

***Biology The Unity and Diversity of Life 14th edition
Starr Test Bank***

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Chapter 02 - Lifes Chemical Basis

Multiple Choice

1. What is the primary reason for the occurrence of mercury in the human body?

- a. It is biologically inactive and dormant.
- b. It provides vital biological functions in trace amounts.
- c. It is needed to kill bacteria.
- d. It is a byproduct of cellular function.
- e. It is consumed through seafood.

ANSWER: e

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.1 Mercury Rising

LEARNING OBJECTIVES: UDOL.STES.16.2.1 - Discuss how mercury poisoning has affected the natural environment and human society.

2. How much mercury can the average human safely consume per day?

- a. 2 micrograms
- b. 7 micrograms
- c. 12 micrograms
- d. 55 micrograms
- e. 90 micrograms

ANSWER: b

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.1 Mercury Rising

LEARNING OBJECTIVES: UDOL.STES.16.2.1 - Discuss how mercury poisoning has affected the natural environment and human society.

3. What is the smallest unit of an element that retains the properties of that element?

- a. atom
- b. compound
- c. ion
- d. molecule
- e. mixture

ANSWER: a

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

4. Which substance is *not* an element?

- a. chlorine
- b. oxygen
- c. carbon
- d. water
- e. hydrogen

ANSWER: d

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DIFFICULTY: Bloom's: Apply

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

5. The atomic number of an atom refers to its ____.

- a. mass or weight
- b. number of protons
- c. number of protons and neutrons
- d. number of neutrons
- e. number of electrons

ANSWER: b

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

6. Isotopes of atoms ____.

- a. have the same number of neutrons but a different number of protons
- b. behave the same chemically and physically but differ biologically from other isotopes
- c. are the same physically and biologically but differ from other isotopes chemically
- d. have the same number of protons but a different number of neutrons
- e. are produced when atoms lose electrons

ANSWER: d

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

7. Which subatomic particles have a negative charge?

- a. neutrons only
- b. protons only
- c. electrons only
- d. both neutrons and protons
- e. both protons and electrons

ANSWER: c

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

8. The nucleus of an atom contains ____.

- a. neutrons and protons
- b. neutrons and electrons
- c. protons and electrons

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- d. protons only
- e. neutrons only

ANSWER: a

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

9. The ____ of an atom have a negative charge.

- a. nuclei
- b. protons
- c. neutrons
- d. ions
- e. electrons

ANSWER: e

DIFFICULTY: Bloom's: Analyze

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

10. The ____ of an atom have no charge.

- a. electrons
- b. protons
- c. neutrons
- d. ions
- e. nuclei

ANSWER: c

DIFFICULTY: Bloom's: Analyze

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

11. The mass number of an atom is determined by the combined masses of its ____.

- a. neutrons and protons
- b. neutrons and electrons
- c. protons and electrons
- d. protons, neutrons, and electrons
- e. neutrons, nucleus, and electrons

ANSWER: a

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

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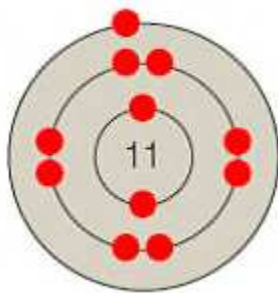


Figure 2.4C

12. Which atom is depicted in the accompanying figure?

- a. hydrogen
- b. sodium
- c. helium
- d. chlorine
- e. oxygen

ANSWER:

b

DIFFICULTY:

Bloom's: Apply

REFERENCES:

2.2 Start with Atoms

PREFACE NAME:

Figure 2.4C

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

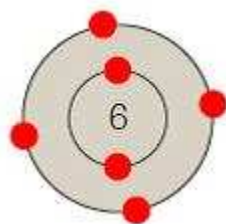


Figure 2.4B

13. Which atom is depicted in the accompanying figure?

- a. hydrogen
- b. helium
- c. carbon
- d. nitrogen
- e. oxygen

ANSWER:

c

DIFFICULTY:

Bloom's: Remember

REFERENCES:

2.2 Start with Atom

PREFACE NAME:

Figure 2.4B

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

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Figure 2.4A

14. Based on its outer shell, the atom in the accompanying figure would be characterized as ____.

- a. very stable
- b. somewhat stable
- c. somewhat unstable
- d. very unstable
- e. radioactive

ANSWER: a

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.3 Why Electrons Matter

PREFACE NAME: Figure 2.4A

LEARNING OBJECTIVES: UDOL.STES.16.2.4 - Examine the characteristics of electrons and their orbitals.

15. All isotopes of an element have a different number of ____.

- a. electrons
- b. protons
- c. neutrons
- d. orbital shells
- e. atoms

ANSWER: c

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

16. In the chemical shorthand, ^{14}C , the 14 represents the number of ____.

- a. excess neutrons
- b. protons plus neutrons
- c. electrons
- d. protons plus electrons
- e. radioactive particles

ANSWER: b

DIFFICULTY: Bloom's: Apply

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

17. Isotopes of an element are differentiated by their ____.

- a. atomic weight
- b. number of orbital shells

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- c. element name
- d. mass number
- e. electron profile

ANSWER: d

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

18. Radioactive isotopes have ____.

- a. excess electrons
- b. excess protons
- c. excess neutrons
- d. insufficient neutrons
- e. insufficient protons

ANSWER: c

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

19. Tracers are elements that ____.

- a. are used in minute amounts in plants
- b. can be monitored through biochemical reactions
- c. must be inert
- d. have an unbalanced electrical charge
- e. must have a stable nucleus

ANSWER: b

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

20. The radioisotope ^{14}C can be used as a research tracer because it ____.

- a. decays to ^{12}C
- b. has a different number of protons than ^{12}C
- c. has fewer neutrons than ^{12}C
- d. behaves the same chemically as ^{12}C
- e. has six carbons and six neutrons

ANSWER: d

DIFFICULTY: Bloom's: Analyze

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

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21. The radioactive decay of ^{14}C produces ____.

- a. carbon 12
- b. carbon 13
- c. more carbon 14
- d. nitrogen 14
- e. oxygen 14

ANSWER: d

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

22. Argon has 18 protons. How many electrons are in its third energy level?

- a. 2
- b. 4
- c. 6
- d. 8
- e. 10

ANSWER: d

DIFFICULTY: Bloom's: Apply

REFERENCES: 2.3 Why Electrons Matter

LEARNING OBJECTIVES: UDOL.STES.16.2.3 - Explain how electrons populate atoms using the shell model.

23. Atoms with a(n) ____ are more likely to form chemical bonds.

- a. filled outer orbital shell
- b. unfilled outer orbital shell
- c. filled inner orbital shell
- d. unfilled inner orbital shell
- e. large number of orbital shells

ANSWER: b

DIFFICULTY: Bloom's: Analyze

REFERENCES: 2.3 Why Electrons Matter

LEARNING OBJECTIVES: UDOL.STES.16.2.4 - Examine the characteristics of electrons and their orbitals.

24. Atoms become ____ in order to achieve a full outer orbital shell.

- a. free radicals
- b. ions
- c. unstable
- d. radioactive
- e. covalents

ANSWER: b

DIFFICULTY: Bloom's: Analyze

REFERENCES: 2.3 Why Electrons Matter

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LEARNING OBJECTIVES: UDOL.STES.16.2.4 - Examine the characteristics of electrons and their orbitals.

25. Nitrogen, with an atomic number of 7, has ____ electron(s) in the first energy level and ____ electrons in the second energy level.

- a. one; six
- b. two; five
- c. three; four
- d. four; three
- e. five; two

ANSWER: b

DIFFICULTY: Bloom's: Apply

REFERENCES: 2.3 Why Electrons Matter

LEARNING OBJECTIVES: UDOL.STES.16.2.4 - Examine the characteristics of electrons and their orbitals.

26. Carbon dioxide is an example of a(n) ____.

- a. atom
- b. ion
- c. compound
- d. mixture
- e. element

ANSWER: c

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.4 Chemical Bonds: From Atoms to Molecules

LEARNING OBJECTIVES: UDOL.STES.16.2.5 - Examine chemical bonds using an example.

27. Which statement is *false*?

- a. A molecule must be made of at least two atoms.
- b. Compounds are made of elements.
- c. Two atoms of oxygen make a molecule of oxygen.
- d. Chemical bonds form between molecules of solute and solvent.
- e. Elements are found in compounds and molecules.

ANSWER: d

DIFFICULTY: Bloom's: Analyze

REFERENCES: 2.4 Chemical Bonds: From Atoms to Molecules

LEARNING OBJECTIVES: UDOL.STES.16.2.5 - Examine chemical bonds using an example.

28. A molecule consists of ____.

- a. radioactive compounds
- b. two or more atoms of the same element
- c. electrically charged elements
- d. elements with one or more extra neutrons
- e. atoms held together by chemical bonds

ANSWER: e

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.4 Chemical Bonds: From Atoms to Molecules

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LEARNING OBJECTIVES: UDOL.STES.16.2.5 - Examine chemical bonds using an example.

29. The bond in table salt (NaCl) is ____.

- a. polar
- b. ionic
- c. covalent
- d. double
- e. nonpolar

ANSWER: b

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.4 Chemical Bonds: From Atoms to Molecules

LEARNING OBJECTIVES: UDOL.STES.16.2.6 - Differentiate between ionic and covalent bonds.

30. In ____ bonds, both atoms exert the same pull on shared electrons.

- a. triple covalent
- b. polar covalent
- c. double covalent
- d. nonpolar covalent
- e. coordinate covalent

ANSWER: d

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.4 Chemical Bonds: From Atoms to Molecules

LEARNING OBJECTIVES: UDOL.STES.16.2.6 - Differentiate between ionic and covalent bonds.

31. In covalent bonds, ____.

- a. atoms share electrons
- b. atoms give up electrons
- c. atoms accept electrons
- d. electrons cannot be shared equally
- e. electrons are always shared equally

ANSWER: a

DIFFICULTY: Bloom's: Analyze

REFERENCES: 2.4 Chemical Bonds: From Atoms to Molecules

LEARNING OBJECTIVES: UDOL.STES.16.2.6 - Differentiate between ionic and covalent bonds.

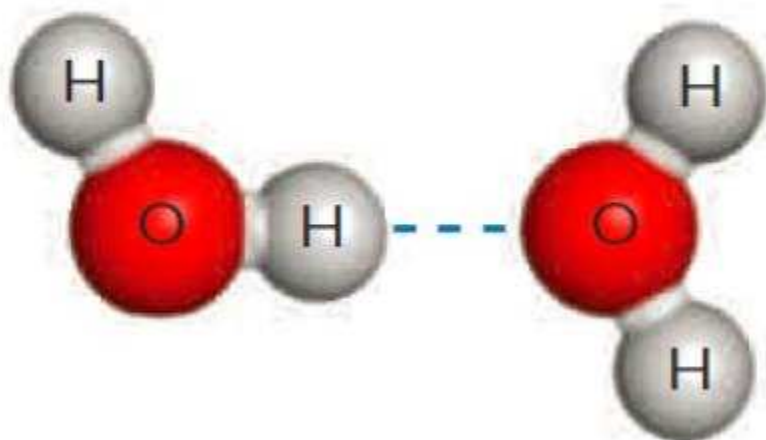


Figure 2.9B

32. The dashed line in the accompanying figure represents a(n) ____.
- a. covalent bond
 - b. ionic bond
 - c. hydrogen bond
 - d. polar covalent bond
 - e. hydrophobic interaction

ANSWER: c

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.5 Hydrogen Bonds and Water

PREFACE NAME: Figure 2.9B

LEARNING OBJECTIVES: UDOL.STES.16.2.7 - Identify the properties of hydrogen bonds.

33. A hydrogen bond is an attraction between a(n) ____ hydrogen atom and another hydrogen atom taking part in ____.
- a. covalently bonded; the same polar covalent bond
 - b. ionically bonded; the same polar covalent bond
 - c. covalently bonded; a separate polar covalent bond
 - d. ionically bonded; a separate nonpolar covalent bond
 - e. nonpolar covalently bonded; a separate nonpolar covalent bond

ANSWER: c

DIFFICULTY: Bloom's: Analyze

REFERENCES: 2.5 Hydrogen Bonds and Water

LEARNING OBJECTIVES: UDOL.STES.16.2.7 - Identify the properties of hydrogen bonds.

34. Water is important to the interactions of biological molecules because it ____.
- a. is a good buffer
 - b. destabilizes temperature
 - c. is a poor solvent for polar and ionic substances
 - d. has weak cohesive properties
 - e. promotes hydrophobic and hydrophilic interactions

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ANSWER: e

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.5 Hydrogen Bonds and Water

LEARNING OBJECTIVES: UDOL.STES.16.2.8 - Describe the properties that hydrogen bonding gives to liquid water.

35. The most likely reason that glucose dissolves in water is that it is ____.

- a. an ionic compound
- b. a polysaccharide
- c. polar and forms many hydrogen bonds with the water molecules
- d. an extremely unstable molecule
- e. highly nonpolar

ANSWER: c

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.5 Hydrogen Bonds and Water

LEARNING OBJECTIVES: UDOL.STES.16.2.8 - Describe the properties that hydrogen bonding gives to liquid water.

36. The solvent, cohesive, and temperature stabilization properties of water are primarily due to its ____.

- a. ability to promote hydrophilic interactions
- b. ionic bonds
- c. hydrogen bonds
- d. ability to promote hydrophobic interactions
- e. nonpolar nature

ANSWER: c

DIFFICULTY: Bloom's: Evaluate

REFERENCES: 2.5 Hydrogen Bonds and Water

LEARNING OBJECTIVES: UDOL.STES.16.2.8 - Describe the properties that hydrogen bonding gives to liquid water.

37. The column of water extending in tubes from plant roots to leaves is maintained by ____.

- a. hydrophilic interactions
- b. ionic bonds
- c. covalent bonds
- d. hydrophobic interactions
- e. cohesion between water molecules

ANSWER: e

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.5 Hydrogen Bonds and Water

LEARNING OBJECTIVES: UDOL.STES.16.2.8 - Describe the properties that hydrogen bonding gives to liquid water.

38. When exposed to water, sodium chloride (NaCl) ____.

- a. dissolves into Na^+ and Cl^- ions
- b. crystallizes into a solid
- c. dissolves into Na^- and Cl^+ ions
- d. crystallizes into a liquid
- e. forms a hydrophobic compound

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ANSWER: a

DIFFICULTY: Bloom's: Analyze

REFERENCES: 2.5 Hydrogen Bonds and Water

LEARNING OBJECTIVES: UDOL.STES.16.2.8 - Describe the properties that hydrogen bonding gives to liquid water.

39. A salt will dissolve in water to form ____.

- a. acids
- b. only hydrogen and oxygen bonds
- c. ions other than H^+ and OH^-
- d. bases
- e. buffers

ANSWER: c

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.5 Hydrogen Bonds and Water

LEARNING OBJECTIVES: UDOL.STES.16.2.8 - Describe the properties that hydrogen bonding gives to liquid water.

40. "Acidic" is an appropriate description for four of the following. Which one is the exception?

- a. excess hydrogen ions
- b. the contents of the stomach
- c. magnesium hydroxide
- d. HCl
- e. a pH less than 7

ANSWER: c

DIFFICULTY: Bloom's: Analyze

REFERENCES: 2.6 Acids and Bases

LEARNING OBJECTIVES: UDOL.STES.16.2.9 - Examine the role played by acids and bases in the normal functioning of biological systems.

41. A solution with a pH of 9 has ____ times fewer hydrogen ions than a solution with a pH of 6.

- a. two
- b. four
- c. 10
- d. 100
- e. 1,000

ANSWER: e

DIFFICULTY: Bloom's: Apply

REFERENCES: 2.6 Acids and Bases

LEARNING OBJECTIVES: UDOL.STES.16.2.9 - Examine the role played by acids and bases in the normal functioning of biological systems.

42. Blood pH is kept near a value of 7.3 - 7.5 because of ____.

- a. salts
- b. buffers
- c. acids
- d. bases

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e. water

ANSWER: b

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.6 Acids and Bases

LEARNING OBJECTIVES: UDOL.STES.16.2.9 - Examine the role played by acids and bases in the normal functioning of biological systems.

Completion

43. Water surface tension is caused by _____ bonds.

ANSWER: hydrogen

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.5 Hydrogen Bonds and Water

LEARNING OBJECTIVES: UDOL.STES.16.2.8 - Describe the properties that hydrogen bonding gives to liquid water.

44. The sharing of two pairs of electrons between two atoms is called a(n) _____.

ANSWER: double bond

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.4 Chemical Bonds: From Atoms to Molecules

LEARNING OBJECTIVES: UDOL.STES.16.2.5 - Examine chemical bonds using an example.

45. ^{14}C is a radioactive isotope, and it turns into _____ when it decays.

ANSWER: nitrogen

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

46. The predictable rate of _____ allows tracers to be used in research studies.

ANSWER: decay
radioactive decay

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.2 Start with Atoms

LEARNING OBJECTIVES: UDOL.STES.16.2.2 - Examine the characteristics of atoms and their radioactive isotopes using examples.

47. The ability of a solution to resist changes in pH depends on its _____ capacity.

ANSWER: buffering

DIFFICULTY: Bloom's: Remember

REFERENCES: 2.6 Acids and Bases

LEARNING OBJECTIVES: UDOL.STES.16.2.9 - Examine the role played by acids and bases in the normal functioning of biological systems.

Matching

Classification. The various energy levels in an atom of magnesium (^{24}Mg) have different numbers of electrons. Use the

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numbers below to answer the following questions.

- a. 1
- b. 2
- c. 3
- d. 6
- e. 8

DIFFICULTY: Bloom's: Apply

REFERENCES: 2.3 Why Electrons Matter

LEARNING OBJECTIVES: UDOL.STES.16.2.3 - Explain how electrons populate atoms using the shell model.

48. The number of electrons in the first energy level

ANSWER: b

49. The number of electrons in the third energy level

ANSWER: b

50. The number of electrons in the second energy level

ANSWER: e

Classification. The following are types of chemical bonds. Answer the questions below by matching the descriptions with the most appropriate bond type.

- a. hydrogen
- b. ionic
- c. covalent
- d. polar covalent
- e. double bond

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.4 Chemical Bonds: From Atoms to Molecules

LEARNING OBJECTIVES: UDOL.STES.16.2.6 - Differentiate between ionic and covalent bonds.

51. The bond between the atoms of table salt (NaCl)

ANSWER: b

52. The bond type holding several molecules of water together

ANSWER: a

53. The bond between the oxygen atoms of oxygen gas (O₂)

ANSWER: e

54. The bond that breaks when salts dissolve in water

ANSWER: b

55. A bond in which connected atoms share electrons

ANSWER: c

56. A bond in which connected atoms unequally share electrons

ANSWER: d

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Classification. The following are important terms relating to water's special properties. Answer the questions below by matching the descriptions with the most appropriate word.

- a. hydrophobic
- b. hydrophilic
- c. salt
- d. solute
- e. solvent

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.5 Hydrogen Bonds and Water

LEARNING OBJECTIVES: UDOL.STES.16.2.7 - Identify the properties of hydrogen bonds.

57. A dissolved substance

ANSWER: d

58. A substance that dissolves in water

ANSWER: b

59. A liquid that dissolves other substances

ANSWER: e

60. A compound that releases ions when dissolved in water

ANSWER: c

61. A substance that does not dissolve in water

ANSWER: a

Classification. The following are important terms relating to acids and bases. Answer the questions below by matching the descriptions with the most appropriate word.

- a. pH
- b. acid
- c. base
- d. buffer

DIFFICULTY: Bloom's: Understand

REFERENCES: 2.6 Acids and Bases

LEARNING OBJECTIVES: UDOL.STES.16.2.9 - Examine the role played by acids and bases in the normal functioning of biological systems.

62. Substance that accepts, but does not release, H^+

ANSWER: c

63. Lemon juice

ANSWER: b

64. Substance that releases, but does not accept, H^+

ANSWER: b

65. Set of chemicals that stabilizes pH

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ANSWER: d

66. Measure of H^+ in a fluid

ANSWER: a

67. Toothpaste

ANSWER: c