Chapter 02
The Chemistry of Life

True / False Questions

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: O01.01e List the important dietary minerals and describe the major uses of each mineral in the body.
HAPS Topic: Module O01 Nutrition.
Learning Outcome: 02.01c State the functions of minerals in the body.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01b Distinguish between chemical elements and compounds.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C01.01c Explain how ions and isotopes are produced by changing the relative number of specific subatomic particles with respect to the structure of an atom.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01d Explain the basis for radioactivity and the types and hazards of ionizing radiation.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01b Distinguish between chemical elements and compounds.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C02.01a List each type of bond in order by relative strength with respect to non-polar covalent, polar covalent, ionic, and hydrogen bonds.
HAPS Topic: Module C02 Chemical bonding.
Learning Outcome: 02.01f Define the types of chemical bonds.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C03.02 Distinguish among the terms solution, solute, solvent, colloid suspension, and emulsion.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02c Show how three kinds of mixtures differ from each other.
Section: 02.02
Topic: The Chemistry of Life

7. The pH of blood plasma is approximately 7.4, which is slightly acidic.
FALSE

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C03.05 State acidic, neutral, and alkaline pH values.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02e Define acid and base and interpret the pH scale.
Section: 02.02
Topic: The Chemistry of Life

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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C03.01 Discuss the physiologically important properties of water.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02b Describe the biologically important properties of water.
Section: 02.02
Topic: The Chemistry of Life

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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: The Chemistry of Life

10. Chemical reactions in which larger molecules are broken down into smaller ones are called catabolic reactions.
TRUE

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.
HAPS Topic: Module O02 Introduction to metabolism.
Learning Outcome: 02.03e Define metabolism and its two subdivisions.
Section: 02.03
Topic: The Chemistry of Life

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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: The Chemistry of Life

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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04e Discuss the types and functions of lipids.
Section: 02.04
Topic: The Chemistry of Life

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04f Discuss protein structure and function.
Section: 02.04
Topic: The Chemistry of Life

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04f Discuss protein structure and function.
Section: 02.04
Topic: The Chemistry of Life

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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C05.01 Describe the generalized reversible reaction for release of energy from ATP and explain the role of ATP in the cell.
HAPS Topic: Module C05 Energy transfer using ATP.
Learning Outcome: 02.04h Describe the structure, production, and function of ATP.
Section: 02.04
Topic: The Chemistry of Life

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01a Name the chemical elements of the body from their chemical symbols.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C01.01d Distinguish among the terms atomic number, mass number and atomic weight with respect to the structure of an atom.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01a Name the chemical elements of the body from their chemical symbols.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C01.01b Relate the number of electrons in an electron shell to an atoms chemical stability and its ability to form chemical bonds with respect to the structure of an atom.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01b Distinguish between chemical elements and compounds.
Section: 02.01
Topic: The Chemistry of Life

19. Na (atomic no. 11) reacts with Cl (atomic no. 17) to become stable. In the reaction, Na will _____, while Cl 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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.
HAPS Topic: Module C02 Chemical bonding.
Learning Outcome: 02.01f Define the types of chemical bonds.
Section: 02.01
Topic: The Chemistry of Life

20. Oxygen 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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C01.01d Distinguish among the terms atomic number, mass number and atomic weight with respect to the structure of an atom.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01b Distinguish between chemical elements and compounds.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.
HAPS Topic: Module C02 Chemical bonding.
Learning Outcome: 02.01f Define the types of chemical bonds.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.
HAPS Topic: Module C02 Chemical bonding.
Learning Outcome: 02.01f Define the types of chemical bonds.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C01.01b Relate the number of electrons in an electron shell to an atoms chemical stability and its ability to form chemical bonds with respect to the structure of an atom.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01f Define the types of chemical bonds.
Section: 02.01
Topic: The Chemistry of Life

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.
HAPS Topic: Module C02 Chemical bonding.
Learning Outcome: 02.01f Define the types of chemical bonds.
Section: 02.01
Topic: The Chemistry of Life

Check All That Apply Questions

25. Which of these is a cation? Check all that apply.
_____ O_2
__X__ K+
__X__ Na+
__X__ Ca^{2+}
_____ Cl^-

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes and radioisotopes.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01e Distinguish between ions, electrolytes, and free radicals.
Section: 02.01
Topic: The Chemistry of Life

Multiple Choice Questions

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C01.03 Compare and contrast the terms atoms, molecules, elements, and compounds.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01a Name the chemical elements of the body from their chemical symbols.
Section: 02.01
Topic: The Chemistry of Life

27. _____ differ from one another in their number of neutrons and atomic mass.
A. Cations
B. Anions
C. Isotopes
D. Electrolytes
E. Free radicals

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes and radioisotopes.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01d Explain the basis for radioactivity and the types and hazards of ionizing radiation.
Section: 02.01
Topic: The Chemistry of Life

28. When jumping into water you notice resistance. This resistance is caused by water's _____.

A. adhesiveness
B. cohesiveness
C. hydrophobic tension
D. hydrophilic tension
E. osmotic equilibrium

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C03.01 Discuss the physiologically important properties of water.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02b Describe the biologically important properties of water.
Section: 02.02
Topic: The Chemistry of Life

29. Which of these is hydrophobic?

A. Glucose
B. K^+
C. Cl^-
D. Water
E. Fat

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C03.01 Discuss the physiologically important properties of water.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02b Describe the biologically important properties of water.
Section: 02.02
Topic: The Chemistry of Life

30. Blood contains NaCl, protein, and cells. The NaCl 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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C03.02 Distinguish among the terms solution, solute, solvent, colloid suspension, and emulsion.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02c Show how three kinds of mixtures differ from each other.
Section: 02.02
Topic: The Chemistry of Life

31. Which of these is the most appropriate to express the number of molecules per volume?
A. Molarity
B. Volume
C. Percentage
D. Weight per volume
E. Milliequivalents per liter

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C03.02 Distinguish among the terms solution, solute, solvent, colloid suspension, and emulsion.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02d 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: The Chemistry of Life

32. A solution with pH 4 has _____ the H^+ concentration of a solution with pH 8.
A. ½
B. 2 times
C. 4 times
D. 10,000 times
E. 1/10,000

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02e Define acid and base and interpret the pH scale.
Section: 02.02
Topic: The Chemistry of Life

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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C03.05 State acidic, neutral, and alkaline pH values.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02e Define acid and base and interpret the pH scale.
Section: 02.02
Topic: The Chemistry of Life

34. In a workout your muscle cells produce lactic acid, yet 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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02e Define acid and base and interpret the pH scale.
Section: 02.02
Topic: The Chemistry of Life

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02e Define acid and base and interpret the pH scale.
Section: 02.02
Topic: The Chemistry of Life

36. A chemical reaction that removes electrons from an atom is called a(n) _____ reaction.
A. reduction
B. condensation
C. hydrolysis
D. anabolic
E. oxidation

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: O02.05 Describe the processes of oxidation, reduction, decarboxylation, and phosphorylation.
HAPS Topic: Module O02 Introduction to metabolism.
Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: The Chemistry of Life

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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.
HAPS Topic: Module O02 Introduction to metabolism.
Learning Outcome: 02.03a Define energy and work, and describe some types of energy.
Section: 02.03
Topic: The Chemistry of Life

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

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.
HAPS Topic: Module O02 Introduction to metabolism.
Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: The Chemistry of Life

39. Potential energy stored in bonds is released as _____ energy.
A. electromagnetic
B. electrical
C. chemical
D. heat
E. kinetic

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.
HAPS Topic: Module O02 Introduction to metabolism.
Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: The Chemistry of Life

40. The breakdown of glucose to yield carbon dioxide, oxygen, and ATP can be described as _____.

A. anabolic and endergonic
B. catabolic and exergonic
C. anabolic and exergonic
D. catabolic and endergonic
E. anabolic and exothermic

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.
HAPS Topic: Module O02 Introduction to metabolism.
Learning Outcome: 02.03e Define metabolism and its two subdivisions.
Section: 02.03
Topic: The Chemistry of Life

41. Which one of the following would *not* increase the rate of a reaction?

A. An increase in reactant concentrations
B. A rise in temperature
C. The presence of a catalyst
D. The presence of an enzyme
E. A decrease in reactant concentrations

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme- catalyzed reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.03d Identify the factors that govern the speed and direction of a reaction.
Section: 02.03
Topic: The Chemistry of Life

42. Which of the following terms encompasses all of the other ones?
A. Catabolism
B. Anabolism
C. Metabolism
D. Oxidation reactions
E. Reduction reactions

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.
HAPS Topic: Module O02 Introduction to metabolism.
Learning Outcome: 02.03e Define metabolism and its two subdivisions.
Section: 02.03
Topic: The Chemistry of Life

43. The breakdown of starch by digestive enzymes into glucose molecules is a(n) _____ reaction.
A. synthesis
B. decomposition
C. exchange
D. anabolic
E. reduction

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: O02.01 Define metabolism, anabolism and catabolism.
HAPS Topic: Module O02 Introduction to metabolism.
Learning Outcome: 02.03c List and define the fundamental types of chemical reactions.
Section: 02.03
Topic: The Chemistry of Life

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. $A + B \rightarrow AB \rightarrow C + D$

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.03b Understand how chemical reactions are symbolized by chemical equations.
Section: 02.03
Topic: The Chemistry of Life

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04b Identify some common functional groups of organic molecules from their formulae.
Section: 02.04
Topic: The Chemistry of Life

46. Which of the following is *not* an organic compound?
A. $C_{16}H_{18}N_3ClS$
B. $Na_2HPO_3(H_2O)_5$
C. CH_4
D. $C_3H_7O_2N$

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C04.01 Define the term organic molecule.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04a Explain why carbon is especially well suited to serve as the structural foundation of many biological molecules.
Section: 02.04
Topic: The Chemistry of Life

47. A _____ reaction breaks a _____ down into its monomers.
A. hydrolysis; polymer
B. dehydration synthesis; molecule
C. dehydration synthesis; polymer
D. polymer; molecule
E. condensation; reactant

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04c Discuss the relevance of polymers to biology and explain how they are formed and broken by dehydration synthesis and hydrolysis.
Section: 02.04
Topic: The Chemistry of Life

48. The formula of an amino group is _____; the formula of a carboxyl group is _____.
A. -COOH; -OH
B. $-CH_3$; $-NH_2$
C. -OH; -SH
D. $-NH_2$; -COOH
E. -SH; $-H_2PO_4$

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04b Identify some common functional groups of organic molecules from their formulae.
Section: 02.04
Topic: The Chemistry of Life

49. Table sugar is a disaccharide called _____ and is made up of the monomer(s) _____.
A. maltose; glucose and sucrose
B. sucrose; glucose and fructose
C. lactose; glucose and galactose
D. glycogen; glucose and fructose
E. glucose; galactose and fructose

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04d Discuss the types and functions of carbohydrates.
Section: 02.04
Topic: The Chemistry of Life

50. Which of the following is a disaccharide?
A. Galactose
B. Lactose
C. Glucose
D. Fructose
E. Amylose

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04d Discuss the types and functions of carbohydrates.
Section: 02.04
Topic: The Chemistry of Life

51. _____ is a monosaccharide, whereas _____ is a polysaccharide.
A. Fructose; sucrose
B. Galactose; maltose
C. Lactose; glycogen
D. Glucose; starch
E. Cellulose; glucose

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04d Discuss the types and functions of carbohydrates.
Section: 02.04
Topic: The Chemistry of Life

52. In general, _____ have a 2:1 ratio of hydrogen to oxygen.
A. enzymes
B. proteins
C. lipids
D. carbohydrates
E. nucleic acids

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04d Discuss the types and functions of carbohydrates.
Section: 02.04
Topic: The Chemistry of Life

53. 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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04d Discuss the types and functions of carbohydrates.
Section: 02.04
Topic: The Chemistry of Life

54. Triglycerides consist of a 3-carbon compound called _____ bound to three _____.
A. pyruvate; fatty acids
B. lactic acid; glycerols
C. eicosanoid; steroids
D. glycerol; fatty acids
E. sterol; fatty acids

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04e Discuss the types and functions of lipids.
Section: 02.04
Topic: The Chemistry of Life

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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04e Discuss the types and functions of lipids.
Section: 02.04
Topic: The Chemistry of Life

56. Which of these molecules is hydrophobic?
A. Glucose
B. Cholesterol
C. Amino acid
D. Protein
E. Disaccharide

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04e Discuss the types and functions of lipids.
Section: 02.04
Topic: The Chemistry of Life

57. Proteins perform 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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.04e Discuss physiological and structural roles in the human body of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04f Discuss protein structure and function.
Section: 02.04
Topic: The Chemistry of Life

58. A drastic conformational change in a protein in response to extreme heat or pH is called _____.
A. contamination
B. denaturation
C. saturation
D. sedimentation
E. deconformation

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme- catalyzed reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04f Discuss protein structure and function.
Section: 02.04
Topic: The Chemistry of Life

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

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04f Discuss protein structure and function.
Section: 02.04
Topic: The Chemistry of Life

60. The folding and coiling of a protein into a globular shape is the _____ structure of the protein.
A. primary
B. secondary
C. tertiary
D. quaternary
E. denatured

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04f Discuss protein structure and function.
Section: 02.04
Topic: The Chemistry of Life

61. An enzyme is substrate-specific because of the shape of its _____.
A. active site
B. receptor
C. secondary structure
D. terminal amino acid
E. alpha chain

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04g Explain how enzymes function.
Section: 02.04
Topic: The Chemistry of Life

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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme- catalyzed reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04g Explain how enzymes function.
Section: 02.04
Topic: The Chemistry of Life

63. All enzymes are _____.
A. cofactors
B. proteins
C. lipids
D. carbohydrates
E. nucleic acids

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme- catalyzed reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04g Explain how enzymes function.
Section: 02.04
Topic: The Chemistry of Life

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

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04j Identify the principal types of nucleic acids.
Section: 02.04
Topic: The Chemistry of Life

65. ATP_____ endergonic and exergonic reactions.
A. opposes
B. decomposes
C. reduces
D. links
E. dehydrates

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C05.01 Describe the generalized reversible reaction for release of energy from ATP and explain the role of ATP in the cell.
HAPS Topic: Module C05 Energy transfer using ATP.
Learning Outcome: 02.04h Describe the structure, production, and function of ATP.
Section: 02.04
Topic: The Chemistry of Life

66. Minerals are found in all of the following *except* _____.
A. bones and teeth
B. vitamins
C. thyroid hormone
D. electrolytes

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: O01.01e List the important dietary minerals and describe the major uses of each mineral in the body.
HAPS Topic: Module O01 Nutrition.
Learning Outcome: 02.01c State the functions of minerals in the body.
Section: 02.01
Topic: The Chemistry of Life

67. An atom with 12 electrons, 13 neutrons, and 11 protons is a(n) _____.
A. anion
B. cation
C. free radical
D. isotope

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes and radioisotopes.
HAPS Topic: Module C01 Atoms and molecules.
Learning Outcome: 02.01e Distinguish between ions, electrolytes, and free radicals.
Section: 02.01
Topic: The Chemistry of Life

68. The concentration of a solution may be expressed by all of the following *except* _____.
A. weight per volume
B. percentage
C. molarity
D. pH

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C03.02 Distinguish among the terms solution, solute, solvent, colloid suspension, and emulsion.
HAPS Topic: Module C03 Inorganic compounds and solutions.
Learning Outcome: 02.02d 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: The Chemistry of Life

69. The vibration of an ear drum is an example of _____ energy.
A. kinetic
B. potential
C. elastic
D. radiant

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C05.01 Describe the generalized reversible reaction for release of energy from ATP and explain the role of ATP in the cell.
HAPS Topic: Module C05 Energy transfer using ATP.
Learning Outcome: 02.03a Define energy and work, and describe some types of energy.
Section: 02.03
Topic: The Chemistry of Life

70. In the following reaction, what is(are) the product(s)? $CO_2 + H_2O$ ---> H_2CO_3
A. H_2CO_3
B. CO_2 and H_2O
C. CO_2 and H_2CO_3
D. H_2O and H_2CO_3

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.03b Understand how chemical reactions are symbolized by chemical equations.
Section: 02.03
Topic: The Chemistry of Life

71. Which of the following will increase the rate of a chemical reaction?
A. An increase in reactant concentration
B. An increase in product concentration
C. A decreased temperature
D. Enzyme inhibition

Blooms Level: 3. Apply
Gradable: automatic
HAPS Objective: C04.06 Demonstrate factors that affect enzyme activity, including denaturation, and interpret graphs showing the effects of various factors on the rate of enzyme- catalyzed reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.03d Identify the factors that govern the speed and direction of a reaction.
Section: 02.03
Topic: The Chemistry of Life

72. Carbon is very versatile in forming bonds with other atoms because it has _____ valence electrons.
A. four
B. two
C. eight
D. six

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.01 Define the term organic molecule.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04a Explain why carbon is especially well suited to serve as the structural foundation of many biological molecules.
Section: 02.04
Topic: The Chemistry of Life

73. Amylase is a digestive enzyme that breaks starches down into sugars through _____ reactions.
A. hydrolysis
B. dehydration synthesis
C. anabolic
D. endergonic

Blooms Level: 2. Understand
Gradable: automatic
HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04c Discuss the relevance of polymers to biology and explain how they are formed and broken by dehydration synthesis and hydrolysis.
Section: 02.04
Topic: The Chemistry of Life

74. Which of the following is not a nucleotide?
A. RNA
B. GTP
C. ATP
D. cAMP

Blooms Level: 1. Remember
Gradable: automatic
HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.
HAPS Topic: Module C04 Organic compounds.
Learning Outcome: 02.04j Identify the principal types of nucleic acids.
Section: 02.04
Topic: The Chemistry of Life