

**Multiple Choice Questions**

1. The primary elements making up living organisms are
- A. carbon, hydrogen, oxygen, and calcium.
  - B. carbon, oxygen, iron, and chlorine.
  - C. carbon, hydrogen, iron, and calcium.
  - D.** carbon, hydrogen, oxygen, and nitrogen.
  - E. carbon, oxygen, sulfur, and calcium.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.01 Identify the most important elements in living organisms.*

*Section: 02.01*

*Topic: Chemistry*

2. The atomic number of an atom or element is
- A. the number of neutrons in the nucleus.
  - B. the number of electrons in the nucleus.
  - C.** the number of protons in the nucleus.
  - D. the number of neutrons in the orbitals.
  - E. the number of protons in the orbitals.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.02 Describe the structure of atoms.*

*Section: 02.01*

*Topic: Chemistry*

3. An ion is
- A. an atom that has gained electrons.
  - B. an atom that has a positive charge.
  - C. an atom that has lost electrons.
  - D. an atom that has a negative charge.
  - E.** All answers are correct.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.02 Describe the structure of atoms.*

*Section: 02.01*

*Topic: Chemistry*

4. The mass number of an atom is defined as
- A. the total number of protons, neutrons, and electrons of an atom.
  - B. the total number of protons and electrons of an atom.
  - C.** the total number of protons and neutrons of an atom.
  - D. the total number of neutrons and electrons of an atom.
  - E. the total number of protons of an atom.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.02 Describe the structure of atoms.*

*Section: 02.01*

*Topic: Chemistry*

5. Isotopes of the same element are different from one another in that
- A. they have a different number of protons.
  - B.** they have a different number of neutrons.
  - C. they have a different number of electrons.
  - D. they are a different element.
  - E. only one of the isotopes is matter.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.02 Describe the structure of atoms.*

*Section: 02.01*

*Topic: Chemistry*

6. The first energy shell of an atom contains a maximum of
- A. one electron.
  - B.** two electrons.
  - C. four electrons.
  - D. eight electrons.
  - E. sixteen electrons.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.02 Describe the structure of atoms.*

*Section: 02.01*

*Topic: Chemistry*

7. If an atom has a valence shell that is full, then it
- A. is highly reactive.
  - B. is chemically unstable.
  - C. is highly likely to combine with other atoms.
  - D. is found only in a gas form.
  - E.** is inert.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.02 Describe the structure of atoms.*

*Section: 02.01*

*Topic: Chemistry*

8. The second energy shell of an atom contains a maximum of
- A.** eight electrons.
  - B. two electrons.
  - C. four electrons.
  - D. one electron.
  - E. sixteen electrons.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.02 Describe the structure of atoms.*

*Section: 02.01*

*Topic: Chemistry*

9. In a covalent bond

- A. atoms share electrons.
- B. atoms of opposite charges attract each other.
- C. atoms share protons.
- D. atoms share neutrons.
- E. atoms are repelled by each other.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.02.01 Compare and contrast the different types of bonds.*

*Section: 02.02*

*Topic: Chemistry*

10. An ionic bond is a bond in which

- A. atoms share electrons.
- B. atoms share protons.
- C. atoms of opposite charges attract each other.
- D. atoms share neutrons.
- E. atoms are repelled by each other.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.02.01 Compare and contrast the different types of bonds.*

*Section: 02.02*

*Topic: Chemistry*

11. In the example of ionic bond formation between sodium and chlorine, which of the following is a false statement?

- A. Na is the chemical symbol for sodium.
- B.** Chlorine donates an electron.
- C. Chlorine becomes negatively charged.
- D. Sodium becomes positively charged.
- E. The bond that is formed is a strong bond.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.02.01 Compare and contrast the different types of bonds.*

*Section: 02.02*

*Topic: Chemistry*

12. In the example of ionic bond formation between sodium and chlorine

- A. Na is the chemical symbol for chlorine.
- B. sodium accepts an electron.
- C.** chlorine accepts an electron.
- D. chlorine becomes positively charged.
- E. both sodium and chlorine accept electrons.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.02.01 Compare and contrast the different types of bonds.*

*Section: 02.02*

*Topic: Chemistry*

13. If a covalent bond is polar
- A. electrons are not shared by atoms.
  - B. protons are shared by atoms.
  - C. it will not form in living organisms.
  - D.** electronegativity of atoms is unequal in their pull on electrons.
  - E. the bond is weak in strength.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.02.01 Compare and contrast the different types of bonds.*

*Section: 02.02*

*Topic: Chemistry*

14. A hydrogen bond
- A. is generally a strong bond.
  - B. does not occur in living organisms.
  - C.** does not require electron transfer.
  - D. forms between atoms having the same electronegativity.
  - E. is a specialized type of covalent bond.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.02.01 Compare and contrast the different types of bonds.*

*Section: 02.02*

*Topic: Chemistry*

15. Evaporation is

- A.** the conversion of a liquid into a vapor.
- B. the conversion of a solid into a vapor.
- C. the conversion of a vapor into a liquid.
- D. the conversion of a vapor into a solid.
- E. All answers are correct.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

16. Ice floats on liquid water because

- A. the molecules are closer together in ice than in liquid water.
- B.** the molecules are farther apart in ice than in liquid water.
- C. ice is denser than liquid water.
- D. convection currents caused by temperature differences push upwards on the ice.
- E. water vapor is less dense than liquid water.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

17. In a chemical equation

- A. the reactants are on the right of the yields arrow.
- B. reactants and products are on both sides of the yields arrow.
- C. the products are on the left of the yields arrow.
- D.** the reactants are on the left of the yields arrow.
- E. the number of atoms of each element may differ on the two sides of the yields arrow.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.02.01 Compare and contrast the different types of bonds.*

*Section: 02.02*

*Topic: Chemistry*

18. An acid

- A. has a value above seven on the pH scale.
- B. is a chemical that takes hydrogen ions from a solution.
- C. has a value of seven on the pH scale.
- D.** is a chemical that adds hydrogen ions to a solution.
- E. All answers are correct.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.01 Explain how acids and bases affect pH.*

*Section: 02.04*

*Topic: Chemistry*

19. A base

- A. has a value of 7 on the pH scale.
- B. is a chemical that adds hydrogen ions to a solution.
- C.** is a chemical that absorbs hydrogen ions from a solution.
- D. has a value below 7 on the pH scale.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.01 Explain how acids and bases affect pH.*

*Section: 02.04*

*Topic: Chemistry*

20. A substance with a pH of 2 is
- A. neutral.
  - B. a weak acid.
  - C. a weak base.
  - D. a strong base.
  - E.** a strong acid.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.01 Explain how acids and bases affect pH.*

*Section: 02.04*

*Topic: Chemistry*

21. A substance with a pH of 6 is
- A.** a weak acid.
  - B. neutral.
  - C. a weak base.
  - D. a strong acid.
  - E. a strong base.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.01 Explain how acids and bases affect pH.*

*Section: 02.04*

*Topic: Chemistry*

22. A substance with a pH of 7 is
- A. a weak acid.
  - B. a weak base.
  - C.** neutral.
  - D. a strong acid.
  - E. a strong base.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.01 Explain how acids and bases affect pH.*

*Section: 02.04*

*Topic: Chemistry*

23. A substance with a pH of 8 is
- A. neutral.
  - B.** a weak base.
  - C. a weak acid.
  - D. a strong acid.
  - E. a strong base.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.01 Explain how acids and bases affect pH.*

*Section: 02.04*

*Topic: Chemistry*

24. A substance with a pH of 13 is
- A. a weak acid.
  - B. a weak base.
  - C. neutral.
  - D. a strong acid.
  - E.** a strong base.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.01 Explain how acids and bases affect pH.*

*Section: 02.04*

*Topic: Chemistry*

25. Organic molecules are defined as chemical compounds that contain
- A. hydrophilic solutions.
  - B. isotopes of carbon.
  - C. ionically bonded atoms.
  - D. strong hydrogen bonds.
  - E.** carbon and hydrogen.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.01 Explain the relationship between monomers and polymers.*

*Section: 02.05*

*Topic: Chemistry*

26. The four major groups of organic compounds are
- A. fats, waxes, carbohydrates, and amino acids.
  - B. carbohydrates, lipids, steroids, and monosaccharides.
  - C. lipids, fats, waxes, and steroids.
  - D.** carbohydrates, lipids, proteins, and nucleic acids.
  - E. carbohydrates, proteins, amino acids, and nucleic acids.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.01 Explain the relationship between monomers and polymers.*

*Section: 02.05*

*Topic: Chemistry*

27. A process by which cells build large molecules from monomers is
- A. hydrolysis.
  - B. reproduction.
  - C.** dehydration synthesis.
  - D. hydrolysis and dehydration synthesis.
  - E. unrelated to chemical bonds.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.01 Explain the relationship between monomers and polymers.*

*Section: 02.05*

*Topic: Chemistry*

28. A process by which cells break polymers down into smaller units is
- A.** hydrolysis.
  - B. dehydration synthesis.
  - C. reproduction.
  - D. hydrolysis and dehydration synthesis.
  - E. unrelated to chemical bonds.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

29. Examples of monosaccharides are
- A. cellulose and sucrose.
  - B. lactose and sucrose.
  - C.** glucose and fructose.
  - D. glucose and cellulose.
  - E. None of the answers are correct.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

30. Which of the following is not a lipid?

- A. a triglyceride
- B. a phospholipid
- C. a wax
- D. a sterol
- E.** a starch molecule

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

31. The primary building block (monomer) of proteins is

- A. a glucose molecule.
- B. a fatty acid.
- C. a nucleotide.
- D.** an amino acid.
- E. four interconnected rings.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

32. An amino acid contains
- A. three R groups and a glycerol.
  - B.** nitrogen, carbon, and an R group.
  - C. multiple saccharide rings.
  - D. carbon and phosphorus monomers.
  - E. carbon and phosphorus.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

33. A peptide bond
- A. is an ionic bond in proteins.
  - B. is a covalent bond in carbohydrates.
  - C.** is a covalent bond in proteins.
  - D. is an ionic bond in carbohydrates.
  - E. is a hydrogen bond in nucleic acids.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

34. The primary building block (monomer) of nucleic acids is
- A.** a nucleotide.
  - B. a glucose molecule.
  - C. a fatty acid.
  - D. an amino acid.
  - E. four interconnected carbon rings.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

35. The three major components in a nucleotide are
- A. glucose, a nitrogen base, and a phosphate group.
  - B. glucose, a fatty acid, and glycerol.
  - C. a nitrogen base, a carboxyl group, and an R group.
  - D.** a nitrogen base, a five-carbon sugar, and a phosphate group.
  - E. a carboxyl group, an R group, and an amino group.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

36. The four nitrogenous bases found in RNA are
- A. glycerol, phosphate, adenine, and glucose.
  - B.** adenine, cytosine, guanine, and uracil.
  - C. adenine, thymine, cytosine, and uracil.
  - D. thymine, cytosine, guanine, and uracil.
  - E. adenine, thymine, guanine, and cytosine.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

37. Water is best described as which of the following?
- A. an ion
  - B. a non-polar molecule
  - C. an atom
  - D.** a polar molecule
  - E. an element

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

38. Individual water molecules bind to each other with
- A. covalent bonds.
  - B. ionic bonds.
  - C.** hydrogen bonds.
  - D. hydrophobic bonds.
  - E. peptide bonds.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

39. Within a single molecule of water, \_\_\_\_\_ bonds are formed between oxygen and hydrogen.
- A. ionic
  - B.** covalent
  - C. hydrogen
  - D. hydrophobic
  - E. nuclear

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

40. What do a lemon, a toaster oven, and sand grains have in common?

- A. All are composed of matter and energy.
- B. All are alive.
- C. All are composed of organic molecules.
- D. All are acidic.
- E. All are basic.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.00.01 Explain the chemical nature of biological molecules.*

*Section: 02.01*

*Topic: Chemistry*

41. You can painlessly wade into a pool, but doing a belly flop off of the high diving board hurts because of \_\_\_\_\_.

- A. water's high density
- B. adhesion of your molecules with the water molecules
- C. water's high boiling point
- D. a neutral pH
- E. cohesion of the water molecules

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

42. Trees are able to transport water hundreds of feet up from the roots because of
- A. water's high density.
  - B.** cohesion of the water molecules.
  - C. water's high boiling point.
  - D. adhesion of tree molecules with the water molecules.
  - E. a neutral pH.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

43. Sugars (CH<sub>2</sub>O)<sub>n</sub> dissolve well in water and are therefore called \_\_\_\_\_ substances.
- A. covalent
  - B. ionic
  - C. hydrogen
  - D. hydrophobic
  - E.** hydrophilic

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

44. Blood pH is closely maintained at a pH of 7.4. A patient whose blood pH drops below 7.35 is suffering from metabolic acidosis and can go into a coma. What happens to the concentration of  $H^+$  ions in a patient with a blood pH of 6.4?

- A.  $H^+$  concentration is decreased 10-fold.
- B.  $H^+$  concentration is decreased 2-fold.
- C.  $H^+$  concentration is increased 2-fold.
- D.  $H^+$  concentration is decreased 4-fold.
- E.**  $H^+$  concentration is increased 10-fold.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.04.01 Explain how acids and bases affect pH.*

*Section: 02.04*

*Topic: Chemistry*

Scientists use carbon dating to determine the age of fossils.  $^{14}C$  is a rare isotope of carbon that has a half life of 5730 years and decays into  $^{14}N$ . By measuring the amount of  $^{14}C$  remaining in a fossil, scientists can estimate when the organism died to within 60,000 years. The atomic numbers of C is 6 and of N is 7.

45.  $^{14}C$  and  $^{14}N$  are both

- A.** atoms.
- B. molecules.
- C. compounds.
- D. polymers.
- E. ions.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.02.02 Differentiate between atoms, molecules, and compounds.*

*Section: 02.02*

*Topic: Chemistry*

46. The most common isotope of carbon is  $^{12}\text{C}$ .  $^{14}\text{C}$  has \_\_\_\_\_ than  $^{12}\text{C}$ .
- A. more protons
  - B.** more neutrons
  - C. fewer neutrons
  - D. fewer protons
  - E. more electrons

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.01.02 Describe the structure of atoms.*

*Section: 02.01*

*Topic: Chemistry*

47.  $^{14}\text{C}$  and  $^{14}\text{N}$  have the same
- A. atomic number.
  - B. number of protons.
  - C.** atomic mass.
  - D. number of neutrons.
  - E. number of electrons.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.01.02 Describe the structure of atoms.*

*Section: 02.01*

*Topic: Chemistry*

48. Which of the following is NOT an example of matter?
- A.** wind
  - B. energy
  - C. light
  - D. sound
  - E. None of the answers are correct.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.00.01 Explain the chemical nature of biological molecules.*

*Section: 02.01*

*Topic: Chemistry*

49. Hydrogen, nitrogen, carbon, and oxygen account for 96% of the human body. These elements are

- A. also the main elements in organic molecules.
- B. rare in non-human organisms.
- C. rare on Earth.
- D. always bonded by hydrogen bonds.
- E. All answers are correct.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.01.01 Identify the most important elements in living organisms.*

*Section: 02.01*

*Topic: Chemistry*

50. Many digestive enzymes are hydrolases which carry out hydrolysis. What do these enzymes have in common?

- A. They use water to form bonds between monomers.
- B. They use water to break bonds in monomers.
- C. They use water to break bonds in polymers.
- D. They use water to form bonds between polymers.
- E. They release water in forming bonds between monomers.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.05.01 Explain the relationship between monomers and polymers.*

*Section: 02.05*

*Topic: Chemistry*

51. \_\_\_\_\_ bonds are formed between monomers to form a polymer.

- A. Ionic
- B. Covalent**
- C. Hydrogen
- D. Hydrophobic
- E. Nuclear

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.05.01 Explain the relationship between monomers and polymers.*

*Section: 02.05*

*Topic: Chemistry*

52. Hydrogen has 1 proton, 0 neutrons, and 1 electron. Which of the following is correct about hydrogen?

- A. Hydrogen has an atomic number of 1.
- B. Hydrogen has an atomic number of 2.
- C. Hydrogen has an atomic mass of 2.
- D. Hydrogen has an atomic number and atomic mass of 2.
- E. Hydrogen has an atomic number and atomic mass of 1.**

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.01.02 Describe the structure of atoms.*

*Section: 02.01*

*Topic: Chemistry*

53. Saturated fats have long straight tails of fatty acids, while unsaturated fats have kinks in their tails created by the double bonds. The kinks prevent the fatty acids from packing together as tightly. Ectothermic (cold blooded) animals need to keep their membranes fluid at cooler temperature and thus contain \_\_\_\_\_ their membranes.

- A. mostly unsaturated fats in
- B. mostly saturated fats in
- C. no fatty acids in
- D. a cell wall around
- E. no lipids in

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

54. Saturated fats have long straight tails of fatty acids, while unsaturated fats have kinks in their tails created by the double bonds. The kinks prevent the fatty acids from packing together as tightly. Hydrogenated vegetable oils have hydrogens added back to the double bonds and thus behave like \_\_\_\_.

- A. unsaturated fats
- B. waxes
- C. carbohydrates
- D. protein
- E. saturated fats

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

55. The polymers with the most complex and diverse three-dimensional structures are

- A. saturated fats.
- B. unsaturated fats.
- C.** proteins.
- D. waxes.
- E. carbohydrates.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

56. A nucleotide contains which of the following?

- A. amino acid and nitrogenous bases
- B. saturated and unsaturated fatty acids
- C.** sugar, nitrogenous base, and phosphate
- D. amino acid and saccharide
- E. fatty acid, glycerol, and phosphate

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

57. How are the monomers in proteins joined?

- A. phosphodiester bonds between amino acids
- B.** peptide bonds between amino acids
- C. peptide bonds between nucleotides
- D. phosphodiester bonds between nucleotides
- E. peptide bonds between carbohydrates

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

58. How are the monomers in nucleic acids joined?

- A. peptide bonds between carbohydrates
- B. peptide bonds between amino acids
- C. phosphodiester bonds between amino acids
- D. peptide bonds between nucleotides
- E.** phosphodiester bonds between nucleotides

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

59. In the section "Investigating Life: E. T. and the Origin of Life," which question cannot be explained by evolution?

- A. The diversity of species on Earth
- B. The common ancestry of all species on Earth
- C.** How life started on Earth
- D. The same types of molecules are found in all organisms
- E. The origin of new species

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.06.01 Explain how researchers used isotopes to test hypotheses about the extraterrestrial origin of organic molecules.*

*Section: 02.06*

*Topic: Chemistry*

*Type: Investigating Life*

60. In the section "Investigating Life: E. T. and the Origin of Life," what hypothesis were the scientists testing?

- A. Organic molecules can be made on Earth.
- B. Extraterrestrial life can be detected on meteorites.
- C. Life can be created from a mixture of organic molecules.
- D. Low-oxygen conditions existed on Earth when production of organic molecules first began.
- E.** Meteorites can bring organic molecules from extraterrestrial origins to Earth.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.06.01 Explain how researchers used isotopes to test hypotheses about the extraterrestrial origin of organic molecules.*

*Section: 02.06*

*Topic: Chemistry*

*Type: Investigating Life*

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**TABLE 2.5**  $^{15}\text{N}$  in the Murchison Meteorite

Organic Compound	$^{15}\text{N}$ (parts per thousand) Relative to Standard
Amino acids from the Murchison meteorite	
Glycine	+37
Alanine	+57
Aspartic acid	+61
Glutamic acid	+58
Typical terrestrial organic compounds	-5 to +10

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**TABLE 2.6**  $^{13}\text{C}$  in the Murchison Meteorite

Organic Compound	$^{13}\text{C}$ (parts per thousand) Relative to Standard
Bases from the Murchison meteorite	
Uracil	+44.5
Xanthine	+37.7
Typical terrestrial organic compounds	-110 to 0

61. In the section "Investigating Life: E. T. and the Origin of Life," how did the scientists determine if the organic molecules in the meteorite were extraterrestrial?

- A. By identifying a decrease in  $^{13}\text{C}$  and  $^{15}\text{N}$  in the meteorite compared to terrestrial measurements
- B. By measuring the amount of amino acids in the meteorite
- C. by measuring the amount of nucleotides in the meteorite
- D.** By identifying an increase in  $^{13}\text{C}$  and  $^{15}\text{N}$  in the meteorite compared to terrestrial measurements
- E. By measuring the total amount of carbon and nitrogen in the meteorite

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.06.01 Explain how researchers used isotopes to test hypotheses about the extraterrestrial origin of organic molecules.*

*Section: 02.06*

*Topic: Chemistry*

*Type: Investigating Life*

62. In the section "Investigating Life: E. T. and the Origin of Life," how are  $^{13}\text{C}$  and  $^{15}\text{N}$  different from the more abundant isotopes  $^{12}\text{C}$  and  $^{14}\text{N}$ ?

- A.  $^{13}\text{C}$  and  $^{15}\text{N}$  each have one more neutron more than  $^{12}\text{C}$  and  $^{14}\text{N}$ .
- B.  $^{13}\text{C}$  and  $^{15}\text{N}$  each have one more proton than  $^{12}\text{C}$  and  $^{14}\text{N}$ .
- C.  $^{13}\text{C}$  and  $^{15}\text{N}$  each have one less neutron than  $^{12}\text{C}$  and  $^{14}\text{N}$ .
- D.  $^{13}\text{C}$  and  $^{15}\text{N}$  each have one less proton than  $^{12}\text{C}$  and  $^{14}\text{N}$ .
- E.  $^{13}\text{C}$  and  $^{15}\text{N}$  each have one less electron than  $^{12}\text{C}$  and  $^{14}\text{N}$ .

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.06.01 Explain how researchers used isotopes to test hypotheses about the extraterrestrial origin of organic molecules.*

*Section: 02.06*

*Topic: Chemistry*

*Type: Investigating Life*

63. In the section "Investigating Life: E. T. and the Origin of Life," why were amino acids analyzed for  $^{15}\text{N}$  levels?

- A. Nitrogen is not present in nucleotides or carbohydrates.
- B. Nitrogen is not present in nucleotides or lipids.
- C. Nitrogen is not present in carbohydrates or lipids.
- D. Nitrogen is not present in amino acids or carbohydrates.
- E. Nitrogen is not present in nucleotides or amino acids.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.06.01 Explain how researchers used isotopes to test hypotheses about the extraterrestrial origin of organic molecules.*

*Section: 02.06*

*Topic: Chemistry*

*Type: Investigating Life*

64. In the section "Investigating Life: E. T. and the Origin of Life," which of the following conclusions can be made from the data table?

- A. Glycine is a less abundant amino acid in the meteorite than in terrestrial samples.
- B.**  $^{15}\text{N}$  is more abundant in amino acids from the meteorite than from terrestrial samples.
- C. Amino acids in the meteorite contain more carbon than amino acids from terrestrial samples.
- D.  $^{13}\text{C}$  is more abundant in amino acids from terrestrial samples than from the meteorite.
- E. Uracil is a more abundant amino acid in the meteorite than in terrestrial samples.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.06.01 Explain how researchers used isotopes to test hypotheses about the extraterrestrial origin of organic molecules.*

*Section: 02.06*

*Topic: Chemistry*

*Type: Investigating Life*

65. In the section "Investigating Life: E. T. and the Origin of Life," what is significant about detecting high levels of amino acids, uracil, and xanthine in the meteorite?

- A. The meteorite originated from Earth.
- B. The biological molecules contaminated the meteorite when it hit Earth.
- C. Life exists somewhere else in our universe besides Earth.
- D.** Biological molecules are formed outside of Earth.
- E. The meteorite was once living material.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.06.01 Explain how researchers used isotopes to test hypotheses about the extraterrestrial origin of organic molecules.*

*Section: 02.06*

*Topic: Chemistry*

*Type: Investigating Life*

66. What essential function did lipids play in the origin of life?

- A.** the formation of biological membranes
- B. storage of information
- C. catalysis of reactions
- D. formation of a cytoskeleton
- E. anaerobic fermentation

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Learning Outcome: 02.06.01 Explain how researchers used isotopes to test hypotheses about the extraterrestrial origin of organic molecules.*

*Section: 02.05*

*Topic: Chemistry*

### **True / False Questions**

67. A peptide bond is a covalent bond formed between amino acids.

**TRUE**

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.01 Explain the relationship between monomers and polymers.*

*Section: 02.05*

*Topic: Chemistry*

68. Cohesion is a property of water in which water molecules tend to stick together.

**TRUE**

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

69. A substance in which other substances dissolve is called a solute.

**FALSE**

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

70. Ice is less dense than liquid water, allowing organisms in ponds to live underneath the ice at the surface of the water, instead of trapped in the ice at the bottom of the pond.

**TRUE**

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03.01 Explain how the structure of water affects its chemical properties.*

*Section: 02.03*

*Topic: Chemistry*

71. A fatty acid is unsaturated if there is at least one double bond between the carbon atoms in the hydrocarbon chains.

**TRUE**

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

72. The primary function of hemoglobin is to regulate the level of sugar in the blood.

**FALSE**

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

73. If a protein is denatured, its structure has changed enough to make the protein nonfunctional.

**TRUE**

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

74. Proteins store the genetic information of the cell and transmit it to the next generation.

**FALSE**

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.02 Compare and contrast the structures and functions of the four classes of biological molecules.*

*Section: 02.05*

*Topic: Chemistry*

### Multiple Choice Questions

75. Two hydrogen atoms bonded together form

- A. a molecule, but not a compound.
- B. a compound, but not a molecule.
- C. a molecule and a compound.
- D. an atom and a molecule.
- E. an atom, but not a molecule or compound.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.02.02 Differentiate between atoms, molecules, and compounds.*

*Section: 02.02*

*Topic: Chemistry*

76. Two hydrogen atoms and an oxygen atom bonded together form

- A. a molecule, but not a compound.
- B. a compound, but not a molecule.
- C. a molecule and a compound.
- D. an atom and a molecule.
- E. an atom, but not a molecule or compound.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.02.02 Differentiate between atoms, molecules, and compounds.*

*Section: 02.02*

*Topic: Chemistry*

77. Which of the following is an example of a polar covalent bond?

A.  $\text{H}_2$

**B.**  $\text{H}_2\text{O}$

C.  $\text{O}_2$

D. the bond between separate water molecules

E.  $\text{H}_2$  and  $\text{H}_2\text{O}$

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.02.01 Compare and contrast the different types of bonds.*

*Section: 02.02*

*Topic: Chemistry*

### True / False Questions

78. It is biologically important that pure water has a neutral pH, so that it does not alter the internal pH of organisms or pH of ecosystems.

**TRUE**

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.04.01 Explain how acids and bases affect pH.*

*Section: 02.04*

*Topic: Chemistry*

### Multiple Choice Questions

79. Human blood, saliva, tears, bile, and urine are close to neutral. Why is human stomach acid very acidic?

- A.** It must break down eaten polymers into monomers.
- B. It is not acidic in the stomach, but rather strongly basic.
- C. To stomach acid will absorb excess  $H^+$  in the stomach.
- D. The stomach acids will add  $OH^-$  to help digest food.
- E. The stomach acid neutralizes  $H^+$  and  $OH^-$  from the consumed foods.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.04.01 Explain how acids and bases affect pH.*

*Section: 02.04*

*Topic: Chemistry*

Chapter 02 - The Chemistry of Life

**True / False Questions**

80. Nucleic acids are to nucleotides like amino acids are to proteins and monosaccharides are to carbohydrates.

**FALSE**

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.05.01 Explain the relationship between monomers and polymers.*

*Section: 02.05*

*Topic: Chemistry*