

# Patton and Thibodeau: Anatomy & Physiology, 7<sup>th</sup> Edition

## Chapter 2: The Chemical Basis 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 34  
TOP: Introduction

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

ANS: F                      DIF: Memorization                      REF: Page 36  
TOP: Atomic Number and Atomic Weight

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

ANS: F                      DIF: Memorization                      REF: Page 36  
TOP: Atomic Structure

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

ANS: F                      DIF: Application                      REF: Page 39                      TOP: Covalent Bonds

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

ANS: T                      DIF: Application                      REF: Page 40  
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 37                      TOP: Energy Levels

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

ANS: F                      DIF: Application                      REF: Page 37                      TOP: Energy Levels

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

ANS: F                      DIF: Memorization                      REF: Page 37  
TOP: Isotopes

9. Electrovalent and ionic bonds are the same.

ANS: T                      DIF: Memorization                      REF: Page 38  
TOP: Ionic Bonds

10. Radiation results from the breaking apart of the nucleus of an atom.

ANS: T                      DIF: Memorization                      REF: Page 38  
TOP: Radioactivity

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

ANS: T                      DIF: Memorization                      REF: Page 38  
TOP: Radioactivity

12. Ionizing radiation can be cancer-producing.

ANS: T                      DIF: Memorization                      REF: Page 38  
TOP: Radioactivity

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

ANS: T                      DIF: Application                      REF: Page 45                      TOP: Buffers

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

ANS: T                      DIF: Application                      REF: Page 45                      TOP: Salts

15. Water is the universal solvent.

ANS: T                      DIF: Memorization                      REF: Page 43  
TOP: Water

16. Electrolytes include acids, bases, and salts.

ANS: T                      DIF: Memorization                      REF: Page 44  
TOP: Electrolytes

17. All inorganic substances are free from carbon.

ANS: F                    DIF: Memorization                    REF: Page 42  
TOP: Organic and Inorganic Compounds

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

ANS: T                    DIF: Memorization                    REF: Page 44  
TOP: Electrolytes

19. Acids are electrolytes that produce OH<sup>+</sup> ions.

ANS: F                    DIF: Memorization                    REF: Page 44  
TOP: Acids

20. pH stands for the negative logarithm of the hydrogen ion concentration.

ANS: T                    DIF: Memorization                    REF: Page 44  
TOP: The pH Scale

21. Proteins are the most abundant of the carbon-containing compounds in the body.

ANS: T                    DIF: Memorization                    REF: Page 52  
TOP: Proteins

22. Glycogen and starch are both examples of polysaccharides.

ANS: T                    DIF: Memorization                    REF: Page 48  
TOP: Disaccharides and Polysaccharides

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

ANS: F                    DIF: Memorization                    REF: Page 52  
TOP: Amino Acids

24. Steroids are often called *tissue hormones*.

ANS: F                    DIF: Synthesis                    REF: Page 50                    TOP: Steroids

25. DNA molecules are the largest molecules in the body.

ANS: T                    DIF: Memorization                    REF: Page 57  
TOP: Nucleic Acids

26. Adenine and thymine are referred to as purine bases, which are important constituents of a DNA molecule.

ANS: F                    DIF: Memorization                    REF: Page 57  
TOP: Nucleic Acids

27. Metabolism includes the processes of both anabolism and catabolism.

ANS: T                    DIF: Memorization                    REF: Page 41  
TOP: Metabolism

28. The ability of proteins to perform their function depends on their shape.

ANS: T                    DIF: Application    REF: Page 56  
TOP: Levels of Protein Structure

29. Enzymes are proteins that function by the lock-and-key theory.

ANS: T                    DIF: Synthesis      REF: Page 56  
TOP: Levels of Protein Structure

30. ATP is broken down in an anabolic reaction.

ANS: F                    DIF: Application    REF: Page 41      TOP:  
Catabolism

31. Catabolism and anabolism are major types of metabolic activity.

ANS: T                    DIF: Memorization                    REF: Page 41  
TOP: Metabolism

32. Sodium chloride is an example of an ionic bond.

ANS: T                    DIF: Application    REF: Page 38      TOP: Ionic  
Bonds

33. The digestion of food is an example of a synthesis reaction.

ANS: F                    DIF: Synthesis      REF: Page 40 | Page 41  
TOP: Chemical Reactions

34. The pH scale indicates the degree of acidity or alkalinity of a solution.

ANS: T                    DIF: Memorization                    REF: Page 44  
TOP: Acids and Bases

35. Litmus paper will turn red in the presence of a base.

ANS: F                    DIF: Memorization                    REF: Page 44

TOP: Acids and Bases

36. High-density lipoprotein (HDL) is also called the “bad” cholesterol.

ANS: F                    DIF: Application    REF: Page 51 (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 52  
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 36  
TOP: Atomic Number and Atomic Weight

39. The mass of a proton is almost exactly equal to the mass of an electron.

ANS: F                    DIF: Memorization                    REF: Page 33  
TOP: Atomic Number and Atomic Weight

40. Hydrogen will react with other atoms to get 8 electrons in its outer energy level.

ANS: F                    DIF: Application    REF: Page 37            TOP: Energy Levels

41. A double covalent bond involves the sharing of 2 electrons.

ANS: F                    DIF: Application    REF: Page 39            TOP: Covalent Bonds

42. Synthesis reactions release energy for use by the cell.

ANS: F                    DIF: Memorization                    REF: Page 40  
TOP: Chemical Reactions

43. Electrolytes dissociate to form ions.

ANS: T                    DIF: Application    REF: Page 44            TOP: Electrolytes

44. As the hydrogen ion concentration increases, the pH value increases.

ANS: F                    DIF: Application    REF: Page 44            TOP: Acids and Bases

45. Sugars and starches are both considered to be carbohydrates.

ANS: T                    DIF: Memorization                    REF: Page 46  
TOP: Carbohydrates

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

ANS: T                    DIF: Memorization                    REF: Page 46  
TOP: Carbohydrates

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

ANS: F                    DIF: Application    REF: Page 52            TOP: Amino Acids

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

ANS: T                    DIF: Memorization                    REF: Page 48  
TOP: Lipids

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

ANS: T                    DIF: Memorization                    REF: Page 48  
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 49  
TOP: Triglycerides or Fats

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

ANS: T                    DIF: Memorization                    REF: Page 50  
TOP: Phospholipids

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

ANS: F                    DIF: Application    REF: Page 51            TOP:  
Prostaglandins

53. Chemistry can be defined as the science that deals with the structure, arrangement, and composition of substances and the reactions they undergo.

ANS: T                      DIF: Memorization                      REF: Page 34  
TOP: Introduction

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

ANS: T                      DIF: Application      REF: Page 36                      TOP: Atomic Structure

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 36  
TOP: Atomic Number and Atomic Weight

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

ANS: F                      DIF: Application      REF: Page 36  
TOP: Atomic Structure, Atomic Number and Atomic Weight

57. Atoms become positively charged by gaining protons.

ANS: F                      DIF: Memorization                      REF: Page 38  
TOP: Ionic Bonds

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

ANS: F                      DIF: Application      REF: Page 42  
TOP: Organic and Inorganic Compounds

59. Acids release protons in solution.

ANS: T                      DIF: Memorization                      REF: Page 44  
TOP: Acids

60. A denatured protein has lost its functional shape.

ANS: T                      DIF: Memorization                      REF: Page 56  
TOP: Proteins

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

ANS: F                      DIF: Memorization                      REF: Page 58

TOP: DNA and RNA

62. Glycoproteins contain both a fat molecule and a protein molecule.

ANS: F                    DIF: Memorization                    REF: Page 60  
TOP: Combined Forms

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

ANS: F                    DIF: Memorization                    REF: Page 38  
TOP: Interaction Between Atoms

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

ANS: F                    DIF: Memorization                    REF: Page 35  
TOP: Elements and Compounds

65. Dalton named the atom after the Greek word for invisible.

ANS: F                    DIF: Memorization                    REF: Page 36  
TOP: Atoms

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

ANS: T                    DIF: Application    REF: Page 36                    TOP: Atoms

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

ANS: F                    DIF: Application    REF: Page 36                    TOP: Atoms

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

ANS: T                    DIF: Application    REF: Page 36                    TOP: Atoms

69. Oxygen has 8 electrons, but only 6 of them are in its outermost energy level.

ANS: T                    DIF: Application    REF: Page 37                    TOP: Energy Levels

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

ANS: T                    DIF: Memorization                    REF: Page 39  
TOP: Attraction Between Molecules

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 40  
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 40 | Page 41  
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 41  
TOP: Chemical Reactions

74. A solution with a pH of 6 has 100 times more hydrogen ions than a solution with a pH of 4.

ANS: F                    DIF: Application    REF: Page 44            TOP: 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 44            TOP: The pH Scale

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

ANS: T                    DIF: Application    REF: Page 48  
TOP: Disaccharides and Polysaccharides

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

ANS: T                    DIF: Application    REF: Page 55  
TOP: Levels of Protein Structure

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

ANS: T                    DIF: Memorization                    REF: Page 50  
TOP: Phospholipids and Steroids

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

ANS: F                    DIF: Memorization                    REF: Page 50  
TOP: Prostaglandins

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

ANS: F                    DIF: Memorization                    REF: Page 58  
TOP: Nucleotides and Related Molecules

81. The distance between the sugar-phosphate structures in a DNA molecule is equal to the distance of one purine and one pyrimidine molecule.

ANS: T                    DIF: Application                    REF: Page 57                    TOP: Nucleic Acids

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

ANS: T                    DIF: Memorization                    REF: Page 59  
TOP: Nucleotides and Related Molecules

83. Because oxygen has 8 electrons, it has achieved its octet and will not react with other elements.

ANS: F                    DIF: Application                    REF: Page 37                    TOP: Energy Levels

84. Both triglycerides and prostaglandins can contain a saturated fat.

ANS: T                    DIF: Application                    REF: Page 49 | Page 50  
TOP: Triglycerides and Prostaglandins

### **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 35  
TOP: Basic Chemistry

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

- A. proton.
- B. neutrons.
- C. mesotrons.
- D. electrons.



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

ANS: C                      DIF: Application    REF: Page 38            TOP: Ionic Bonds

9. An example of an element would be:
- A. Ne.
  - B. CO<sub>2</sub>.
  - C. C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>.
  - D. H<sub>2</sub>O.

ANS: A                      DIF: Application    REF: Page 34  
TOP: Elements and Compounds

10. An isotope of an element contains a different number of \_\_\_\_ than other atoms of the same element.
- A. electrons
  - B. protons
  - C. neutrons
  - D. protons and neutrons

ANS: C                      DIF: Application    REF: Page 37            TOP: Isotopes

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

ANS: B                      DIF: Synthesis        REF: Page 37 (Figure 2-6)  
TOP: Attraction Between Atoms: Chemical Bonds

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

ANS: D                      DIF: Application    REF: Page 38 (Figure 2-7)  
TOP: Isotopes

13. Which of the following bonds are the weakest?
- A. Ionic bonds
  - B. Hydrogen bonds

- C. Electrovalent bonds
- D. Covalent bonds

ANS: B                      DIF: Memorization                      REF: Page 39  
TOP: Hydrogen Bonds

14. The type of reaction in which substances are combined to form more complex substances is called a(n):
- A. reversible reaction.
  - B. exchange reaction.
  - C. synthesis reaction.
  - D. decomposition reaction.

ANS: C                      DIF: Memorization                      REF: Page 40  
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 40 | Page 41  
TOP: Chemical Reactions

16. Substances that accept hydrogen ions are called:
- A. acids.
  - B. bases.
  - C. buffers.
  - D. salts.

ANS: B                      DIF: Memorization                      REF: Page 44  
TOP: Bases

17. Acids:
- A. are proton donors.
  - B. taste sour.
  - C. release hydrogen ions in an aqueous solution.
  - D. are all of the above.

ANS: D                      DIF: Synthesis                      REF: Page 44                      TOP: Acids

18. A solution that contains a greater concentration of hydroxide ions (OH<sup>-</sup>) than hydrogen ions (H<sup>+</sup>) is a(n):
- A. acidic solution.
  - B. alkaline (basic) solution.
  - C. neutral solution.

ANS: B                      DIF: Application                      REF: Page 44                      TOP: Bases

19. In the presence of a base, red litmus paper will:

- A. stay red.
- B. turn blue.
- C. turn green.
- D. turn yellow.

ANS: B                      DIF: Memorization  
TOP: Acids and Bases

REF: Page 44

20. The most abundant and important compound(s) in the body is/are:

- A. air.
- B. water.
- C. proteins.
- D. nucleic acids.

ANS: B                      DIF: Memorization  
TOP: Water

REF: Page 42

21. Approximately what percentage of body weight is water?

- A. 40%
- B. 50%
- C. 60%
- D. 70%

ANS: D                      DIF: Memorization  
TOP: Water

REF: Page 42

22.  $AB + CD \leftrightarrow AD + CB$  is an example of a(n):

- A. synthesis reaction.
- B. exchange reaction.
- C. decomposition reaction.
- D. reversible reaction.

ANS: B                      DIF: Application      REF: Page 41  
TOP: Chemical Reactions

23. Which of the following represent(s) properties of water?

- A. Cohesion
- B. High heat of vaporization
- C. Strong polarity
- D. All of the above

ANS: D                      DIF: Synthesis              REF: Page 43  
TOP: Properties of Water

24. The approximate pH of gastric fluid is:

- A. 10.
- B. 8.

- C. 4.
- D. 2.

ANS: D                    DIF: Memorization  
REF: Page 45 (Figure 2-15)                    TOP: The pH Scale

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

ANS: B                    DIF: Synthesis                    REF: Page 46  
TOP: Organic Molecules

26. The enzyme lactase catalyzes the chemical reaction that changes lactose to:
- A. glucose only.
  - B. glucose and fructose.
  - C. fructose and galactose.
  - D. glucose and galactose.

ANS: D                    DIF: Synthesis                    REF: Page 56 (Table 2-6)  
TOP: Proteins

27. Peptide bonds join together molecules of:
- A. glycerol.
  - B. glucose.
  - C. amino acids.
  - D. water.

ANS: C                    DIF: Application                    REF: Page 52                    TOP: Amino Acids

28. Vitamin D functions to:
- A. form retinol.
  - B. increase calcium uptake.
  - C. promote wound healing.
  - D. aid in the synthesis of blood clotting proteins.

ANS: B                    DIF: Application                    REF: Page 48 (Table 2-5)  
TOP: Lipids

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

ANS: B                    DIF: Application    REF: Page 46  
TOP: Organic Molecules

30. The simple sugars that are the building blocks for other carbohydrates are:  
A. disaccharides.  
B. monosaccharides.  
C. polysaccharides.

ANS: B                    DIF: Memorization                    REF: Page 48  
TOP: Carbohydrates

31. The element that is present in all proteins but not in carbohydrates is:  
A. carbon.  
B. hydrogen.  
C. oxygen.  
D. nitrogen.

ANS: D                    DIF: Synthesis                    REF: Page 46 | Page 52  
TOP: Carbohydrates and Proteins

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

ANS: D                    DIF: Synthesis                    REF: Page 42                    TOP:  
Anabolism

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

ANS: B                    DIF: Application    REF: Page 52                    TOP: Amino  
Acids

34. The basic building blocks of fats are:  
A. monosaccharides.  
B. disaccharides.  
C. amino acids.  
D. fatty acids and glycerol.

ANS: D                    DIF: Memorization                    REF: Page 48  
TOP: Triglycerides or Fats

35. A structural lipid found in the cell membrane is a:



- A. triglyceride.
- B. phospholipid.
- C. steroid.
- D. both B and C.

ANS: D                    DIF: Application    REF: Page 50  
TOP: Phospholipids and Steroids

36. DNA:
- A. is a single strand of nucleotides.
  - B. contains the sugar ribose.
  - C. is the heredity molecule.
  - D. transports amino acids during protein synthesis.

ANS: C                    DIF: Application    REF: Page 57 | Page 58  
TOP: Nucleic Acids

37. The study of metabolism includes examination of:
- A. catabolism.
  - B. anabolism.
  - C. ATP requirements.
  - D. all of the above.

ANS: D                    DIF: Memorization                    REF: Page 41  
TOP: Metabolism

38. The bonds that exist between phosphate groups of the ATP molecule are:
- A. hydrogen bonds.
  - B. high-energy bonds.
  - C. covalent bonds.
  - D. both B and C.

ANS: D                    DIF: Application    REF: Page 41 | Page 42  
TOP: Metabolism

39. The type of lipoprotein associated with cholesterol and the production of atherosclerotic changes in blood vessels is:
- A. HDL.
  - B. LDL.
  - C. VLDL.

ANS: B                    DIF: Memorization                    REF: Page 51  
(Box 2-2)  
TOP: Formation of Triglycerides

40. The type of lipid found in sex hormones is:
- A. triglycerides.
  - B. phosphoglycerides.
  - C. steroids.

D. prostaglandins.

ANS: C                    DIF: Application    REF: Page 50            TOP: Steroids

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

ANS: D                    DIF: Memorization                    REF: Page 57  
TOP: Nucleic Acids

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

ANS: B                    DIF: Application    REF: Page 35 (Table 2-1)  
TOP: Basic Chemistry

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

ANS: C                    DIF: Memorization                    REF: Page 36  
TOP: Atomic Structure

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

ANS: C                    DIF: Memorization                    REF: Page 36  
TOP: Energy Levels

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

ANS: A                    DIF: Synthesis            REF: Page 37            TOP: Energy Levels

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

ANS: C                      DIF: Application    REF: Page 38            TOP: Ionic Bonds

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

ANS: B                      DIF: Memorization                      REF: Page 38  
TOP: Covalent Bonds

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

ANS: A                      DIF: Memorization                      REF: Page 40  
TOP: Chemical Reactions

49. Proteins are composed of \_\_\_\_ commonly occurring amino acids.
- A. 10
  - B. 18
  - C. 20
  - D. 22

ANS: C                      DIF: Memorization                      REF: Page 52  
TOP: Proteins

50. Amino acids frequently become joined by:
- A. peptide bonds.
  - B. catabolic reactions.
  - C. atrophic reactions.
  - D. all of the above.

ANS: A                      DIF: Application    REF: Page 52            TOP: Amino Acids

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

- B. 69%
- C. 78%
- D. 96%

ANS: D                    DIF: Memorization  
TOP: Elements and Compounds

REF: Page 35

52. Which subatomic particles carry a charge?
- A. Protons and neutrons
  - B. Neutrons and electrons
  - C. Protons and electrons
  - D. Only neutrons carry a charge.

ANS: C                    DIF: Memorization  
TOP: Atomic Structure

REF: Page 36

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: Synthesis        REF: Page 36  
TOP: Atomic Number and Atomic Weight

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                    DIF: Application    REF: Page 38        TOP: Ionic  
Bonds

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 above.

ANS: D                    DIF: Application    REF: Page 39        TOP: 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 40  
TOP: Chemical Reactions

57. Electrolytes are:
- A. organic compounds.
  - B. called *cations* 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 44  
TOP: Electrolytes

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

ANS: A                    DIF: Application    REF: Page 44                    TOP: Acids and  
Bases

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

ANS: D                    DIF: Application    REF: Page 45                    TOP: Salts

60. Hydrolysis:
- A. joins compounds by removing a water molecule.
  - B. breaks down compounds by removing a water molecule.
  - C. joins compounds by adding a water molecule.
  - D. breaks down compounds by adding a water molecule.

ANS: C                    DIF: Memorization  
REF: Page 54 (Figure 2-27)                    TOP: Amino Acids

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

ANS: D                    DIF: Application    REF: Page 48 | Page 49  
TOP: Triglycerides or Fats

62. As the concentration of hydrogen ions ( $H^+$ ) increases, the:
- A. solution becomes more basic.

- B. solution becomes more acidic.
- C. pH rises.
- D. both A and C.

ANS: B                      DIF: Application    REF: Page 44            TOP: Acids and Bases

63. As the concentration of hydroxide ions ( $\text{OH}^-$ ) increases, the:
- A. solution becomes more basic.
  - B. solution becomes more acidic.
  - C. pH rises.
  - D. both A and C.

ANS: D                      DIF: Application    REF: Page 44            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 50  
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 36            TOP: Atomic Structure

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 37            TOP: Energy Levels

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 40  
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 O<sub>2</sub> 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 44  
TOP: Oxygen and Carbon Dioxide

69. A solution with a pH of 4 has:
- A. 10 times more H<sup>+</sup> ions than a solution with a pH of 6.
  - B. 10 times more OH<sup>-</sup> ions than a solution with a pH of 6.
  - C. 100 times more H<sup>+</sup> ions than a solution with a pH of 6.
  - D. 100 times more OH<sup>-</sup> ions than a solution with a pH of 6.

ANS: C                    DIF: Application    REF: Page 44            TOP: The pH  
Scale

70. The alpha helix is an example of which level of protein structure?
- A. Primary
  - B. Secondary
  - C. Tertiary
  - D. Quaternary

ANS: B                    DIF: Memorization                    REF: Page 54  
TOP: Levels of Protein Structure

71. Which of the following is not true of RNA?
- A. It contains ribose sugar.
  - B. It contains adenine.
  - C. It is composed of smaller molecules called *nucleotides*.
  - D. All of the above are true of RNA.

ANS: D                    DIF: Memorization                    REF: Page 57  
TOP: DNA and RNA

72. Which of the following is not true of all isotopes of oxygen?
- A. They can all react with two hydrogen atoms to form water.
  - B. They have the same number of protons.
  - C. They have the same atomic mass.
  - D. All of the above are true of isotopes of oxygen.

ANS: C                    DIF: Application    REF: Page 37            TOP: Isotopes

73. Hydrogen bonds are important in the attractive forces between:

- A. water molecules.
- B. large protein molecules.
- C. nucleic acids.
- D. All of the above are true.

ANS: D                      DIF: Memorization                      REF: Page 39 |  
Page 40  
TOP: Hydrogen Bonds

74. A strong acid:

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

ANS: B                      DIF: Application      REF: Page 44                      TOP: Acids

75. Which of the following is not a function of protein?

- A. Provides structure for the body
- B. Acts as a catalyst for chemical reactions
- C. Provides energy for the body
- D. All of the above are functions of protein

ANS: D                      DIF: Memorization                      REF: Page 52  
TOP: Proteins

76. Which level of protein structure refers to the number, kind, and sequence of amino acids?

- A. Primary
- B. Secondary
- C. Tertiary
- D. Quaternary

ANS: A                      DIF: Memorization                      REF: Page 54  
TOP: Levels of Protein Structure

77. Which level of protein structure is one that contains several polypeptide chains?

- A. Primary
- B. Secondary
- C. Tertiary
- D. Quaternary

ANS: D                      DIF: Memorization                      REF: Page 55  
TOP: Levels of Protein Structure

78. Which of the following is not true of both triglycerides and phospholipids?

- A. They both contain glycerol.



- B. They both contain fatty acids.
- C. They both contain a hydrophobic and hydrophilic end.
- D. All of the above are true of both triglycerides and phospholipids.

ANS: C                    DIF: Application    REF: Page 48 | Page 50  
TOP: Triglycerides and Phospholipids

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

ANS: B                    DIF: Application    REF: Page 50 | Page 51  
TOP: Steroids and Prostaglandins

80. Which energy-releasing or energy-transferring molecule does not contain a nucleotide?
- A. FAD
  - B. Creatine phosphate
  - C. NAD
  - D. ATP

ANS: B                    DIF: Memorization                    REF: Page 58 |  
Page 59  
TOP: Nucleotides and Related Molecules

81. The twisted, double-strand arrangement of nucleotides in a DNA molecule is a(n):
- A. deoxyribose.
  - B. double helix.
  - C. guanine.
  - D. uracil.

ANS: B                    DIF: Application    REF: Page 57            TOP: RNA and  
DNA

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

ANS: D                    DIF: Application    REF: Page 44            TOP: Bases

83. When sodium (Na) gives up an electron to chlorine, the result is the formation of a sodium ion ( $\text{Na}^+$ ) with a positive charge. This happens because there is then:
- A. one more proton (+) than electron (-).
  - B. one more electron (-) than proton (-).
  - C. one more proton (+) than neutron.

D. one more electron (–) than neutron.

ANS: A                    DIF: Application    REF: Page 38            TOP: Ionic  
Bonds

84. If an atom with nine (9) electrons was to ionically bond with an atom with three (3) electrons, what would occur?

- A. The atom with 9 electrons would share one of its electrons with the other atom.
- B. The atom with 9 electrons would lose one of its electrons, and the atom with three electrons would accept it.
- C. The atom with 9 electrons would accept one of the electrons from the atom with 3 electrons.
- D. The atom with 3 electrons would share one of its electrons with the other atom.

ANS: C                    DIF: Application    REF: Page 38            TOP: Ionic  
Bonds

85. The carbon-containing molecules formed by living things are often called:

- A. buffers.
- B. inorganic molecules.
- C. organic molecules.
- D. salts.

ANS: C                    DIF: Application    REF: Page 42  
TOP: Organic and Inorganic Compounds

86. The term that is used to describe all of the chemical reactions that occur in body cells is:

- A. catabolism.
- B. metabolism.
- C. synthesis.
- D. anabolism.

ANS: B                    DIF: Application    REF: Page 41            TOP:  
Metabolism

87. If your physician encourages you to take a daily aspirin, it is likely because aspirin can increase prostaglandin synthesis and play a:

- A. therapeutic role in preventing abnormal blood clots.
- B. therapeutic role in preventing abnormal blood clots.
- C. role in preventing the accumulation of cholesterol in the arteries.
- D. role in preventing the accumulation of cholesterol in the arteries.

ANS: A                    DIF: Application    REF: Page 51            TOP:  
Prostaglandin

88. When your body is building larger and more complex chemical molecules from smaller subunits, what is occurring?

- A. Anabolic reactions that expend energy

- B. Anabolic reactions that require energy
- C. Catabolic reactions that expend energy
- D. Catabolic reactions that require energy

ANS: B                    DIF: Application    REF: Page 42            TOP:  
Metabolism

## MATCHING

*Match each term to its corresponding descriptive phrase.*

- A. proton
- B. neutron
- C. electron
- D. isotopes
- E. ionic bonds
- F. covalent bonds
- G. Octet rule
- H. atomic number
- I. atomic weight
- J. hydrogen bonds

1. number of protons an atom has
2. subatomic particle with no charge
3. bond formed between atoms when they share electrons
4. subatomic particle with a positive charge
5. atoms with the same number of protons but a different number of neutrons
6. value determined by adding the number of protons and neutrons in an atom
7. bond that requires a polar molecule
8. subatomic particle that has a negative charge and is found in a “cloud” surrounding the nucleus of the atom
9. bond that is formed by the transfer of an electron from one atom to another
10. reaction of an atom that results in 8 electrons in the outer energy level

1. ANS: H                    DIF: Memorization                    REF: Page 36  
TOP: Atomic Number and Atomic Weight
2. ANS: B                    DIF: Memorization                    REF: Page 36  
TOP: Atomic Structure
3. ANS: F                    DIF: Memorization                    REF: Page 38  
TOP: Covalent Bonds
4. ANS: A                    DIF: Memorization                    REF: Page 36  
TOP: Atomic Structure
5. ANS: D                    DIF: Memorization                    REF: Page 37  
TOP: Isotopes
6. ANS: I                    DIF: Memorization                    REF: Page 36  
TOP: Atomic Number and Atomic Weight
7. ANS: J                    DIF: Memorization                    REF: Page 39

- TOP: Hydrogen Bonds
8. ANS: C                    DIF: Memorization                    REF: Page 36  
TOP: Atomic Structure
9. ANS: E                    DIF: Memorization                    REF: Page 38  
TOP: Ionic Bonds
10. ANS: G                    DIF: Memorization                    REF: Page 36 |  
Page 37  
TOP: Energy Levels

*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 sex 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 direct 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 48 |  
Page 49  
TOP: Triglycerides or Fats
12. ANS: A                    DIF: Memorization                    REF: Page 44  
TOP: Acids and Bases
13. ANS: E                    DIF: Memorization                    REF: Page 46  
TOP: Carbohydrates
14. ANS: B                    DIF: Memorization                    REF: Page 44  
TOP: Acids and Bases
15. ANS: G                    DIF: Memorization                    REF: Page 50  
TOP: Steroids
16. ANS: I                    DIF: Memorization                    REF: Page 50  
TOP: Prostaglandins

17. ANS: J                      DIF: Memorization                      REF: Page 41 |  
Page 42  
TOP: Metabolism
18. ANS: D                      DIF: Memorization                      REF: Page 57  
TOP: Nucleic Acids
19. ANS: H                      DIF: Memorization                      REF: Page 52  
TOP: Proteins
20. ANS: C                      DIF: Memorization                      REF: Page 57  
TOP: Nucleic Acids

### SHORT ANSWER

1. Describe the Bohr model of the atom.

ANS:

Answers will vary.

DIF: Memorization

REF: Page 36 | Page 37

TOP: Energy Levels

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

ANS:

Answers will vary.

DIF: Application    REF: Page 38 | Page 40

TOP: Covalent Bonds, Ionic or Electrovalent Bonds, Hydrogen Bonds

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

ANS:

Answers will vary.

DIF: Application    REF: Page 48 | Page 51

TOP: Lipids

4. Explain the different functions performed by RNA in the cell.

ANS:

Answers will vary.

DIF: Memorization

REF: Page 57 | Page 58

TOP: DNA and RNA

5. Explain the three types of chemical reactions discussed in this chapter and give the formula for each.

ANS:

Answers will vary.

DIF: Memorization

REF: Page 40 | Page 41

TOP: Chemical Reactions

6. Explain the body's reaction to a shortage of ATP as an energy source for the cell.

ANS:

Answers will vary.

DIF: Application REF: Page 58 | Page 59

TOP: Nucleotides and Related Molecules

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

ANS:

Answers will vary.

DIF: Application REF: Page 43 TOP: Properties of Water

8. Explain the role of buffers in maintaining the proper environment in which the body can function.

ANS:

Answers will vary

DIF: Application REF: Page 45 TOP: Buffers

### **OTHER**

1. Challenge: If one side of a DNA molecule is A-T-C-G-G-T-C-A-G, what would the bases be on the other side of the molecule?

ANS:

T-A-G-C-C-A-G-T-C

DIF: Synthesis REF: Page 57 | Page 58

TOP: Nucleic Acids

2. 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 56    TOP: Proteins