: Page 24
TOP: Chemical Bonds
10. ANS: G DIF: Memorization REF: Page 23
TOP: Chemical Interactions

Match each term to its corresponding descriptive phrase.

- a. Acid
 - b. Base
 - c. RNA
 - d. DNA
 - e. Carbohydrate
 - f. Fat
 - g. Steroid
 - h. Protein
 - i. Prostaglandins
 - j. ATP
11. ___ Substance composed of a glycerol molecule and three fatty acid molecules
12. ___ Releases a hydrogen ion into a solution, which lowers the pH
13. ___ Starch or sugar
14. ___ Releases a hydroxide ion into solution, which raises the pH
15. ___ Lipid found in hormones that is made up of four rings
16. ___ Types of lipids that are called *tissue hormones*
17. ___ Molecule that is the body's usual source of energy
18. ___ Nucleic acid that contains thymine and deoxyribose sugar
19. ___ Substance that is made up of a long chain of amino acids
20. ___ Nucleic acid that contains ribose sugar and uracil

11. ANS: F DIF: Memorization REF: Page 32
TOP: Triglycerides or Fats
12. ANS: A DIF: Memorization REF: Page 28
TOP: Acids and Bases
13. ANS: E DIF: Memorization REF: Page 30
TOP: Carbohydrates
14. ANS: B DIF: Memorization REF: Page 28
TOP: Acids and Bases

15. ANS: G DIF: Memorization REF: Page 33
TOP: Steroids (Table 2-2)
16. ANS: I DIF: Memorization REF: Page 34
TOP: Prostaglandins
17. ANS: J DIF: Memorization REF: Page 38
TOP: Metabolism
18. ANS: D DIF: Memorization REF: Page 37
TOP: Nucleic Acids and Related Molecules
19. ANS: H DIF: Memorization REF: Page 34
TOP: Proteins
20. ANS: C DIF: Memorization REF: Page 37
TOP: Nucleic Acids and Related Molecules

OTHER

1. Name, describe, and give the locations of the three subatomic particles.

ANS:

Answers will vary.

DIF: Memorization

REF: Page 22 | Page 23

TOP: Atoms and Their Characteristics

2. Name and briefly describe the type of chemical bonds discussed in this chapter.

ANS:

Answers will vary.

DIF: Application REF: Page 24 | Page 25

TOP: Chemical Bonds, Polar Molecules, and Hydrogen Bonds

3. Name the four types of lipids, and give a function for each type.

ANS:

Answers will vary.

DIF: Application REF: Page 32 | Page 34

TOP: Lipids

4. Define or explain the following terms: *atomic number*, *atomic weight*, and *isotope*.

ANS:

Answers will vary.

DIF: Memorization

REF: Page 23

TOP: Atoms and Their Characteristics

5. Explain the three types of chemical reactions discussed in this chapter, and give the formula for each. Explain which usually require energy and which usually give off energy.

ANS:

Answers will vary.

DIF: Memorization
TOP: Chemical Reactions

REF: Page 26

6. Explain what is meant by the octet rule. What effect does having 8 valence electrons have on the reactivity of an atom?

ANS:

Answers will vary.

DIF: Application REF: Page 23 TOP: Chemical Interactions

7. Explain why the properties of water are important in the functioning of the body.

ANS:

Answers will vary.

DIF: Application REF: Page 27 | Page 28 TOP: Water

8. Explain the relationship between the concentration of H^+ and OH^- on the pH value of a solution.

ANS:

Answers will vary.

DIF: Application REF: Page 28 | Page 29
TOP: Acids and Bases and the pH Scale

9. Name and describe the three types of carbohydrates discussed in the chapter.

ANS:

Answers will vary.

DIF: Memorization REF: Page 30 TOP: Carbohydrates

10. Describe the structure of an amino acid and how amino acids are linked to form proteins.

ANS:

Answers will vary.

DIF: Memorization REF: Page 35 TOP: Amino Acids

11. Describe the four levels of protein structure.

ANS:

Answers will vary.

DIF: Memorization

REF: Page 36

TOP: Levels of Protein Structure

12. Describe the structure of DNA and RNA.

ANS:

Answers will vary.

DIF: Memorization

REF: Page 37

TOP: Nucleic Acids and Related Molecules

13. If one side of the DNA molecule had the nucleotide sequence of A-C-C-G-T-A, what would be the sequence of nucleotides on the other side of the molecule?

ANS:

T-G-G-C-A-T

DIF: Application

REF: Page 37

TOP: Nucleic Acids and Related Molecules

14. Explain the structural differences between HDL and LDL lipoproteins and their impact on health.

ANS:

Answers will vary.

DIF: Memorization

REF: Page 34 (Box 2-2)

TOP: Blood Lipoproteins (Box 2-2)

15. Challenge: Enzymes that are exposed to high heat or low pH solutions lose their ability to function. What causes this to happen? Be specific.

ANS:

Answers will vary.

DIF: Synthesis

REF: Page 36 | Page 37

TOP: Proteins