

chapter 02

True / False Questions

1. Minerals are organic elements extracted from the soil by plants.
True False
2. Molecules composed of two or more atoms are called compounds.
True False
3. Hydrogen, deuterium, and tritium are three isotopes of hydrogen.
True False
4. Potassium, sodium, and chlorine are trace elements.
True False
5. Ionic bonds break apart in water more easily than covalent bonds do.
True False
6. A solution is a mixture composed of two or more substances that are physically blended but not chemically combined.
True False
7. Blood pH is approximately 7.4, which is slightly acidic.
True False
8. The high heat capacity of water makes it a very ineffective coolant.
True False
9. In an exchange reaction, covalent bonds are broken and new covalent bonds are formed.
True False
10. All the chemical reactions in which larger molecules are broken down to smaller ones are called catabolic reactions.
True False
11. The opposite of a dehydration synthesis is a hydrolysis.
True False
12. Unsaturated fatty acids have as much hydrogen as they can carry.
True False
13. A dipeptide is a molecule with two peptide bonds.
True False
14. All amino acids have both a carboxyl group and an amino group attached to a central carbon.
True False
15. ATP is the body's most important form of long-term energy storage.
True False

Multiple Choice Questions

16. The most abundant element in the human body, by weight, is
- nitrogen.
 - hydrogen.
 - carbon.
 - oxygen.
 - calcium.
17. Sodium has an atomic number of 11 and an atomic mass of 23. Sodium has
- 12 neutrons and 11 protons.
 - 12 protons and 11 neutrons.
 - 12 electrons and 11 neutrons.
 - 12 protons and 11 electrons.
 - 12 electrons and 11 protons.
18. The chemical properties of an atom are determined by its
- protons.
 - electrons.
 - neutrons.
 - protons and neutrons.
 - particles.
19. Sodium, which has an atomic number of 11, will react with chlorine, which has an atomic number of 17. When these two atoms react, both become stable. To become stable, sodium will _____, while chlorine will _____.
- accept one electron; give up one electron
 - give up one proton; accept one proton
 - share one electron with chlorine; share one electron with sodium
 - become an anion; become a cation
 - give up one electron; accept one electron
20. Consider oxygen, which has an atomic number of 8 and an atomic mass of 16. How many valence electrons does it have?
- 2
 - 4
 - 6
 - 8
 - 16
21. Oxygen has an atomic number of eight. When two oxygen atoms come together, they form a(n) _____ bond.
- hydrogen
 - nonpolar covalent
 - polar covalent
 - ionic
 - Van der Waals
22. When table salt, sodium chloride (NaCl), is placed in water
- Na^+ and Cl^- form ionic bonds with each other.
 - Na^+ and Cl^- form polar covalent bonds with each other.
 - Na^+ and Cl^- form hydrogen bonds with water.
 - Ionic bonds between Na^+ and Cl^- are broken.
 - Na^+ and Cl^- become separated by their Van der Waals forces.
23. The bonding properties of an atom are determined by its
- electrons.
 - protons.
 - positrons.
 - neutrons.
 - photons.

24. What type of bond attracts one water molecule to another?
- an ionic bond
 - a peptide bond
 - a hydrogen bond
 - a covalent bond
 - a hydrolytic bond
25. Which of these is a cation?
- O₂
 - K
 - Na
 - Ca²⁺
 - Cl⁻
26. _____ account for 98.5% of the body's weight.
- Carbon, oxygen, hydrogen, sodium, potassium, and chlorine
 - Carbon, oxygen, iron, sodium, potassium, and chlorine
 - Carbon, nitrogen, hydrogen, sodium, potassium, and chlorine
 - Carbon, oxygen, hydrogen, nitrogen, sodium, and potassium
 - Carbon, oxygen, hydrogen, nitrogen, calcium, and phosphorus
27. Varieties of elements called _____ differ from one another only in number of neutrons and therefore in atomic mass.
- cations
 - anions
 - isotopes
 - electrolytes
 - free radicals
28. When you jump off a high diving board into water, you notice great resistance of water. This resistance is called _____ and is caused by water's great _____.
- surface tension; adhesiveness
 - surface tension; cohesiveness
 - hydrophobic tension; adhesiveness
 - hydrophilic tension; cohesiveness
 - hydrophilic tension; adhesiveness
29. Which of these is hydrophobic?
- sugar
 - K⁺
 - Cl⁻
 - water
 - fat
30. Consider a mixture of blood, which contains sodium chloride, protein, and cells or formed elements. The sodium chloride is in a(n) _____, the protein is in a(n) _____, and the cells are in a _____.
- emulsion; solution; suspension
 - solvent; emulsion; colloid
 - colloid; suspension; solution
 - suspension; colloid; solution
 - solution; colloid; suspension
31. Which of these is the most appropriate to express number of molecules per volume?
- molarity
 - volume
 - percentage
 - weight per volume
 - milliequivalents per liter

32. A solution with pH 4 has _____ the H^+ concentration of a solution with pH 8.
- $\frac{1}{2}$
 - twice
 - 4 times
 - 10,000 times
 - $\frac{1}{10,000}$
33. Which of these has the highest H^+ concentration?
- lemon juice, pH = 2.3
 - red wine, pH = 3.2
 - tomato juice, pH = 4.7
 - saliva, pH = 6.6
 - household ammonia, pH = 10.8
34. Blood has a pH ranging from 7.35 to 7.45. Slight deviations from this can cause major problems, even death. You are doing an intense workout, and your skeletal muscle cells are producing metabolic acids such as lactic acid. Your blood pH does not drop significantly in spite of the metabolic acids released into the blood. You maintain a constant blood pH because
- metabolic acids are neutralized in muscle cells before released into the blood.
 - metabolic bases are produced at the same rate by muscle cells to neutralize the acids.
 - the respiratory system removes excess H^+ from the blood before the pH is lowered.
 - the body contains chemicals called buffers that resist changes in pH.
 - endothelial cells secrete excess H^+ to prevent a decrease in pH.
35. A solution that resists a change in pH when acid or base is added to it is
- a buffer.
 - a catalyst.
 - a reducing agent.
 - an oxidizing agent.
 - a colloid.
36. Any chemical reaction that removes electrons from an atom is called
- reduction.
 - condensation.
 - hydrolysis.
 - anabolism.
 - oxidation.
37. The most relevant free energy in human physiology is the energy stored in
- electrolytes ionized in water.
 - free radicals with an odd number of electrons.
 - radioisotopes.
 - the chemical bonds of organic molecules.
 - Van der Waals forces.
38. The breakdown of glycogen (an energy-storage compound) is an example of a(n) _____ reaction.
- exergonic
 - endergonic
 - exchange
 - synthesis
 - equilibrium
39. When ATP breaks down to ADP, potential energy stored in bonds is released. This energy stored in bonds is _____ energy.
- electromagnetic
 - electrical
 - chemical
 - heat
 - kinetic

40. Glucose is broken down in most of your cells to form carbon dioxide, oxygen, and the energy currency of the cell called ATP. What type of chemical reaction is this?
- anabolic or endergonic
 - catabolic or exergonic
 - anabolic or exergonic
 - catabolic or endergonic
 - anabolic or exothermic
41. Which one of the following would *not* increase the rate of a reaction?
- reactants being more concentrated
 - rise in temperature
 - presence of a catalyst
 - presence of an enzyme
 - decrease in reactant concentrations
42. Which of the following words includes all of the other terms?
- catabolism
 - anabolism
 - metabolism
 - oxidative reactions
 - reductive reactions
43. Digestive enzymes breakdown the starch in a potato into thousands of glucose molecules. This exemplifies a(n) _____ reaction.
- synthesis
 - decomposition
 - exchange
 - anabolic
 - reductive
44. Which of the following equations depicts an exchange reaction?
- $AB \rightarrow A + B$
 - $A + B \rightarrow AB$
 - $AB + CD \rightarrow AC + BD$
 - $AB \rightarrow A^- + B^+$
 - $A + B \rightarrow AB \rightarrow C + D$
45. A(n) _____ is a group of atoms that determines many of the properties of an organic molecule.
- carboxyl group
 - functional group
 - hydroxyl group
 - amino group
 - phosphate group
46. _____ is *not* an organic compound.
- $C_{16}H_{18}N_3ClS$
 - $Na_2HPO_3(H_2O)_5$
 - CH_4
 - $C_3H_7O_2N$
47. A _____ converts a _____ to its monomers.
- hydrolysis; polymer
 - dehydration synthesis; molecule
 - dehydration synthesis; polymer
 - polymer; molecule
 - condensation; reactant

48. The formula for an amino group is _____ whereas the formula of a carboxyl group is _____
- A. -COOH; -OH.
 - B. -CH₃; -NH₂.
 - C. -OH; -SH.
 - D. -NH₂; -COOH.
 - E. -SH; -H₂PO₄.
49. Table sugar is a disaccharide called _____ and is made up of the monomer(s) _____.
- A. maltose; glucose
 - B. sucrose; glucose and fructose
 - C. lactose; glucose and galactose
 - D. glycogen; glucose
 - E. glucose; galactose and fructose
50. Which of the following is a disaccharide?
- A. galactose
 - B. lactose
 - C. glucose
 - D. fructose
 - E. amylose
51. _____ is a monosaccharide, whereas _____ is a polysaccharide.
- A. Fructose; sucrose
 - B. Galactose; maltose
 - C. Lactose; glycogen
 - D. Glucose; starch
 - E. Cellulose; glucose
52. In general, _____ have a 2:1 ratio of hydrogen to oxygen.
- A. enzymes
 - B. proteins
 - C. lipids
 - D. carbohydrates
 - E. nucleic acids
53. Proteoglycans are macromolecules that form gels, which help hold cells and tissues together, lubricate joints, and account for the tough rubbery texture of cartilage. Proteoglycans are composed of
- A. carbohydrates and fats.
 - B. nucleic acids and fats.
 - C. carbohydrates and proteins.
 - D. proteins and fats.
 - E. nucleic acids and proteins.
54. Triglycerides are molecules consisting of one 3-carbon compound called _____ bound to three _____.
- A. eicosanoid; fatty acids
 - B. steroid; glycerols
 - C. eicosanoid; steroid
 - D. glycerol; fatty acids
 - E. steroid; fatty acids
55. _____ are major components of cell membranes, and are said to be _____.
- A. Triglycerides; hydrophobic
 - B. Steroids; hydrophilic
 - C. Bile acids; fat-soluble
 - D. Eicosanoids; water-soluble
 - E. Phospholipids; amphiphilic

56. Which of these is (are) always hydrophobic?
- A. glucose
 - B. cholesterol
 - C. amino acids
 - D. proteins
 - E. disaccharides
57. Proteins can serve all of the following functions *except*
- A. catalyze metabolic reactions.
 - B. give structural strength to cells and tissues.
 - C. produce muscular and other forms of movement.
 - D. regulate transport of solutes into and out of cells.
 - E. store hereditary information.
58. A drastic conformational change in proteins in response to conditions such as extreme heat or pH will lead to loss of a protein's function. This drastic change in three-dimensional shape is called
- A. contamination.
 - B. denaturation.
 - C. saturation.
 - D. sedimentation.
 - E. deconformation.
59. Proteins are _____ built from _____ different amino acids.
- A. monomers; 10
 - B. molecules; 10
 - C. polymers; 20
 - D. macromolecules; 40
 - E. polypeptides; 80
60. The folding and coiling of proteins into globular and fibrous shapes determines the _____ structure of the protein.
- A. primary
 - B. secondary
 - C. tertiary
 - D. quaternary
 - E. denatured
61. Enzymes are specific to substrates because of the shape of their
- A. active sites.
 - B. receptors.
 - C. secondary structure.
 - D. terminal amino acids.
 - E. alpha chain.
62. _____ is the substrate of _____.
- A. Glucose; lactose
 - B. Lactase; glucose
 - C. Lactose; lactase
 - D. Galactose; lactose
 - E. Sucrase; sucrose
63. All enzymes are _____, but not all of those are enzymes.
- A. cofactors
 - B. proteins
 - C. lipids
 - D. carbohydrates
 - E. nucleic acids

64. Nucleic acids are _____ of _____.
- A. molecules; monosaccharides
 - B. monomers; ATP
 - C. polymers; nucleotides
 - D. polymers; cAMP
 - E. polymers; DNA
65. ATP _____ endergonic and exergonic reactions.
- A. opposes
 - B. decomposes
 - C. reduces
 - D. links
 - E. dehydrates

chapter 02 Key

True / False Questions

1. Minerals are organic elements extracted from the soil by plants.

FALSE

*Bloom's Level: 1. Remember
Learning Outcome: 02.01.c State the functions of minerals in the body.
Section: 02.01
Topic: Chemistry*

2. Molecules composed of two or more atoms are called compounds.

FALSE

*Bloom's Level: 3. Apply
Learning Outcome: 02.01.b Distinguish between chemical elements and compounds.
Section: 02.01
Topic: Chemistry*

3. Hydrogen, deuterium, and tritium are three isotopes of hydrogen.

TRUE

*Bloom's Level: 1. Remember
Learning Outcome: 02.01.d Explain the basis for radioactivity and the types and hazards of ionizing radiation.
Section: 02.01
Topic: Chemistry*

4. Potassium, sodium, and chlorine are trace elements.

FALSE

*Bloom's Level: 1. Remember
Learning Outcome: 02.01.b Distinguish between chemical elements and compounds.
Section: 02.01
Topic: Chemistry*

5. Ionic bonds break apart in water more easily than covalent bonds do.

TRUE

*Bloom's Level: 2. Understand
Learning Outcome: 02.01.f Define the types of chemical bonds.
Section: 02.01
Topic: Chemistry*

6. A solution is a mixture composed of two or more substances that are physically blended but not chemically combined.

TRUE

*Bloom's Level: 2. Understand
Learning Outcome: 02.02.c Show how three kinds of mixtures differ from each other.
Section: 02.02
Topic: Chemistry*

7. Blood pH is approximately 7.4, which is slightly acidic.

FALSE

*Bloom's Level: 1. Remember
Learning Outcome: 02.02.e Define acid and base and interpret the pH scale.
Section: 02.02
Topic: Chemistry*

8. The high heat capacity of water makes it a very ineffective coolant.

FALSE

*Bloom's Level: 2. Understand
Learning Outcome: 02.02.b Describe the biologically important properties of water.
Section: 02.02
Topic: Chemistry*

9. In an exchange reaction, covalent bonds are broken and new covalent bonds are formed.

TRUE

*Bloom's Level: 5. Evaluate
Learning Outcome: 02.03.c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: Chemistry*

10. All the chemical reactions in which larger molecules are broken down to smaller ones are called catabolic reactions.

TRUE

*Bloom's Level: 1. Remember
Learning Outcome: 02.03.e Define metabolism and its two subdivisions.
Section: 02.03
Topic: Chemistry*

11. The opposite of a dehydration synthesis is a hydrolysis.

TRUE

*Bloom's Level: 1. Remember
Learning Outcome: 02.03.c List and define the fundamental types of chemical reactions.
Section: 02.04
Topic: Chemistry*

12. Unsaturated fatty acids have as much hydrogen as they can carry.

FALSE

*Bloom's Level: 2. Understand
Learning Outcome: 02.04.e Discuss the types and functions of lipids.
Section: 02.04
Topic: Chemistry*

13. A dipeptide is a molecule with two peptide bonds.

FALSE

*Bloom's Level: 1. Remember
Learning Outcome: 02.04.f Discuss protein structure and function.
Section: 02.04
Topic: Chemistry*

14. All amino acids have both a carboxyl group and an amino group attached to a central carbon.

TRUE

*Bloom's Level: 1. Remember
Learning Outcome: 02.04.f Discuss protein structure and function.
Section: 02.04
Topic: Chemistry*

15. ATP is the body's most important form of long-term energy storage.

FALSE

*Bloom's Level: 2. Understand
Learning Outcome: 02.04.h Describe the structure, production, and function of ATP.
Section: 02.04
Topic: Chemistry*

Multiple Choice Questions

16. The most abundant element in the human body, by weight, is

- A. nitrogen.
- B. hydrogen.
- C. carbon.
- D.** oxygen.
- E. calcium.

*Bloom's Level: 1. Remember
Learning Outcome: 02.01.a Name the chemical elements of the body from their chemical symbols.
Section: 02.01
Topic: Chemistry*

17. Sodium has an atomic number of 11 and an atomic mass of 23. Sodium has

- A.** 12 neutrons and 11 protons.
- B. 12 protons and 11 neutrons.
- C. 12 electrons and 11 neutrons.
- D. 12 protons and 11 electrons.
- E. 12 electrons and 11 protons.

*Bloom's Level: 3. Apply
Learning Outcome: 02.01.a Name the chemical elements of the body from their chemical symbols.
Section: 02.01
Topic: Chemistry*

18. The chemical properties of an atom are determined by its
- A. protons.
 - B.** electrons.
 - C. neutrons.
 - D. protons and neutrons.
 - E. particles.

Bloom's Level: 3. Apply
Learning Outcome: 02.01.b Distinguish between chemical elements and compounds.
Section: 02.01
Topic: Chemistry

19. Sodium, which has an atomic number of 11, will react with chlorine, which has an atomic number of 17. When these two atoms react, both become stable. To become stable, sodium will _____, while chlorine will _____.
- A. accept one electron; give up one electron
 - B. give up one proton; accept one proton
 - C. share one electron with chlorine; share one electron with sodium
 - D. become an anion; become a cation
 - E.** give up one electron; accept one electron

Bloom's Level: 3. Apply
Learning Outcome: 02.01.b Distinguish between chemical elements and compounds.
Section: 02.01
Topic: Chemistry

20. Consider oxygen, which has an atomic number of 8 and an atomic mass of 16. How many valence electrons does it have?
- A. 2
 - B. 4
 - C.** 6
 - D. 8
 - E. 16

Bloom's Level: 5. Evaluate
Learning Outcome: 02.01.b Distinguish between chemical elements and compounds.
Section: 02.01
Topic: Chemistry

21. Oxygen has an atomic number of eight. When two oxygen atoms come together, they form a(n) _____ bond.
- A. hydrogen
 - B.** nonpolar covalent
 - C. polar covalent
 - D. ionic
 - E. Van der Waals

Bloom's Level: 3. Apply
Learning Outcome: 02.01.f Define the types of chemical bonds.
Section: 02.01
Topic: Chemistry

22. When table salt, sodium chloride (NaCl), is placed in water
- A. Na^+ and Cl^- form ionic bonds with each other.
 - B. Na^+ and Cl^- form polar covalent bonds with each other.
 - C. Na^+ and Cl^- form hydrogen bonds with water.
 - D.** Ionic bonds between Na^+ and Cl^- are broken.
 - E. Na^+ and Cl^- become separated by their Van der Waals forces.

Bloom's Level: 3. Apply
Learning Outcome: 02.01.f Define the types of chemical bonds.
Section: 02.01
Topic: Chemistry

23. The bonding properties of an atom are determined by its
A. electrons.
B. protons.
C. positrons.
D. neutrons.
E. photons.

Bloom's Level: 2. Understand
Learning Outcome: 02.01.f Define the types of chemical bonds.
Section: 02.01
Topic: Chemistry

24. What type of bond attracts one water molecule to another?
A. an ionic bond
B. a peptide bond
C. a hydrogen bond
D. a covalent bond
E. a hydrolytic bond

Bloom's Level: 1. Remember
Learning Outcome: 02.01.f Define the types of chemical bonds.
Section: 02.01
Topic: Chemistry

25. Which of these is a cation?
A. O₂
B. K
C. Na
D. Ca²⁺
E. Cl⁻

Bloom's Level: 2. Understand
Learning Outcome: 02.01.e Distinguish between ions, electrolytes, and free radicals.
Section: 02.01
Topic: Chemistry

26. _____ account for 98.5% of the body's weight.
A. Carbon, oxygen, hydrogen, sodium, potassium, and chlorine
B. Carbon, oxygen, iron, sodium, potassium, and chlorine
C. Carbon, nitrogen, hydrogen, sodium, potassium, and chlorine
D. Carbon, oxygen, hydrogen, nitrogen, sodium, and potassium
E. Carbon, oxygen, hydrogen, nitrogen, calcium, and phosphorus

Bloom's Level: 1. Remember
Learning Outcome: 02.01.a Name the chemical elements of the body from their chemical symbols.
Section: 02.01
Topic: Chemistry

27. Varieties of elements called _____ differ from one another only in number of neutrons and therefore in atomic mass.
A. cations
B. anions
C. isotopes
D. electrolytes
E. free radicals

Bloom's Level: 1. Remember
Learning Outcome: 02.01.d Explain the basis for radioactivity and the types and hazards of ionizing radiation.
Section: 02.01
Topic: Chemistry

28. When you jump off a high diving board into water, you notice great resistance of water. This resistance is called _____ and is caused by water's great _____.
- A. surface tension; adhesiveness
 - B.** surface tension; cohesiveness
 - C. hydrophobic tension; adhesiveness
 - D. hydrophilic tension; cohesiveness
 - E. hydrophilic tension; adhesiveness

Bloom's Level: 3. Apply
Learning Outcome: 02.02.b Describe the biologically important properties of water.
Section: 02.02
Topic: Chemistry

29. Which of these is hydrophobic?
- A. sugar
 - B. K^+
 - C. Cl^-
 - D. water
 - E.** fat

Bloom's Level: 3. Apply
Learning Outcome: 02.02.b Describe the biologically important properties of water.
Section: 02.02
Topic: Chemistry

30. Consider a mixture of blood, which contains sodium chloride, protein, and cells or formed elements. The sodium chloride is in a(n) _____, the protein is in a(n) _____, and the cells are in a _____.
- A. emulsion; solution; suspension
 - B. solvent; emulsion; colloid
 - C. colloid; suspension; solution
 - D. suspension; colloid; solution
 - E.** solution; colloid; suspension

Bloom's Level: 3. Apply
Learning Outcome: 02.02.c Show how three kinds of mixtures differ from each other.
Section: 02.02
Topic: Chemistry

31. Which of these is the most appropriate to express number of molecules per volume?
- A.** molarity
 - B. volume
 - C. percentage
 - D. weight per volume
 - E. milliequivalents per liter

Bloom's Level: 1. Remember
Learning Outcome: 02.02.d Discuss some ways in which the concentration of a solution can be expressed, and explain why different expressions of concentration are used for different purposes.
Section: 02.02
Topic: Chemistry

32. A solution with pH 4 has _____ the H^+ concentration of a solution with pH 8.
- A. $\frac{1}{2}$
 - B. twice
 - C. 4 times
 - D.** 10,000 times
 - E. $\frac{1}{10,000}$

Bloom's Level: 5. Evaluate
Learning Outcome: 02.02.e Define acid and base and interpret the pH scale.
Section: 02.02
Topic: Chemistry

33. Which of these has the highest H^+ concentration?
A. lemon juice, pH = 2.3
B. red wine, pH = 3.2
C. tomato juice, pH = 4.7
D. saliva, pH = 6.6
E. household ammonia, pH = 10.8

Bloom's Level: 3. Apply
Learning Outcome: 02.02.e Define acid and base and interpret the pH scale.
Section: 02.02
Topic: Chemistry

34. Blood has a pH ranging from 7.35 to 7.45. Slight deviations from this can cause major problems, even death. You are doing an intense workout, and your skeletal muscle cells are producing metabolic acids such as lactic acid. Your blood pH does not drop significantly in spite of the metabolic acids released into the blood. You maintain a constant blood pH because
A. metabolic acids are neutralized in muscle cells before released into the blood.
B. metabolic bases are produced at the same rate by muscle cells to neutralize the acids.
C. the respiratory system removes excess H^+ from the blood before the pH is lowered.
D. the body contains chemicals called buffers that resist changes in pH.
E. endothelial cells secrete excess H^+ to prevent a decrease in pH.

Bloom's Level: 5. Evaluate
Learning Outcome: 02.02.e Define acid and base and interpret the pH scale.
Section: 02.02
Topic: Chemistry

35. A solution that resists a change in pH when acid or base is added to it is
A. a buffer.
B. a catalyst.
C. a reducing agent.
D. an oxidizing agent.
E. a colloid.

Bloom's Level: 1. Remember
Learning Outcome: 02.02.e Define acid and base and interpret the pH scale.
Section: 02.02
Topic: Chemistry

36. Any chemical reaction that removes electrons from an atom is called
A. reduction.
B. condensation.
C. hydrolysis.
D. anabolism.
E. oxidation.

Bloom's Level: 1. Remember
Learning Outcome: 02.03.c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: Chemistry

37. The most relevant free energy in human physiology is the energy stored in
A. electrolytes ionized in water.
B. free radicals with an odd number of electrons.
C. radioisotopes.
D. the chemical bonds of organic molecules.
E. Van der Waals forces.

Bloom's Level: 3. Apply
Learning Outcome: 02.03.a Define energy and work, and describe some types of energy.
Section: 02.03
Topic: Chemistry

38. The breakdown of glycogen (an energy-storage compound) is an example of a(n) _____ reaction.
- A.** exergonic
 - B. endergonic
 - C. exchange
 - D. synthesis
 - E. equilibrium

Bloom's Level: 2. Understand
Learning Outcome: 02.03.c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: Chemistry

39. When ATP breaks down to ADP, potential energy stored in bonds is released. This energy stored in bonds is _____ energy.
- A. electromagnetic
 - B. electrical
 - C.** chemical
 - D. heat
 - E. kinetic

Bloom's Level: 1. Remember
Learning Outcome: 02.03.c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: Chemistry

40. Glucose is broken down in most of your cells to form carbon dioxide, oxygen, and the energy currency of the cell called ATP. What type of chemical reaction is this?
- A. anabolic or endergonic
 - B.** catabolic or exergonic
 - C. anabolic or exergonic
 - D. catabolic or endergonic
 - E. anabolic or exothermic

Bloom's Level: 3. Apply
Learning Outcome: 02.03.e Define metabolism and its two subdivisions.
Section: 02.03
Topic: Chemistry

41. Which one of the following would *not* increase the rate of a reaction?
- A. reactants being more concentrated
 - B. rise in temperature
 - C. presence of a catalyst
 - D. presence of an enzyme
 - E.** decrease in reactant concentrations

Bloom's Level: 2. Understand
Learning Outcome: 02.03.d Identify the factors that govern the speed and direction of a reaction.
Section: 02.03
Topic: Chemistry

42. Which of the following words includes all of the other terms?
- A. catabolism
 - B. anabolism
 - C.** metabolism
 - D. oxidative reactions
 - E. reductive reactions

Bloom's Level: 3. Apply
Learning Outcome: 02.03.e Define metabolism and its two subdivisions.
Section: 02.03
Topic: Chemistry

43. Digestive enzymes breakdown the starch in a potato into thousands of glucose molecules. This exemplifies a(n) _____ reaction.
- A. synthesis
 - B. decomposition**
 - C. exchange
 - D. anabolic
 - E. reductive

Bloom's Level: 2. Understand
Learning Outcome: 02.03.c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: Chemistry

44. Which of the following equations depicts an exchange reaction?
- A. $AB \rightarrow A + B$
 - B. $A + B \rightarrow AB$
 - C. $AB + CD \rightarrow AC + BD$**
 - D. $AB \rightarrow A^- + B^+$
 - E. $A + B \rightarrow AB \rightarrow C + D$

Bloom's Level: 2. Understand
Learning Outcome: 02.03.b Understand how chemical reactions are symbolized by chemical equations.
Section: 02.03
Topic: Chemistry

45. A(n) _____ is a group of atoms that determines many of the properties of an organic molecule.
- A. carboxyl group
 - B. functional group**
 - C. hydroxyl group
 - D. amino group
 - E. phosphate group

Bloom's Level: 1. Remember
Learning Outcome: 02.04.b Identify some common functional groups of organic molecules from their formulae.
Section: 02.04
Topic: Chemistry

46. _____ is *not* an organic compound.
- A. $C_{16}H_{18}N_3ClS$
 - B. $Na_2HPO_3(H_2O)_5$**
 - C. CH_4
 - D. $C_3H_7O_2N$

Bloom's Level: 3. Apply
Learning Outcome: 02.04.a Explain why carbon is especially well suited to serve as the structural foundation of many biological molecules.
Section: 02.04
Topic: Chemistry

47. A _____ converts a _____ to its monomers.
- A. hydrolysis; polymer**
 - B. dehydration synthesis; molecule
 - C. dehydration synthesis; polymer
 - D. polymer; molecule
 - E. condensation; reactant

Bloom's Level: 3. Apply
Learning Outcome: 02.04.c Discuss the relevance of polymers to biology and explain how they are formed and broken by dehydration synthesis and hydrolysis.
Section: 02.04
Topic: Chemistry

48. The formula for an amino group is _____ whereas the formula of a carboxyl group is _____

- A. -COOH; -OH.
- B. -CH₃; -NH₂.
- C. -OH; -SH.
- D.** -NH₂; -COOH.
- E. -SH; -H₂PO₄.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.f Discuss protein structure and function.
Section: 02.04
Topic: Chemistry

49. Table sugar is a disaccharide called _____ and is made up of the monomer(s) _____.

- A. maltose; glucose
- B.** sucrose; glucose and fructose
- C. lactose; glucose and galactose
- D. glycogen; glucose
- E. glucose; galactose and fructose

Bloom's Level: 1. Remember
Learning Outcome: 02.04.d Discuss the types and functions of carbohydrates.
Section: 02.04
Topic: Chemistry

50. Which of the following is a disaccharide?

- A. galactose
- B.** lactose
- C. glucose
- D. fructose
- E. amylose

Bloom's Level: 1. Remember
Learning Outcome: 02.04.d Discuss the types and functions of carbohydrates.
Section: 02.04
Topic: Chemistry

51. _____ is a monosaccharide, whereas _____ is a polysaccharide.

- A. Fructose; sucrose
- B. Galactose; maltose
- C. Lactose; glycogen
- D.** Glucose; starch
- E. Cellulose; glucose

Bloom's Level: 3. Apply
Learning Outcome: 02.04.d Discuss the types and functions of carbohydrates.
Section: 02.04
Topic: Chemistry

52. In general, _____ have a 2:1 ratio of hydrogen to oxygen.

- A. enzymes
- B. proteins
- C. lipids
- D.** carbohydrates
- E. nucleic acids

Bloom's Level: 2. Understand
Learning Outcome: 02.04.d Discuss the types and functions of carbohydrates.
Section: 02.04
Topic: Chemistry

53. Proteoglycans are macromolecules that form gels, which help hold cells and tissues together, lubricate joints, and account for the tough rubbery texture of cartilage. Proteoglycans are composed of
- A. carbohydrates and fats.
 - B. nucleic acids and fats.
 - C.** carbohydrates and proteins.
 - D. proteins and fats.
 - E. nucleic acids and proteins.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.d Discuss the types and functions of carbohydrates.
Section: 02.04
Topic: Chemistry

54. Triglycerides are molecules consisting of one 3-carbon compound called _____ bound to three _____.
- A. eicosanoid; fatty acids
 - B. steroid; glycerols
 - C. eicosanoid; steroid
 - D.** glycerol; fatty acids
 - E. steroid; fatty acids

Bloom's Level: 1. Remember
Learning Outcome: 02.04.e Discuss the types and functions of lipids.
Section: 02.04
Topic: Chemistry

55. _____ are major components of cell membranes, and are said to be _____.
- A. Triglycerides; hydrophobic
 - B. Steroids; hydrophilic
 - C. Bile acids; fat-soluble
 - D. Eicosanoids; water-soluble
 - E.** Phospholipids; amphiphilic

Bloom's Level: 3. Apply
Learning Outcome: 02.04.e Discuss the types and functions of lipids.
Section: 02.04
Topic: Chemistry

56. Which of these is (are) always hydrophobic?
- A. glucose
 - B.** cholesterol
 - C. amino acids
 - D. proteins
 - E. disaccharides

Bloom's Level: 3. Apply
Learning Outcome: 02.04.e Discuss the types and functions of lipids.
Section: 02.04
Topic: Chemistry

57. Proteins can serve all of the following functions *except*
- A. catalyze metabolic reactions.
 - B. give structural strength to cells and tissues.
 - C. produce muscular and other forms of movement.
 - D. regulate transport of solutes into and out of cells.
 - E.** store hereditary information.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.f Discuss protein structure and function.
Section: 02.04
Topic: Chemistry

58. A drastic conformational change in proteins in response to conditions such as extreme heat or pH will lead to loss of a protein's function. This drastic change in three-dimensional shape is called
- A. contamination.
 - B. denaturation.**
 - C. saturation.
 - D. sedimentation.
 - E. deconformation.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.f Discuss protein structure and function.
Section: 02.04
Topic: Chemistry

59. Proteins are _____ built from _____ different amino acids.
- A. monomers; 10
 - B. molecules; 10
 - C. polymers; 20**
 - D. macromolecules; 40
 - E. polypeptides; 80

Bloom's Level: 1. Remember
Learning Outcome: 02.04.f Discuss protein structure and function.
Section: 02.04
Topic: Chemistry

60. The folding and coiling of proteins into globular and fibrous shapes determines the _____ structure of the protein.
- A. primary
 - B. secondary
 - C. tertiary**
 - D. quaternary
 - E. denatured

Bloom's Level: 1. Remember
Learning Outcome: 02.04.f Discuss protein structure and function.
Section: 02.04
Topic: Chemistry

61. Enzymes are specific to substrates because of the shape of their
- A. active sites.**
 - B. receptors.
 - C. secondary structure.
 - D. terminal amino acids.
 - E. alpha chain.

Bloom's Level: 1. Remember
Learning Outcome: 02.04.g Explain how enzymes function.
Section: 02.04
Topic: Chemistry

62. _____ is the substrate of _____.
- A. Glucose; lactose
 - B. Lactase; glucose
 - C. Lactose; lactase**
 - D. Galactose; lactose
 - E. Sucrase; sucrose

Bloom's Level: 3. Apply
Learning Outcome: 02.04.g Explain how enzymes function.
Section: 02.04
Topic: Chemistry

63. All enzymes are _____, but not all of those are enzymes.
- A. cofactors
 - B. proteins**
 - C. lipids
 - D. carbohydrates
 - E. nucleic acids

Bloom's Level: 3. Apply
Learning Outcome: 02.04.g Explain how enzymes function.
Section: 02.04
Topic: Chemistry

64. Nucleic acids are _____ of _____.
- A. molecules; monosaccharides
 - B. monomers; ATP
 - C. polymers; nucleotides**
 - D. polymers; cAMP
 - E. polymers; DNA

Bloom's Level: 3. Apply
Learning Outcome: 02.04.j Identify the principal types of nucleic acids.
Section: 02.04
Topic: Chemistry

65. ATP _____ endergonic and exergonic reactions.
- A. opposes
 - B. decomposes
 - C. reduces
 - D. links**
 - E. dehydrates

Bloom's Level: 3. Apply
Learning Outcome: 02.04.h Describe the structure, production, and function of ATP.
Section: 02.04
Topic: Chemistry

chapter 02 Summary

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Learning Outcome: 02.01.d Explain the basis for radioactivity and the types and hazards of ionizing radiation.	2
Learning Outcome: 02.01.e Distinguish between ions, electrolytes, and free radicals.	1
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Learning Outcome: 02.02.b Describe the biologically important properties of water.	3
Learning Outcome: 02.02.c Show how three kinds of mixtures differ from each other.	2
Learning Outcome: 02.02.d Discuss some ways in which the concentration of a solution can be expressed, and explain why different expressions of concentration are used for different purposes.	1
Learning Outcome: 02.02.e Define acid and base and interpret the pH scale.	5
Learning Outcome: 02.03.a Define energy and work, and describe some types of energy.	1
Learning Outcome: 02.03.b Understand how chemical reactions are symbolized by chemical equations.	1
Learning Outcome: 02.03.c List and define the fundamental types of chemical reactions.	6
Learning Outcome: 02.03.d Identify the factors that govern the speed and direction of a reaction.	1
Learning Outcome: 02.03.e Define metabolism and its two subdivisions.	3
Learning Outcome: 02.04.a Explain why carbon is especially well suited to serve as the structural foundation of many biological molecules.	1
Learning Outcome: 02.04.b Identify some common functional groups of organic molecules from their formulae.	1
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