Chapter 02: Chemistry of Life

MULTIPLE CHOICE

1. Which of the following is not a subatomic particle that makes up the atom?
   a. Ion
   b. Proton
   c. Neutron
   d. Electron

   ANS: A DIF: Memorization REF: p. 23
   OBJ: 2 TOP: Atoms

2. The atomic number of an atom is equal to the number of
   a. electrons
   b. neutrons
   c. protons
   d. both b and c above

   ANS: C DIF: Memorization REF: p. 23
   OBJ: 2 TOP: Atoms

3. The atomic mass of an atom is equal to the number of
   a. electrons
   b. neutrons
   c. protons
   d. both b and c above

   ANS: D DIF: Memorization REF: p. 23
   OBJ: 2 TOP: Atoms

4. This subatomic particle is found in the nucleus of the atom.
   a. Electron
   b. Neutron
   c. Proton
   d. Both b and c above

   ANS: D DIF: Memorization REF: p. 23
   OBJ: 2 TOP: Atoms

5. This subatomic particle is found in orbitals around the nucleus of the atom.
   a. Electron
   b. Neutron
   c. Proton
   d. Both b and c above

   ANS: A DIF: Memorization REF: p. 24
   OBJ: 2 TOP: Atoms

6. This is not a characteristic of a proton:
   a. contributes to the atom’s atomic number
   b. contributes to the atom’s atomic mass

c. is located in the nucleus of the atom
d. carries a negative electrical charge

ANS: D DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

7. This is not a characteristic of a neutron:
a. contributes to the atom's atomic number
b. contributes to the atom's atomic mass
c. is located in the nucleus of the atom
d. has no electrical charge

ANS: A DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

8. This is not a characteristic of an electron:
a. is in an orbital around the nucleus of the atom
b. has a negative electrical charge
c. contributes to the atom's atomic number
d. all of the above are characteristics of an electron

ANS: C DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

9. A particular atom has 16 protons, 17 neutrons, and 16 electrons. The atomic number of this atom is
a. 49
b. 32
c. 33
d. 16

ANS: D DIF: Application REF: p. 23 OBJ: 2
TOP: Atoms

10. A particular atom has 16 protons, 17 neutrons, and 16 electrons. The atomic mass of this atom is
a. 49
b. 32
c. 33
d. 16

ANS: C DIF: Application REF: p. 23 OBJ: 2
TOP: Atoms

11. The second energy level of an atom
a. has four orbitals
b. can hold eight electrons
c. is a lower energy level then the first energy level
d. both a and b above

ANS: B DIF: Application REF: p. 24 OBJ: 2
TOP: Atoms

12. Compounds are
    a. pure substances
    b. made up of only one type of atom
    c. made up of two or more different types of atoms
    d. both a and b above

    ANS: C DIF: Memorization REF: p. 24
    OBJ: 1 TOP: Elements, molecules, and compounds

13. The formula for oxygen gas is O_2; this means it is
    a. made up of two atoms of oxygen
    b. a molecule
    c. a compound
    d. both a and b above

    ANS: D DIF: Application REF: p. 24 OBJ: 1
    TOP: Elements, molecules, and compounds

14. If an atom had 20 protons and 18 electrons, it would
    a. have a negative 2 charge
    b. have a plus 2 charge
    c. be attracted to a positively charged ion
    d. both a and c above

    ANS: B DIF: Application REF: p. 25 OBJ: 3
    TOP: Ionic bonds

15. Ionic bonds:
    a. usually dissolve easily in water
    b. produced ions when dissolved in water
    c. are formed by atoms of opposite charge
    d. all of the above

    ANS: D DIF: Memorization REF: p. 25
    OBJ: 3 TOP: Ionic bonds

16. Covalent bonds
    a. dissociate in water
    b. are formed when electrons are shared between atoms
    c. are formed by atoms of opposite charge
    d. both a and c above

    ANS: B DIF: Memorization REF: pp. 25-26
    OBJ: 3 TOP: Covalent bonds

17. Organic compounds must contain
    a. oxygen
    b. carbon–oxygen bonds
    c. hydrogen–oxygen bonds
    d. none of the above

    ANS: D DIF: Memorization REF: p. 27
    OBJ: 4 TOP: Inorganic chemistry

18. Which of the following is not true of water?
    a. Water is the most abundant organic compound in the body.
    b. Water is found both in and around the cells of the body.
    c. Water is the solvent in which most other compounds are dissolved.
    d. All of the above are true of water.

    ANS: A DIF: Memorization REF: p. 27
    OBJ: 5 TOP: Water

19. In a dehydration synthesis reaction:
    a. water is a reactant
    b. water is a product
    c. a large molecule is broken down into a smaller one
    d. both a and c above

    ANS: B DIF: Memorization REF: p. 27
    OBJ: 5 TOP: Water

20. In a dehydration synthesis reaction:
    a. hydrogen and oxygen are removed from the reactants
    b. water is added to the reactants
    c. water is broken down into hydrogen and oxygen
    d. both a and c above

    ANS: A DIF: Memorization REF: p. 27
    OBJ: 5 TOP: Water

21. In a hydrolysis reaction:
    a. water is a product
    b. water is a reactant
    c. water is broken down into hydrogen and oxygen
    d. the product is larger than either reactant

    ANS: B DIF: Memorization REF: p. 27
    OBJ: 5 TOP: Water

22. Which of the following statements is true?
    a. The process of hydrolysis is used to build a larger molecule from smaller molecules.
    b. Water is an end product of a hydrolysis reaction.
    c. The process of dehydration synthesis is used to build a larger molecule from smaller molecules.
    d. Water is a reactant in a dehydration synthesis reaction.

    ANS: C DIF: Memorization REF: p. 27
    OBJ: 5 TOP: Water

23. Which is not true of the following chemical equation? $K^+ + Cl^- \rightarrow KCl$
    a. The equation indicates that there are two reactants.
    b. The equation indicates that there is one product.
    c. The equation indicates that the reaction occurs in both directions equally.

d. All of the above are true.

ANS: C DIF: Memorization REF: p. 28
OBJ: 4 TOP: Inorganic chemistry

24. An acid
    a. has a pH greater than 7
    b. has a pH less than 7
    c. has more OH^- ions than H^+ ions in solution
    d. both a and c above

ANS: B DIF: Memorization REF: p. 28
OBJ: 6 TOP: Acids, bases, and salts

25. A base
    a. has a pH greater than 7
    b. has a pH less than 7
    c. has more OH^- ions than H^+ ions in solution
    d. both a and c above

ANS: D DIF: Memorization REF: p. 28
OBJ: 6 TOP: Acids, bases, and salts

26. A solution with a pH of 6
    a. is an acid
    b. is a base
    c. has 10 times more H^+ ions than a solution with a pH of 5
    d. both a and c above

ANS: A DIF: Memorization REF: p. 28
OBJ: 6 TOP: Acids, bases, and salts

27. A solution with a pH of 11
    a. is an acid
    b. is a base
    c. has 10 times more OH^- ions than a solution with a pH of 10
    d. both b and c above

ANS: D DIF: Memorization REF: p. 28
OBJ: 6 TOP: Acids, bases, and salts

28. When the body removes CO_2 by way of the respiratory system
    a. it lowers the pH of the blood
    b. it raises the pH of the blood
    c. it has no effect on pH because CO_2 is neither an acid nor a base
    d. it is acting as a buffer

ANS: B DIF: Memorization REF: p. 29
OBJ: 6 TOP: Acids, bases, and salts

29. If a strong acid were added to one container of pure water and an equal amount of a weak acid were added to a second container of pure water:
    a. the pH of both containers would go up equally

b. the pH of both containers would go down equally
c. the pH of the container with the strong acid would go up more than the container with the weak acid
d. none of the above

ANS: D DIF: Application REF: p. 28 OBJ: 6
TOP: Acids, bases, and salts

30. Which of the following is a monosaccharide?
a. Glucose
b. Sucrose
c. Lactose
d. Glucagon

ANS: A DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

31. Which of the following is a disaccharide?
a. Glucose
b. Sucrose
c. Starch
d. Glycogen

ANS: B DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

32. Which of the following is a polysaccharide?
a. Glucose
b. Lactose
c. Sucrose
d. Glycogen

ANS: D DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

33. Liver cells and muscle cells are able to store chains of glucose in a molecule called
a. glycogen
b. polyglucose
c. sucrose
d. lactose

ANS: A DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

34. Which of the following is not true of triglycerides?
a. A part of the molecule attracts water.
b. The molecule contains three fatty acids.
c. The molecule contains glycerol.
d. Triglycerides are used by the body to store energy.

ANS: A DIF: Memorization REF: p. 30
OBJ: 7 TOP: Lipids

35. Which of the following is not true of phospholipids?
    a. The molecule contains three fatty acids.
    b. The molecule has a water-attracting part.
    c. The molecule has a water-repelling part.
    d. It is important in the structure of the cell membrane.

    ANS: A DIF: Memorization REF: p. 30
    OBJ: 7 TOP: Lipids

36. Which of the following is not true of cholesterol?
    a. It is a steroid lipid.
    b. It helps stabilize the cell membrane.
    c. It contains only two fatty acids.
    d. It is the starting point for making the hormone estrogen.

    ANS: C DIF: Memorization REF: p. 31
    OBJ: 7 TOP: Lipids

37. This lipid can be found in the cell membrane
    a. triglycerides
    b. phospholipids
    c. cholesterol
    d. both b and c above

    ANS: D DIF: Memorization REF: p. 31
    OBJ: 7 TOP: Lipids

38. Which of the following is a structural protein?
    a. Hormones
    b. Collagen
    c. Growth factor
    d. Enzymes

    ANS: B DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Proteins

39. The “lock and key” model is use to describe the functioning of
    a. enzymes
    b. collagen molecules
    c. keratin molecules
    d. both a and c above

    ANS: A DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Proteins

40. Which of the following is not true of enzymes?
    a. They function on the lock and key model.
    b. They are functional proteins.
    c. They are catalysts.
    d. All of the above are true of enzymes.

    ANS: D DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Proteins

41. This molecule is found in DNA but not RNA
    a. guanine
    b. thymine
    c. uracil
    d. adenine

    ANS: B DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Nucleic acids

42. This molecule is found in DNA but not RNA
    a. adenine
    b. ribose sugar
    c. deoxyribose sugar
    d. phosphate

    ANS: C DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Nucleic acids

43. This molecule is found in RNA but not DNA
    a. guanine
    b. thymine
    c. uracil
    d. adenine

    ANS: C DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Nucleic acids

44. This molecule is found in RNA but not DNA
    a. ribose sugar
    b. deoxyribose sugar
    c. adenine
    d. cytosine

    ANS: A DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Nucleic acids

45. This subatomic particle does not contribute to the mass of an atom
    a. proton
    b. neutron
    c. electron
    d. all of the above particles contribute to the mass of an atom

    ANS: C DIF: Memorization REF: p. 23
    OBJ: 2 TOP: Atoms

46. The magnesium atom has two electrons in its outer energy level and is willing to donate both of them. The sodium atom has seven electrons in its outer energy level and will accept one electron. The chemical formula for the compound formed by magnesium and sodium would be
    a. Mg_2Na
    b. $MgNa_2$

c. Mg_2S
d. MgS_2

ANS: B DIF: Synthesis REF: pp. 25-26 OBJ: 3
TOP: Ionic bonds

47. Which of the following organs help maintain the proper pH of body fluids?
a. Kidneys by forming urine
b. Lungs by exhaling carbon dioxide
c. Spleen by filtering the blood
d. Both a and b above

ANS: D DIF: Memorization REF: p. 29
OBJ: 6 TOP: Acids, bases, and salts

48. Which of the following lipids do not contain fatty acids?
a. Phospholipids
b. Cholesterol
c. Triglycerides
d. Both a and b above

ANS: B DIF: Memorization REF: pp. 30-31
OBJ: 7 TOP: Lipids

49. Which of the following lipids are used as starting points in the making of hormones?
a. Phospholipids
b. Cholesterol
c. Triglycerides
d. Both b and c above

ANS: B DIF: Memorization REF: p. 31
OBJ: 7 TOP: Lipids

50. In an atom, each orbital can hold
a. one electron
b. two electrons
c. eight electrons
d. hydrogen can hold two and the rest of the atoms can hold eight

ANS: B DIF: Memorization REF: p. 24
OBJ: 2 TOP: Atoms

51. An isotope is an atom with
a. more protons than electrons
b. more electrons than protons
c. the same number of protons but different number of neutrons
d. either a or b above

ANS: C DIF: Memorization REF: p. 25
OBJ: 3 TOP: Clinical Application: Radioactive Isotopes

52. Which of the following carries a positive electrical charge?
a. Proton

b. Neutron
c. Electron
d. Both proton and neutron

ANS: A DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

53. Which of the following is found in the nucleus of the atom?
a. Proton
b. Neutron
c. Electron
d. Both proton and neutron

ANS: D DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

54. Which of the following is found in orbitals surrounding the nucleus of the atom?
a. Proton
b. Neutron
c. Electron
d. Both proton and neutron

ANS: C DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

55. Which of the following carries no electrical charge?
a. Proton
b. Neutron
c. Electron
d. Both proton and neutron

ANS: B DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

56. Which of the following contributes to the atom’s atomic mass?
a. Proton
b. Neutron
c. Electron
d. Both proton and neutron

ANS: D DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

57. Which of the following contributes to the atom’s atomic number?
a. Proton
b. Neutron
c. Electron
d. Both proton and neutron

ANS: A DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

58. Which of the following carries a negative electrical charge?

a. Proton
b. Neutron
c. Electron
d. Both proton and neutron

ANS: C DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

59. Which of the following contain three fatty acids and a molecule of glycerol?
a. Enzymes
b. Triglycerides
c. Phospholipids
d. All of the above

ANS: B DIF: Memorization REF: p. 29
OBJ: 7 TOP: Lipids

60. Which of the following is an example of a monosaccharide?
a. Glucose
b. Lactose
c. Glycogen
d. Starch

ANS: A DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

61. Which of the following has thymine as one of its nucleotides?
a. DNA
b. RNA
c. Both a and b above
d. Neither a nor b above

ANS: A DIF: Memorization REF: p. 32
OBJ: 7 TOP: Nucleic acids

62. Which of the following is a lipid with a water-attracting and water-repelling part of its molecule?
a. Triglycerides
b. Cholesterol
c. Phospholipids
d. None of the above

ANS: C DIF: Memorization REF: p. 30
OBJ: 7 TOP: Lipids

63. Which of the following is an example of a structural protein?
a. Enzymes
b. Collagen
c. Glycogen
d. None of the above

ANS: B DIF: Memorization REF: p. 32
OBJ: 7 TOP: Proteins

64. Which of the following is an example of a functional protein?
    a. Collagen
    b. Glycogen
    c. Enzymes
    d. None of the above

    ANS: C DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Proteins

65. Which of the following is a lipid that can be found along with cholesterol in the cell membrane?
    a. Triglycerides
    b. Phospholipids
    c. Both a and b above
    d. Neither a nor b above

    ANS: B DIF: Memorization REF: p. 30
    OBJ: 7 TOP: Lipids

66. Which of the following is a nucleic acid with a double helix structure?
    a. DNA
    b. RNA
    c. Both a and b above
    d. Neither a nor b above

    ANS: A DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Nucleic acids

67. Which of the following is a protein whose function is explained by the lock and key model?
    a. Collagen
    b. Glycogen
    c. Enzymes
    d. None of the above

    ANS: C DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Proteins

68. Which of the following has uracil as one of its nucleotides?
    a. DNA
    b. RNA
    c. Both a and b above
    d. Neither a nor b above

    ANS: B DIF: Memorization REF: p. 32
    OBJ: 7 TOP: Nucleic acids

69. Which of the following is an example of a disaccharide?
    a. Glucose
    b. Dextrose
    c. Glycogen
    d. Lactose

ANS: D DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

70. Which of the following is a starting substance for making the hormones estrogen and testosterone?
    a. Lactose
    b. Collagen
    c. DNA
    d. Cholesterol

ANS: D DIF: Memorization REF: p. 31
OBJ: 7 TOP: Lipids

71. Which of the following acts as a chemical catalyst?
    a. DNA
    b. RNA
    c. Enzymes
    d. Phospholipids

ANS: C DIF: Memorization REF: p. 32
OBJ: 7 TOP: Proteins

72. Which of the following is an example of a polysaccharide?
    a. Glucose
    b. Glycogen
    c. Dextrose
    d. Lactose

ANS: B DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

73. Which of the following is the steroid lipid?
    a. Cholesterol
    b. Triglycerides
    c. Enzymes
    d. Phospholipids

ANS: A DIF: Memorization REF: p. 31
OBJ: 7 TOP: Lipids

74. This element is not one of the elements that make up 96% of the body.
    a. Nitrogen
    b. Hydrogen
    c. Oxygen
    d. Sodium

ANS: D DIF: Memorization REF: p. 24
OBJ: 1 TOP: Elements, molecules, and compounds

75. This is a way the body can remove excess H^+ ions from the body
    a. excreting them in the urine
    b. exhaling CO_2 from the lungs
    c. using a buffer

d. all of the above can remove H^+ ions from the blood

ANS: D DIF: Memorization REF: p. 29
OBJ: 6 TOP: Acids, bases, and salts

76. This modified nucleotide plays an important role in energy-transfer in the body
a. adenosine triphosphate
b. enzymes
c. mRNA
d. glycoproteins

ANS: A DIF: Memorization REF: p. 33
OBJ: 7 TOP: Nucleic acids

77. Low blood pH results in a condition called
a. alkalosis
b. acidosis
c. atherosclerosis
d. hydrolysis

ANS: B DIF: Memorization REF: p. 29
OBJ: 6 TOP: Acids, bases, and salts

TRUE/FALSE

1. Matter can be defined as anything that occupies space and has mass.

ANS: T DIF: Memorization REF: p. 23
OBJ: 1 TOP: Levels of chemical organization

2. Atoms have never been seen by scientists, but their presence is strongly supported by the atomic theory.

ANS: F DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

3. The proton of the atom carries a positive electrical charge.

ANS: T DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

4. The proton of the atom is found in orbitals around the nucleus.

ANS: F DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

5. The proton of an atom is found in the nucleus.

ANS: T DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

6. An atom with 15 protons would have an atomic mass of 15.

ANS: F DIF: Application REF: p. 23 OBJ: 2
TOP: Atoms

7. An atom with 15 protons would have an atomic number of 15.

ANS: T DIF: Application REF: p. 23 OBJ: 2
TOP: Atoms

8. An atom with 15 protons and 15 electrons would have an atomic mass of 30.

ANS: F DIF: Application REF: p. 23 OBJ: 2
TOP: Atoms

9. An atom with 15 protons and 15 neutrons would have an atomic mass of 30.

ANS: T DIF: Application REF: p. 23 OBJ: 2
TOP: Atoms

10. Neutrons have no electrical charge.

ANS: T DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

11. Neutrons and electrons are found in the nucleus of the atom.

ANS: F DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

12. Neutrons contribute to the atomic number of an atom.

ANS: F DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

13. Neutrons contribute to the atomic mass of the atom.

ANS: T DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

14. Electrons carry a negative electrical charge.

ANS: T DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

15. The number of electrons plus the number of protons is equal to the atomic number of an atom.

ANS: F DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

16. All orbitals of an atom can hold two electrons.

ANS: T DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms

17. All energy levels of an atom can hold four orbitals.

ANS: F DIF: Memorization REF: p. 24
OBJ: 2 TOP: Atoms

18. All energy levels can hold eight electrons.

ANS: F DIF: Memorization REF: p. 24
OBJ: 2 TOP: Atoms

19. The first energy level of an atom can hold only two orbitals.

ANS: F DIF: Memorization REF: p. 24
OBJ: 2 TOP: Atoms

20. The first energy level of an atom is closest to the nucleus and is the lowest energy level.

ANS: T DIF: Memorization REF: p. 24
OBJ: 2 TOP: Atoms

21. The terms *energy level* and *electron orbital* are interchangeable.

ANS: F DIF: Memorization REF: p. 24
OBJ: 2 TOP: Atoms

22. Elements are pure substances.

ANS: T DIF: Memorization REF: p. 24
OBJ: 1 TOP: Elements, molecules, and compounds

23. The terms *molecule* and *compound* are interchangeable.

ANS: F DIF: Memorization REF: p. 24
OBJ: 1 TOP: Elements, molecules, and compounds

24. A formula of a compound tells you the number and types of elements that make up that compound.

ANS: T DIF: Memorization REF: p. 24
OBJ: 1 TOP: Elements, molecules, and compounds

25. The elements sodium, oxygen, hydrogen, and nitrogen make up 96% of the human body.

ANS: F DIF: Memorization REF: p. 24
OBJ: 1 TOP: Elements, molecules, and compounds

26. An atom is said to be chemically stable when its outer energy level is full.

ANS: T DIF: Memorization REF: p. 24
OBJ: 3 TOP: Chemical bonding

27. An atom with one more electron than proton would have a plus one charge.

ANS: F DIF: Application REF: p. 25 OBJ: 3
TOP: Ionic bonds

28. In order for an atom to be an ion, the number of electrons cannot equal the number of protons.

ANS: T DIF: Application REF: p. 25 OBJ: 3
TOP: Ionic bonds

29. When ionic compounds dissolve in water, they tend to dissociate into ions.

ANS: T DIF: Memorization REF: p. 25
OBJ: 3 TOP: Ionic bonds

30. The ions that are dissolved in water are called electrolytes.

ANS: T DIF: Memorization REF: p. 25
OBJ: 3 TOP: Ionic bonds

31. The symbol for a sodium atom that has lost one electron would be Na.

ANS: F DIF: Application REF: p. 25 OBJ: 3
TOP: Ionic bonds

32. The symbol for a sodium atom that has lost one electron would be Na^+.

ANS: T DIF: Application REF: p. 25 OBJ: 3
TOP: Ionic bonds

33. Atom X has eight electrons, two in its first energy level and six in its second energy level. It would most likely form an ion with a plus two charge.

ANS: F DIF: Synthesis REF: p. 25 OBJ: 3
TOP: Ionic bonds

34. Covalent bonds do not usually dissociate in water.

ANS: T DIF: Memorization REF: p. 26
OBJ: 3 TOP: Covalent bonds

35. Covalent bonds dissociate into ions when dissolved in water.

ANS: F DIF: Memorization REF: p. 26
OBJ: 3 TOP: Covalent bonds

36. All compounds in the human body are, by definition, organic compounds.

ANS: F DIF: Memorization REF: p. 27
OBJ: 4 TOP: Inorganic chemistry

37. Organic compounds must have either a C–C or C–H bond.

ANS: T DIF: Memorization REF: p. 27
OBJ: 4 TOP: Inorganic chemistry

38. Water is an inorganic compound.

ANS: T DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

39. Aqueous solutions have water as the solvent.

ANS: T DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

40. In a dehydration synthesis reaction, water is always a reactant.

ANS: F DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

41. In a dehydration synthesis reaction, water is always a product.

ANS: T DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

42. In dehydration synthesis reaction, smaller reactants are joined to form a larger product.

ANS: T DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

43. In the process of hydrolysis, a molecule of water is broken down to hydrogen and oxygen.

ANS: F DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

44. In hydrolysis, water is used to break the bonds of a larger molecule and convert it to smaller molecules.

ANS: T DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

45. In a hydrolysis reaction, water is always an end product.

ANS: F DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

46. Hydrolysis is virtually the reverse of a dehydration synthesis reaction.

ANS: T DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

47. Acids produce an excess of H^+ ions.

ANS: T DIF: Memorization REF: p. 28

OBJ: 6 TOP: Acids, bases, and salts

48. Bases produce an excess of OH^- ions.

ANS: T DIF: Memorization REF: p. 28
OBJ: 6 TOP: Acids, bases, and salts

49. An increase in H^+ ions will cause an increase in the pH value.

ANS: F DIF: Memorization REF: p. 28
OBJ: 6 TOP: Acids, bases, and salts

50. An increase in pH value would mean more H^+ ions are in solution.

ANS: F DIF: Application REF: p. 28 OBJ: 6
TOP: Acids, bases, and salts

51. A solution with a pH of 4 has 100 times more H^+ ions than a solution with a pH of 2.

ANS: F DIF: Application REF: p. 28 OBJ: 6
TOP: Acids, bases, and salts

52. A solution with a pH of 3 has 10 times more H^+ ions than a solution with a pH of 4.

ANS: T DIF: Application REF: p. 28 OBJ: 6
TOP: Acids, bases, and salts

53. A solution that has a greater concentration of OH^- ions than H^+ ions would be called a base.

ANS: T DIF: Memorization REF: p. 28
OBJ: 6 TOP: Acids, bases, and salts

54. A strong acid added to a solution would raise the pH more than the same amount of a weak acid added to the solution.

ANS: F DIF: Application REF: p. 28 OBJ: 6
TOP: Acids, bases, and salts

55. When a neutralization reaction occurs between a strong acid and base, one of the end products is water.

ANS: T DIF: Memorization REF: p. 29
OBJ: 6 TOP: Acids, bases, and salts

56. A buffer is a chemical that helps prevent a sudden change in pH.

ANS: T DIF: Memorization REF: p. 29
OBJ: 6 TOP: Acids, bases, and salts

57. The word *carbohydrate* literally means “sugar.”

ANS: F DIF: Memorization REF: p. 29

OBJ: 7 TOP: Carbohydrates

58. Both sucrose and lactose are monosaccharides.

ANS: F DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

59. Glucose is used by the body as a source of energy.

ANS: T DIF: Memorization REF: p. 29
OBJ: 7 TOP: Carbohydrates

60. Both sucrose and lactose are disaccharides.

ANS: T DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

61. A molecule of glycogen contains more saccharide units than a molecule of sucrose.

ANS: T DIF: Application REF: p. 30 OBJ: 7
TOP: Carbohydrates

62. A molecule of glucose has more saccharide units than a molecule of lactose.

ANS: F DIF: Application REF: p. 30 OBJ: 7
TOP: Carbohydrates

63. Muscles store chains of glucose in a molecule called dextrose.

ANS: F DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

64. Glycogen and starch are both polysaccharides.

ANS: T DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

65. Cholesterol is an important source of energy for the body.

ANS: F DIF: Memorization REF: p. 30
OBJ: 7 TOP: Lipids

66. Phospholipids and triglycerides both contain fatty acids.

ANS: T DIF: Memorization REF: p. 30
OBJ: 7 TOP: Lipids

67. Phospholipids and triglycerides both have parts of their molecules that attract water.

ANS: F DIF: Memorization REF: p. 30
OBJ: 7 TOP: Lipids

68. Phospholipids are the starting substance for several steroid hormones in the body.

ANS: F DIF: Memorization REF: p. 31
OBJ: 7 TOP: Lipids

69. Both phospholipids and cholesterol are structural components of the cell membrane.

ANS: T DIF: Memorization REF: pp. 30-31
OBJ: 7 TOP: Lipids

70. Both phospholipids and cholesterol are steroid lipids.

ANS: F DIF: Memorization REF: p. 31
OBJ: 7 TOP: Lipids

71. The bonds that join amino acids together to form a protein are called peptide bonds.

ANS: T DIF: Memorization REF: p. 31
OBJ: 7 TOP: Proteins

72. The functional proteins in the body include hormones, collagen, and cell membrane receptors.

ANS: F DIF: Memorization REF: p. 32
OBJ: 7 TOP: Proteins

73. The shape of proteins determines their role in body chemistry.

ANS: T DIF: Memorization REF: p. 32
OBJ: 7 TOP: Proteins

74. The basic building blocks of nucleic acids are nucleotides.

ANS: T DIF: Memorization REF: p. 32
OBJ: 7 TOP: Nucleic acids

75. Both DNA and RNA contain uracil.

ANS: F DIF: Memorization REF: p. 32
OBJ: 7 TOP: Nucleic acids

76. Both DNA and RNA contain a sugar molecule as part of their structure.

ANS: T DIF: Application REF: p. 32 OBJ: 7
TOP: Nucleic acids

77. Both DNA and RNA have a double helix structure.

ANS: F DIF: Memorization REF: p. 32
OBJ: 7 TOP: Nucleic acids

78. DNA is the “master code” for making proteins.

ANS: T DIF: Memorization REF: p. 32
OBJ: 7 TOP: Nucleic acids

79. LDLs have a high concentration of protein and low concentration of lipid.

ANS: F DIF: Memorization REF: p. 31
OBJ: 7 TOP: Clinical Application: Blood Lipoproteins

80. HDL is sometimes called the “bad” cholesterol.

ANS: F DIF: Memorization REF: p. 31
OBJ: 7 TOP: Clinical Application: Blood Lipoproteins

81. LDL is sometimes called the “bad” cholesterol.

ANS: T DIF: Memorization REF: p. 31
OBJ: 7 TOP: Clinical Application: Blood Lipoproteins

82. High levels of LDL are associated with the development of atherosclerosis.

ANS: T DIF: Memorization REF: p. 31
OBJ: 7 TOP: Clinical Application: Blood Lipoproteins

83. An atom’s mass number is usually greater than its atomic number.

ANS: T DIF: Application REF: p. 23 OBJ: 2
TOP: Atoms

84. An atom’s atomic number is usually greater than its mass number.

ANS: F DIF: Application REF: p. 23 OBJ: 2
TOP: Atoms

85. Electrons move in an elliptical orbit rather than a circular orbit around the nucleus.

ANS: F DIF: Memorization REF: pp. 23-24
OBJ: 2 TOP: Atoms

86. An electron in the third energy level is closer to the nucleus than an electron in the second energy level.

ANS: F DIF: Memorization REF: p. 24
OBJ: 2 TOP: Atoms

87. All compounds are molecules, but not all molecules are compounds.

ANS: T DIF: Application REF: p. 24 OBJ: 1
TOP: Elements, molecules, and compounds

88. The bond between carbon and hydrogen in an organic compound is an example of a covalent bond.

ANS: T DIF: Memorization REF: p. 26
OBJ: 4 TOP: Inorganic chemistry

89. Water is the most abundant solute in the body.

ANS: F DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

90. Chemical bonds can store potential chemical energy.

ANS: T DIF: Memorization REF: pp. 27-28
OBJ: 3 TOP: Water

91. The primary source of energy used by the body is a carbohydrate.

ANS: T DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates

92. The only group of organic compounds that contains sugar is the carbohydrates.

ANS: F DIF: Application REF: p. 30 OBJ: 7
TOP: Carbohydrates | Nucleic acids

93. Adenosine triphosphate is a modified nucleotide that is important in energy transfer in the body.

ANS: T DIF: Memorization REF: p. 30
OBJ: 7 TOP: Nucleic acids

94. If blood pH tests indicate that your blood pH is high, you are suffering from alkalosis.

ANS: T DIF: Application REF: p. 29 OBJ: 6
TOP: Acids, bases, and salts

MATCHING

Match the name of the element with the correct symbol.

a. Potassium
b. Phosphorus
c. Sodium
d. Calcium
e. Carbon
f. Hydrogen
g. Chlorine
h. Nitrogen

1. C
2. Ca
3. Cl
4. H
5. Na
6. P
7. K

8. N

1. ANS: E DIF: Memorization REF: p. 26
   OBJ: 1 TOP: Elements, molecules, and compounds
2. ANS: D DIF: Memorization REF: p. 26
   OBJ: 1 TOP: Elements, molecules, and compounds
3. ANS: G DIF: Memorization REF: p. 26
   OBJ: 1 TOP: Elements, molecules, and compounds
4. ANS: F DIF: Memorization REF: p. 26
   OBJ: 1 TOP: Elements, molecules, and compounds
5. ANS: C DIF: Memorization REF: p. 26
   OBJ: 1 TOP: Elements, molecules, and compounds
6. ANS: B DIF: Memorization REF: p. 26
   OBJ: 1 TOP: Elements, molecules, and compounds
7. ANS: A DIF: Memorization REF: p. 26
   OBJ: 1 TOP: Elements, molecules, and compounds
8. ANS: H DIF: Memorization REF: p. 26
   OBJ: 1 TOP: Elements, molecules, and compounds

Match the term with its definition or explanation.

a. Proton
b. Electron
c. Neutron
d. Atomic mass
e. Atomic number
f. Element
g. Compound
h. Hydrolysis
i. Acid
j. Base
k. Covalent bond
l. Ionic bond
m. Water
n. Buffer
o. Electrolytes
p. Dehydration synthesis

9. A process where a molecule of water is used to make large compounds smaller
10. A substance composed of more than one type of element
11. When an ionic compound dissociates in water it forms these
12. Bond formed by the attraction of opposite charges
13. A subatomic particle with a positive charge
14. The most important inorganic compound in the body
15. A substance that resists a change in pH
16. A subatomic particle with a negative charge
17. The sum of the protons and neutrons in an atom
18. The number of protons in an atom
19. A pure substance made up of only one kind of atom
20. A subatomic particle with no charge

21. A substance that increases the concentration of H^+ ions in a solution
22. A bond formed when electrons are shared
23. A substance that increases the concentration of OH^- ions in a solution
24. A process where a molecule of water is removed to make two small molecules into one larger molecule

9. ANS: H DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water
10. ANS: G DIF: Memorization REF: p. 24
OBJ: 1 TOP: Elements, molecules, and compounds
11. ANS: O DIF: Memorization REF: p. 25
OBJ: 3 TOP: Ionic bonds
12. ANS: L DIF: Memorization REF: p. 26
OBJ: 3 TOP: Ionic bonds
13. ANS: A DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms
14. ANS: M DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water
15. ANS: N DIF: Memorization REF: p. 29
OBJ: 6 TOP: Acids, bases, and salts
16. ANS: B DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms
17. ANS: D DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms
18. ANS: E DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms
19. ANS: F DIF: Memorization REF: p. 24
OBJ: 1 TOP: Elements, molecules, and compounds
20. ANS: C DIF: Memorization REF: p. 23
OBJ: 2 TOP: Atoms
21. ANS: I DIF: Memorization REF: p. 28
OBJ: 6 TOP: Acids, bases, and salts
22. ANS: K DIF: Memorization REF: p. 25
OBJ: 3 TOP: Covalent bonds
23. ANS: J DIF: Memorization REF: p. 28
OBJ: 6 TOP: Acids, bases, and salts
24. ANS: P DIF: Memorization REF: p. 27
OBJ: 5 TOP: Water

Match the term with the definition or explanation.

a. Glucose
b. Enzyme
c. Triglyceride
d. Glycogen
e. Cholesterol
f. Adenosine triphosphate
g. RNA
h. Phospholipids
i. Collagen
j. DNA

25. This is an example of a functional protein.
26. This nucleic acid has thymine as one of its nitrogen bases.
27. This lipid has a side that attracts water and another side that repels water and is important in formation of cell membranes.
28. This is the monosaccharide that the body prefers for its source of energy.
29. This is an example of a structural protein.
30. This nucleic acid has uracil as one of its nitrogen bases.
31. This lipid is made up of a molecule of glycerol and three fatty acids.
32. This is a special type of nucleotide that is used to transfer energy in the body.
33. This is a lipid that is used in the making of a number of hormones in the body.
34. This is the polysaccharide that the human body stores for energy.

25. ANS: B DIF: Memorization REF: p. 32
OBJ: 7 TOP: Proteins
26. ANS: J DIF: Memorization REF: p. 32
OBJ: 7 TOP: Nucleic acids
27. ANS: H DIF: Memorization REF: p. 30
OBJ: 7 TOP: Lipids
28. ANS: A DIF: Memorization REF: p. 30
OBJ: 7 TOP: Carbohydrates
29. ANS: I DIF: Memorization REF: p. 32
OBJ: 7 TOP: Protein
30. ANS: G DIF: Memorization REF: p. 32
OBJ: 7 TOP: Nucleic acids
31. ANS: C DIF: Memorization REF: p. 30
OBJ: 7 TOP: Lipids
32. ANS: F DIF: Memorization REF: p. 33
OBJ: 7 TOP: Nucleic acids
33. ANS: E DIF: Memorization REF: p. 31
OBJ: 7 TOP: Lipids
34. ANS: D DIF: Memorization REF: p. 29
OBJ: 7 TOP: Carbohydrates

ESSAY

1. Briefly describe the structure of the atom.

   ANS:
   (Answers may vary)

   DIF: Memorization REF: p. 23 OBJ: 2
   TOP: Atoms

2. A particular atom contains 28 protons, 28 electrons, and 31 neutrons. What is its atomic mass? What is its atomic number?

   ANS:
   (Answers may vary)

   DIF: Synthesis REF: p. 23 OBJ: 2 TOP: Atoms

3. Distinguish among an element, a molecule, and a compound.

   ANS:
   (Answers may vary)

   DIF: Memorization REF: p. 24 OBJ: 1
   TOP: Elements, molecules, and compounds

4. Write the correct chemical formula for a substance containing four atoms of chlorine and one atom of carbon.

   ANS:
   (Answers may vary)

   DIF: Synthesis REF: p. 24 OBJ: 1
   TOP: Elements, molecules, and compounds

5. Assume an atom of element X has two electrons in its outermost energy level. Two atoms of element Y each have seven electrons in their outermost energy level (eight is stable). Explain how an ionic bond would form among these three atoms and give the formula for the compound.

   ANS:
   (Answers may vary)

   DIF: Synthesis REF: p. 25 OBJ: 3 TOP: Atoms, Ionic bonds

6. Explain the relationship between the number of H^+ ions in solution and the pH value.

   ANS:
   (Answers may vary)

   DIF: Application REF: p. 28 OBJ: 6 TOP: Acids, bases, and salts

7. Describe the three ways in which the body can regulate the removal of H^+ ions or a sudden change in pH.

   ANS:
   (Answers may vary)

   DIF: Memorization REF: p. 29 OBJ: 6
   TOP: Acids, bases, and salts

8. List the three types of lipids in the body and describe the structure and function of each.

   ANS:
   (Answers may vary)

   DIF: Memorization REF: pp. 30-31 OBJ: 7
   TOP: Lipids

9. Differentiate between DNA and RNA in terms of structure and function.

   ANS:
   (Answers may vary)

   DIF: Application REF: p. 29 OBJ: 7 TOP: Nucleic acids

10. Describe the two different types of lipoproteins in the blood. Explain their possible impact on health.

    ANS:
    (Answers may vary)

    DIF: Memorization REF: p. 31 OBJ: 7
    TOP: Clinical Application: Blood Lipoproteins

11. Explain the difference between structural and functional proteins. Give an example of each.

    ANS:
    (Answers may vary)

    DIF: Memorization REF: p. 32 OBJ: 7
    TOP: Proteins

12. Describe the types of carbohydrates. What are the two large molecules that can store carbohydrates?

    ANS:
    (Answers may vary)

    DIF: Memorization REF: pp. 29-30 OBJ: 7
    TOP: Carbohydrates