Chapter 02 - Life - Chemistry - and Water

Modified True / False

1. The four elements that make up more than 96% of the weight of living organisms are oxygen, carbon, hydrogen and calcium.

ANSWER: False - oxygen, carbon, hydrogen and nitrogen
REFERENCES: 2.1 The Organization of Matter: Elements and Atoms
QUESTION TYPE: Modified True / False
LEARNING OBJECTIVES: DYNS.RUSS.17.02.1.1 - Describe the elemental composition of living organisms.
KEYWORDS: Bloom's: Remember

2. Carbon dioxide is an element.

ANSWER: False - a compound
REFERENCES: 2.1 The Organization of Matter: Elements and Atoms
QUESTION TYPE: Modified True / False
LEARNING OBJECTIVES: DYNS.RUSS.17.02.1.2 - Describe atoms, molecules, elements, and compounds.
KEYWORDS: Bloom's: Understand

3. Hydrogen, atomic number 1, has 3 isotopes, ^{1}H, ^{2}H, ^{3}H. ^{1}H is comprised of one proton, one neutron and one electron.

ANSWER: False - one proton, one electron and no neutrons
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Modified True / False
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Apply

4. Atoms with atomic numbers between lithium and neon have two energy levels.

ANSWER: True
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Modified True / False
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.2 - Illustrate the arrangement of electrons around an atomic nucleus.
KEYWORDS: Bloom's: Remember

5. In the representation of hydrogen gas, H-H, the dash represents two electrons being shared equally.

ANSWER: True
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Modified True / False
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.1 - Compare ionic, covalent, and hydrogen bonds.
KEYWORDS: Bloom's: Apply

6. Proteins in thermophiles must be stabilized by van der Waals forces, because hydrogen bonds cannot be maintained at high temperatures

ANSWER: True
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Modified True / False
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.3 - Describe van der Waals forces.
KEYWORDS: Bloom's: Remember

7. Ice floats in liquid water because there are, on average, fewer hydrogen bonds between molecules in ice than water, resulting in a lower density.

ANSWER: False - more
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Modified True / False
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Understand

8. The polarity of water allows it to create a hydration layer that prevents salt from coming back out of solution after it has been dissolved.

ANSWER: True
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Modified True / False
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.2 - Discuss how molecular polarity contributes to the properties of water.
KEYWORDS: Bloom's: Remember

9. Acid precipitation can have a pH as low as 3.

ANSWER: True
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Modified True / False
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.2 - Describe the pH scale.
KEYWORDS: Bloom's: Remember

10. Buffers can increase the pH of a solution when acids are added.

ANSWER: False - maintain
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Modified True / False
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.3 - Discuss the role of buffers in biological systems.
KEYWORDS: Bloom's: Understand

Multiple Choice

11. Four elements, including ____, make up more than 96% of the mass of most living organisms.

a. sodium
b. potassium
c. phosphorus
d. nitrogen
e. calcium

ANSWER: d
REFERENCES: 2.1 The Organization of Matter: Elements and Atoms
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.1.1 - Describe the elemental composition of living organisms.
KEYWORDS: Bloom's: Remember

12. A trace element is one found in specific organisms in ____ quantities and is ____ for normal biological functions.
    a. moderate; unnecessary
    b. moderate; vital
    c. small; unnecessary
    d. large; unnecessary
    e. small; vital

ANSWER: e
REFERENCES: 2.1 The Organization of Matter: Elements and Atoms
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.1.1 - Describe the elemental composition of living organisms.
KEYWORDS: Bloom's: Remember

13. Prolonged iodine deficiency causes ____, a condition in which the thyroid gland enlarges so much that the front of the neck swells significantly.
    a. gout
    b. cancer
    c. a goiter
    d. anemia
    e. granuloma

ANSWER: c
REFERENCES: 2.1 The Organization of Matter: Elements and Atoms
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.1.1 - Describe the elemental composition of living organisms.
KEYWORDS: Bloom's: Remember

14. The smallest unit that retains the chemical and physical properties of an element is a(n) ____.
    a. proton
    b. compound
    c. molecule
    d. neutron
    e. atom

ANSWER: e
REFERENCES: 2.1 The Organization of Matter: Elements and Atoms
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.1.2 - Describe atoms, molecules, elements, and compounds.
KEYWORDS: Bloom's: Remember

15. The substance H_2O is considered to be ____.
    a. both a molecule and a compound
    b. a compound but not a molecule
    c. neither a molecule nor a compound
    d. a molecule but not a compound
    e. both a molecule and an ion

ANSWER: a
REFERENCES: 2.1 The Organization of Matter: Elements and Atoms
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.1.2 - Describe atoms, molecules, elements, and compounds.
KEYWORDS: Bloom's: Apply

16. The substance O_2 is considered to be ____.
    a. both a molecule and a compound
    b. a compound but not a molecule
    c. neither a molecule nor a compound
    d. a molecule but not a compound
    e. both a molecule and an ion

ANSWER: d
REFERENCES: 2.1 The Organization of Matter: Elements and Atoms
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.1.2 - Describe atoms, molecules, elements, and compounds.
KEYWORDS: Bloom's: Apply

17. Diluted acetic acid, CH_3COOH, is commonly called vinegar. How many atoms of hydrogen are present in one molecule of acetic acid?
    a. one
    b. two
    c. three
    d. four
    e. five

ANSWER: d
REFERENCES: 2.1 The Organization of Matter: Elements and Atoms
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.1.2 - Describe atoms, molecules, elements, and compounds.
KEYWORDS: Bloom's: Apply

18. Radioactive ____ is commonly used to treat patients with dangerously overactive thyroid glands.
    a. carbon
    b. radium
    c. iodine
    d. thallium
    e. cobalt

ANSWER: c
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Remember

19. An oxygen atom has ____ surrounding a nucleus composed of ____.
    a. neutrons; electrons and protons
    b. electrons; protons and neutrons
    c. protons and electrons; neutrons
    d. protons; neutrons and electrons
    e. electrons and neutrons; protons

ANSWER: b
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Remember

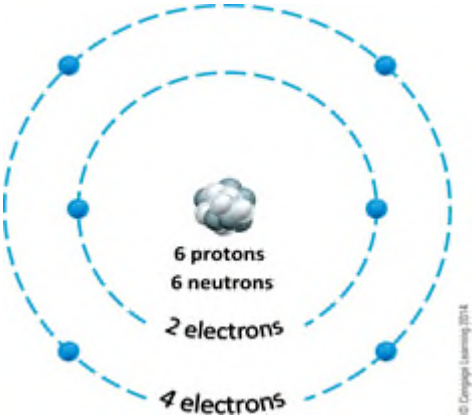

Figure 2.1

20. Answer the question using the accompanying figure. The mass number of the atom depicted in the figure is ____.
    a. 4
    b. 6
    c. 8
    d. 12
    e. 18

ANSWER: d
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
PREFACE NAME: Figure 2.1
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Analyze

21. Answer the question using the accompanying figure. The atomic number of the atom depicted in the figure is ____.
    a. 4
    b. 6
    c. 8
    d. 12
    e. 18

ANSWER: b
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
PREFACE NAME: Figure 2.1
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Analyze

22. Answer the question using the accompanying figure. The atom depicted in this figure can form ____ covalent bonds with another atom.

a. 0
b. 2
c. 4
d. 3
e. 6

ANSWER: c
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
PREFACE NAME: Figure 2.1
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Analyze

23. Which of the three atomic particles are charged?

a. electrons and protons
b. neutrons only
c. protons and neutrons
d. electrons only
e. protons, neutrons, and electrons

ANSWER: a
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Remember

24. Isotopes of the same element differ from each other in the number of ____.

a. electrons and protons
b. neutrons only
c. protons and neutrons
d. electrons only
e. protons, neutrons, and electrons

ANSWER: b
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice

LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Understand

25. A carbon atom with six protons, seven neutrons, and six electrons has a mass number of ____.

a. 6
b. 7
c. 12
d. 13
e. 19

ANSWER: d
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Apply

26. 14C is heavier than ^{12}C because it has ____.

a. two more electrons than ^{12}C
b. two more neutrons than ^{12}C
c. two more protons than ^{12}C
d. two more protons and two more electrons than ^{12}C
e. one more proton and one more neutron than ^{12}C

ANSWER: b
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Apply

27. When the isotope ^{14}C undergoes radioactive decay, a neutron splits into an electron and a proton, with ejection of the electron. This decay produces an atom of ____.

a. iron
b. carbon
c. hydrogen
d. oxygen
e. nitrogen

ANSWER: e
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS: Bloom's: Remember

28. An orbital describes the ____ of an electron.

a. exact location
b. exact path
c. most frequent locations
d. charge
e. chemical bonds

ANSWER: c
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.2 - Illustrate the arrangement of electrons around an atomic nucleus.
KEYWORDS: Bloom's: Remember

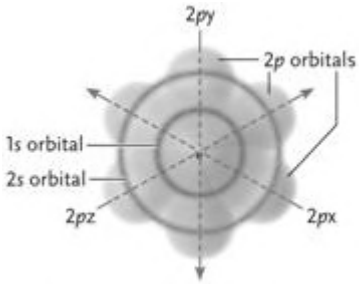

Figure 2.2

29. Answer the question using the accompanying figure. The electrons at the lowest energy level in the neon atom depicted are found in which orbital?

a. 1*s*
b. 2*s*
c. 2*p*x
d. 2*p*y
e. 2*p*z

ANSWER: a
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
PREFACE NAME: Figure 2.2
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.2 - Illustrate the arrangement of electrons around an atomic nucleus.
KEYWORDS: Bloom's: Understand

30. Answer the question using the accompanying figure. All of the orbitals shown in the neon atom are completely filled with electrons. How many electrons does this neon atom have?

a. 5
b. 6
c. 8
d. 10
e. 16

ANSWER: d
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice

PREFACE NAME: Figure 2.2
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.2 - Illustrate the arrangement of electrons around an atomic nucleus.
KEYWORDS: Bloom's: Evaluate

31. Sodium has one valence electron in its third energy level. To reach a stable energy configuration, sodium will tend to____.

a. take up an electron from another atom
b. move its valence electron to the second energy shell
c. give up an electron to another atom
d. share its valence electron with another atom
e. move an electron from the second energy level to the valence shell

ANSWER: c
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.3 - Explain how electrons determine the chemical properties of atoms.
KEYWORDS: Bloom's: Apply

32. Which element is most likely to share electrons with other atoms in joint orbitals?

a. chlorine (7 valence electrons)
b. calcium (2 valence electrons)
c. argon (8 valence electrons)
d. carbon (4 valence electrons)
e. potassium (1 valence electron)

ANSWER: d
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.3 - Explain how electrons determine the chemical properties of atoms.
KEYWORDS: Bloom's: Analyze

33. Which element is likely to be chemically unreactive?

a. chlorine (7 valence electrons)
b. calcium (2 valence electrons)
c. argon (8 valence electrons)
d. carbon (4 valence electrons)
e. potassium (1 valence electron)

ANSWER: c
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.3 - Explain how electrons determine the chemical properties of atoms.
KEYWORDS: Bloom's: Analyze

34. Which element is most likely to accept an electron from another atom?

a. chlorine (7 valence electrons)
b. calcium (2 valence electrons)
c. neon (8 valence electrons)

d. carbon (4 valence electrons)
e. potassium (1 valence electron)

ANSWER: a
REFERENCES: 2.2 Atomic Structure
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.2.3 - Explain how electrons determine the chemical properties of atoms.
KEYWORDS: Bloom's: Analyze

35. The attraction between Na^+ cations and Cl^- anions form ____ that hold the ions together in the compound NaCl.
a. polar covalent bonds
b. van der Waals forces
c. ionic bonds
d. hydrogen bonds
e. nonpolar covalent bonds

ANSWER: c
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.1 - Compare ionic, covalent, and hydrogen bonds.
KEYWORDS: Bloom's: Understand

36. Metallic ions such as Ca^{2+}, Na^+, and Fe^{3+} readily form ____.
a. polar covalent bonds
b. van der Waals forces
c. ionic bonds
d. hydrogen bonds
e. nonpolar covalent bonds

ANSWER: c
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.1 - Compare ionic, covalent, and hydrogen bonds.
KEYWORDS: Bloom's: Remember

37. The chemical bonds that are formed when atoms share electrons equally are called ____.
a. polar covalent bonds
b. van der Waals forces
c. ionic bonds
d. hydrogen bonds
e. nonpolar covalent bonds

ANSWER: e
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.1 - Compare ionic, covalent, and hydrogen bonds.
KEYWORDS: Bloom's: Remember

38. Electronegativity is the tendency of an atom to attract ____ to itself in a chemical bond.
    a. neutrons
    b. protons
    c. electrons
    d. delta forces
    e. polar associations

ANSWER: c
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.1 - Compare ionic, covalent, and hydrogen bonds.
KEYWORDS: Bloom's: Understand

39. The chemical linkages that exert an attractive force over the greatest distance are ____.
    a. polar covalent bonds
    b. van der Waals forces
    c. ionic bonds
    d. hydrogen bonds
    e. nonpolar covalent bonds

ANSWER: c
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.1 - Compare ionic, covalent, and hydrogen bonds.
KEYWORDS: Bloom's: Remember

40. Chemical bonds that are formed when one atom with a partial positive charge (created from unequal sharing of electrons) is electrically attracted to another atom with a partial negative charge (also created from unequal sharing of electrons) are called ____.
    a. polar covalent bonds
    b. van der Waals forces
    c. ionic bonds
    d. hydrogen bonds
    e. nonpolar covalent bonds

ANSWER: d
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.2 - Discuss polar and nonpolar bonds and molecular associations.
KEYWORDS: Bloom's: Remember

41. Molecules such as H-H and O=O are held together by ____.
    a. polar covalent bonds
    b. van der Waals forces
    c. ionic bonds
    d. hydrogen bonds
    e. nonpolar covalent bonds

ANSWER: e

REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.2 - Discuss polar and nonpolar bonds and molecular associations.
KEYWORDS: Bloom's: Analyze

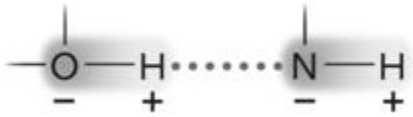

Figure 2.3

42. Answer the question using the accompanying figure. The molecule shown is held together by ____.
    a. polar covalent bonds
    b. van der Waals forces
    c. ionic bonds
    d. hydrogen bonds
    e. nonpolar covalent bonds

ANSWER: d
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
PREFACE NAME: Figure 2.3
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.2 - Discuss polar and nonpolar bonds and molecular associations.
KEYWORDS: Bloom's: Apply

43. A polar covalent bond would be most likely to form between ____.
    a. atoms with different electronegativities
    b. cations and anions
    c. atoms with partial positive and partial negative charges
    d. atoms with filled valence shells
    e. atoms of the same element

ANSWER: a
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.2 - Discuss polar and nonpolar bonds and molecular associations.
KEYWORDS: Bloom's: Understand

44. Which type of chemical linkage is the weakest?
    a. polar covalent bonds
    b. van der Waals forces
    c. ionic bonds
    d. hydrogen bonds
    e. nonpolar covalent bonds

ANSWER: b
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.3 - Describe van der Waals forces.

KEYWORDS: Bloom's: Remember

45. Geckos are able to cling to vertical walls due to ____.
    a. polar covalent bonds
    b. van der Waals forces
    c. ionic bonds
    d. hydrogen bonds
    e. nonpolar covalent bonds

ANSWER: b
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.3 - Describe van der Waals forces.
KEYWORDS: Bloom's: Remember

46. In contrast to ionic bonds, covalent bonds ____.
    a. hold atoms together
    b. have distinct, three-dimensional forms
    c. transfer electrons from one atom to another
    d. are rarely broken
    e. are transient

ANSWER: b
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.4 - Explain the role of chemical bonds in chemical reactions and determining molecular shape.
KEYWORDS: Bloom's: Remember

47. In a molecule of methane, CH_4, each hydrogen atom shares an orbital with the carbon atom. The total number of shared electrons in CH_4 is ____.
    a. 1
    b. 2
    c. 4
    d. 5
    e. 8

ANSWER: e
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.4 - Explain the role of chemical bonds in chemical reactions and determining molecular shape.
KEYWORDS: Bloom's: Analyze

48. In the presence of water, nonpolar associations form between molecules or regions of molecules that are ____.
    a. partially charged
    b. hydrophobic and hydrophilic
    c. hydrophobic

d. fully charged
e. hydrophilic

ANSWER: c
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.4 - Explain the role of chemical bonds in chemical reactions and determining molecular shape.
KEYWORDS: Bloom's: Understand

49. A mixture of vegetable oil and water will separate into layers because oil is ____ and forms ____.
a. hydrophobic; nonpolar associations
b. hydrophilic; nonpolar associations
c. hydrophilic; polar associations
d. hydrophobic; polar associations
e. hydrophobic; ionic associations

ANSWER: a
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.4 - Explain the role of chemical bonds in chemical reactions and determining molecular shape.
KEYWORDS: Bloom's: Apply

50. The formation and breaking of bonds between atoms requires ____.
a. a chemical reaction
b. van der Walls forces
c. partial charges
d. an empty valence shell
e. an enzyme

ANSWER: a
REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.4 - Explain the role of chemical bonds in chemical reactions and determining molecular shape.
KEYWORDS: Bloom's: Remember

51. A molecule of water in the middle of a chunk of ice will usually have ____ hydrogen bonds with other water molecules.
a. 2
b. 3
c. 3.4
d. 4
e. 6

ANSWER: d
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice

LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Remember

52. Which substance would have the most difficulty entering a water lattice?
a. table salt (NaCl)
b. a nonpolar molecule
c. a sodium ion
d. a proton (H^+)
e. an electron
ANSWER: b
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Apply

53. Water has an unusually high boiling point for its molecular weight because water molecules ____.
a. are very dense
b. get much heavier as they are heated
c. are held to each other by hydrogen bonds
d. are held together by covalent bonds
e. form hydration layers
ANSWER: c
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Understand

54. The hydrogen-bond lattice causes water to have an unusually ____ specific heat, an unusually ____ heat of vaporization and an unusually ____ density in solid form.
a. high; high; high
b. low; low; low
c. high; low; high
d. high; high; low
e. low; low; high
ANSWER: d
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Understand

55. Water has an important stabilizing effect on temperature in living organisms and their environments because as water

absorbs heat, much of the energy is used to ____ instead of raising the temperature.

a. create hydrogen bonds
b. create covalent bonds
c. break surface tension
d. break hydrogen bonds
e. create hydration layers

ANSWER: d
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Remember

http://www.flickr.com/photos/alasdair_thomson/

56. The water strider shown in the figure above is able to stand on water because of the ____ of water.

a. covalent bonds
b. surface tension
c. van der Waals forces
d. density
e. hydration layer

ANSWER: b
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
PREFACE NAME: Figure 2.4
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Remember

57. When water molecules exposed to the air form hydrogen bonds between adjacent water molecules below and beside them, molecules in the upper layer become more resistant to separating from those underneath. This property of water is known as ____.

a. cohesion
b. adhesion
c. a hydration layer
d. a water lattice
e. surface tension

ANSWER: e
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Remember

58. How many calories, as defined in chemistry, are in one calorie, which is the unit used to quantify the amount of energy in the food we eat?

a. 10
b. 100
c. 1,000
d. 10,000
e. 100,000

ANSWER: c
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Remember

59. Multiple hydrogen bonds together stabilize proteins into a spiral structure called a ____.

a. water lattice

b. alpha helix
c. chemical groups
d. delta minus
e. delta plus

ANSWER: b
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Understand

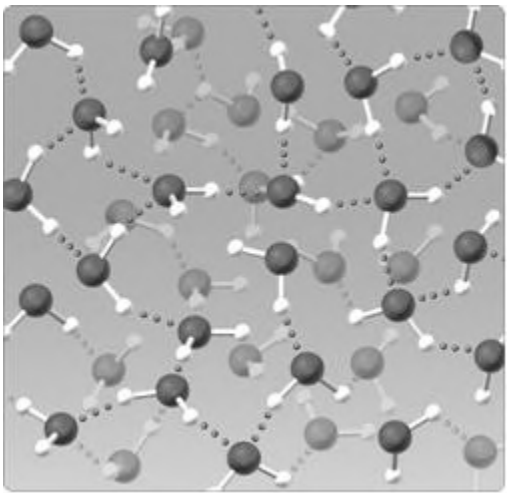

Figure 2.5

60. The water lattice illustrated in the figure above forms as a result of ____ between water molecules.
a. covalent bonds
b. hydrogen bonds
c. nonpolar interactions
d. ionic bonds
e. van der Walls forces

ANSWER: b
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
PREFACE NAME: Figure 2.5
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.
KEYWORDS: Bloom's: Remember

61. Biological membranes are held together mainly by ____.
a. hydrogen bonds between lipid molecules
b. hydration layers over lipid molecules
c. exclusion of the nonpolar regions of lipids by water
d. hydrogen bonds between water molecules
e. surface tension at the interface between layers of water molecules

ANSWER: c
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.2 - Discuss how molecular polarity contributes to the properties of water.
KEYWORDS: Bloom's: Understand

62. A ____ is formed when a ____ is dissolved in a ____.
    a. solution; solute; solvent
    b. solute; solvent; solution
    c. solution; solvent; solute
    d. solvent; solution; solute
    e. solvent; solute; solution

ANSWER: a
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.2 - Discuss how molecular polarity contributes to the properties of water.
KEYWORDS: Bloom's: Remember

63. When sugar dissolves in water, water is acting as a ____ and the sugar molecules are acting as ____.
    a. solution; solvents
    b. solute; solutions
    c. solvent; solutes
    d. solute; solvents
    e. solvent; solutions

ANSWER: c
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.2 - Discuss how molecular polarity contributes to the properties of water.
KEYWORDS: Bloom's: Apply

64. When salt dissolves in water, the water molecules form ____ around the Na^+ and Cl^- ions.
    a. covalent bonds
    b. hydration layers
    c. nonpolar interactions
    d. membranes
    e. ionic bonds

ANSWER: b
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.2 - Discuss how molecular polarity contributes to the properties of water.
KEYWORDS: Bloom's: Understand

65. Water has a molecular weight of 18 g per mole, and glucose has a molecular weight of 180 g per mole. Which masses of water and glucose would have an approximately equal number of molecules?

a. 1 g of water and 180 g of glucose
b. 90 g of water and 9 g of glucose
c. 180 g of water and 1 g of glucose
d. 9 g of water and 90 g of glucose
e. 90 g of water and 90 g of glucose

ANSWER: d
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.2 - Discuss how molecular polarity contributes to the properties of water.
KEYWORDS: Bloom's: Analyze

66. Avogadro's number represents the ____.

a. number of grams in a mole of substance
b. number of moles in a gram of substance
c. number of atoms in one gram of substance
d. atomic weight of an atom divided by the weight of an atom of that element
e. weight of an atom of an element divided by the atomic weight of that element

ANSWER: d
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.2 - Discuss how molecular polarity contributes to the properties of water.
KEYWORDS: Bloom's: Remember

67. Ethanol, the alcohol found in wine and beer, has the molecular formula CH_3CH_2OH. What is the molecular weight of ethanol if the atomic weight of C=12, H=1 and O=16?

a. 29 g/mol
b. 30 g/mol
c. 34 g/mol
d. 45 g/mol
e. 46 g/mol

ANSWER: e
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.2 - Discuss how molecular polarity contributes to the properties of water.
KEYWORDS: Bloom's: Remember

68. The most common isotope of carbon has an atomic number of 6 and a mass number of 12, while the most common isotope of oxygen has an atomic number of 8 and a mass number of 16. A molecule of CO_2 made up of these common isotopes has a molecular weight of ____.

a. 28
b. 44
c. 56
d. 14
e. 22

ANSWER: b
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.2 - Discuss how molecular polarity contributes to the properties of water.
KEYWORDS: Bloom's: Analyze

69. When added to water, a base will act as a(n) ____ and cause the pH of the solution to ____.
a. proton acceptor; rise
b. proton donor; rise
c. proton acceptor; fall
d. proton donor; fall
e. acid; fall

ANSWER: a
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.1 - Compare acids and bases.
KEYWORDS: Bloom's: Apply

70. When added to water at neutral pH (7.0), an acid will ____.
a. act as a proton donor, raising the pH of the solution
b. act as a proton acceptor, raising the pH of the solution
c. act as a proton donor, lowering the pH of the solution
d. act as a proton acceptor, lowering the pH of the solution
e. do nothing since the aqueous solution is neutral

ANSWER: c
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.1 - Compare acids and bases.
KEYWORDS: Bloom's: Apply

71. In water, NaOH almost completely separates into Na^+ and OH^- ions. Thus, NaOH is _____.
a. a strong acid
b. a strong base
c. a weak acid
d. a weak base
e. neutral

ANSWER: b
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers

QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.1 - Compare acids and bases.
KEYWORDS: Bloom's: Apply

72. Seawater typically is ____.
a. highly basic
b. neutral
c. somewhat basic
d. somewhat acidic
e. highly basic

ANSWER: c
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.1 - Compare acids and bases.
KEYWORDS: Bloom's: Remember

73. A pH of 6 is ____ times more ____ than a pH of 2.
a. 3; acidic
b. 4; acidic
c. 3; basic
d. 10,000; basic
e. 40; basic

ANSWER: d
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.2 - Describe the pH scale.
KEYWORDS: Bloom's: Apply

74. Pure water has a pH of 7.0, therefore, ____.
a. $[H^+] < [OH^-]$
b. $[H^+] = [OH^-]$
c. $[H^+] = 0$
d. $[OH^-] = 0$
e. $[H^+] > [OH^-]$

ANSWER: b
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.2 - Describe the pH scale.
KEYWORDS: Bloom's: Remember

75. Lemon juice has a pH of 2.0, therefore, ____.
a. $[H^+] < [OH^-]$
b. $[H^+] = [OH^-]$

c. $[H^+] = 0$

d. $[OH^-] = 0$

e. $[H^+] > [OH^-]$

ANSWER: e
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.2 - Describe the pH scale.
KEYWORDS: Bloom's: Understand

76. Solution A has a pH of 6 and solution B has a pH of 8. Therefore, ____.

a. A has 10 times greater H^+ concentration than B.

b. B has 10 times greater H^+ concentration than A.

c. A has 100 times greater H^+ concentration than B.

d. B has 100 times greater H^+ concentration than A.

e. A has 1,000 times greater H^+ concentration than B.

ANSWER: c
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.2 - Describe the pH scale.

77. Without ____, living organisms would often experience major changes in pH in their cells.

a. buffers
b. acids
c. surface tension
d. nonpolar bonds
e. bases

ANSWER: a
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.3 - Discuss the role of buffers in biological systems.
KEYWORDS: Bloom's: Remember

78. Most pH buffers are ____.

a. strong acids
b. weak acids or weak bases
c. weak acids
d. strong bases
e. strong acids or strong bases

ANSWER: b
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.3 - Discuss the role of buffers in biological systems.

KEYWORDS: Bloom's: Remember

79. Consider the equilibrium established in the carbonic acid-bicarbonate buffer system, which maintains pH balance in mammalian blood:

$H_2CO_3 \rightarrow HCO3- + H+$

During hypoventilation, breathing rate decreases, and therefore elimination of CO2 during exhalation decreases. How is optimal blood pH maintained when acid levels increase in our blood from hypoventilating?

a. excess H+ from the acid react with H_2CO_3 to decrease pH level

b. excess H+ from the acid react with H_2CO_3 to increase pH level

c. excess H+ from the acid react with H_2CO_3 to maintain pH level

d. excess H+ from the acid react with HCO3- to increase pH level

e. excess H+ from the acid react with HCO3- to maintain pH level

ANSWER: e
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.3 - Discuss the role of buffers in biological systems.
KEYWORDS: Bloom's: Evaluate

80. High levels of carbon dioxide in the atmosphere are causing ____.

a. the pH of the ocean to increase

b. the pH of the ocean to decrease

c. the natural buffers in the ocean to die

d. increased calcification of the coral reefs

e. increased biodiversity in coral reefs

ANSWER: b
REFERENCES: 2.5 Water Ionization and Acids, Bases, and Buffers
QUESTION TYPE: Multiple Choice
LEARNING OBJECTIVES: DYNS.RUSS.17.02.5.3 - Discuss the role of buffers in biological systems.
KEYWORDS: Bloom's: Remember

Matching

Match each of the following terms with its correct definition.

a. Anything that occupies space and has mass

b. A pure substance that cannot be broken down into simpler substances by ordinary chemical or physical techniques

c. An atom with the same number of protons as another atom but a different number of neutrons

d. The locations around an atomic nucleus where an electron occurs most frequently

e. A molecule whose component atoms are different from each other

REFERENCES: 2.1 The Organization of Matter: Elements and Atoms
2.3 Chemical Bonds and Chemical Reactions
2.2 Atomic Structure
QUESTION TYPE: Matching
LEARNING OBJECTIVES: DYNS.RUSS.17.02.1.2 - Describe atoms, molecules, elements, and compounds.
DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.

DYNS.RUSS.17.02.3.1 - Compare ionic, covalent, and hydrogen bonds.
DYNS.RUSS.17.2.2.2 - Illustrate the arrangement of electrons around an atomic nucleus.

KEYWORDS: Bloom's: Remember

81. element
ANSWER: b

82. compound
ANSWER: e

83. matter
ANSWER: a

84. orbital
ANSWER: d

85. isotope
ANSWER: c

For each of the following situations, choose the correct type of chemical bond. Some choices may be used more than once.

a. ionic bonds
b. nonpolar covalent bonds
c. polar covalent bonds
d. hydrogen bonds
e. van der Waals forces

REFERENCES: 2.3 Chemical Bonds and Chemical Reactions
2.4 Hydrogen Bonds and the Properties of Water

QUESTION TYPE: Matching

LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.1 - Compare ionic, covalent, and hydrogen bonds.
DYNS.RUSS.17.02.3.2 - Discuss polar and nonpolar bonds and molecular associations.
DYNS.RUSS.17.02.3.3 - Describe van der Waals forces.
DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.

KEYWORDS: Bloom's: Evaluate

86. Occurs in sodium chloride (NaCl)
ANSWER: a

87. The weakest of the chemical linkages listed
ANSWER: e

88. Generates regions of partial positivity and partial negativity within a molecule
ANSWER: c

89. Characteristic of molecules that contain atoms of only one kind
ANSWER: b

90. Forms when atoms gain or lose valence electrons completely

ANSWER: a

91. Attraction that arises when the constant movement of electrons, by chance, produces temporary zones of partial positive and partial negative charges
ANSWER: e

92. Occurs when electrons are shared unequally between two atoms
ANSWER: c

93. Creates a region that is hydrophobic
ANSWER: b

94. Occurs between water molecules
ANSWER: d

95. Occurs in molecular oxygen (O_2)
ANSWER: b

Subjective Short Answer

96. Why is iodine considered a trace element and what is its biological function in humans?

ANSWER:	Iodine is 0.0004% of a human's weight, compared to elements that occur at quantities greater than 0.01%. Iodine is required for proper thyroid gland function. Lack of iodine affects metabolism and growth. In the short-term iodine deficiency results in lethargy, apathy and sensitivity to cold temperatures, in the long-term, iodine deficiency causes a goiter.
REFERENCES:	2.1 The Organization of Matter: Elements and Atoms
QUESTION TYPE:	Subjective Short Answer
LEARNING OBJECTIVES:	DYNS.RUSS.17.02.1.1 - Describe the elemental composition of living organisms.
KEYWORDS:	Bloom's: Remember

97. Explain how radiometric dating allows scientists to determine the age of a particular fossil.

ANSWER:	Radioactive isotopes decay in a very predictable way. By knowing the approximate concentration of a radioisotope that is naturally present, and determining the concentration of the radioisotope in the fossil, you can calculate the length of time that it took for the radioactive isotope to decay to the level in the fossil.
REFERENCES:	2.2 Atomic Structure
QUESTION TYPE:	Subjective Short Answer
LEARNING OBJECTIVES:	DYNS.RUSS.17.02.2.1 - Summarize the constitution and properties of atoms and their isotopes.
KEYWORDS:	Bloom's: Evaluate

98. If van der Waals forces are weak, how can geckos utilize these forces to cling to and walk up vertical smooth surfaces?

ANSWER:	The toes of geckos are covered by millions of hairs (setae). At the tip of each setae are hundreds of thousands of pads, where each pad forms a weak interaction with a smooth surface due to van der Waal forces. Collectively, these forces form strong attractive forces.
REFERENCES:	2.3 Chemical Bonds and Chemical Reactions
QUESTION TYPE:	Subjective Short Answer

LEARNING OBJECTIVES: DYNS.RUSS.17.02.3.3 - Describe van der Waals forces.
KEYWORDS: Bloom's: Remember

99. Describe the difference between cohesion and adhesion, and how they, together, allow water to move upward in plants.
ANSWER: Cohesion is the resistance of a molecules to separate from each other, where adhesion is the ability of molecules to stick to surfaces. Cohesion in water is the resistance to separate due to the hydrogen-bond lattice. Adhesion in water is the ability of hydrogen bonds to form with charged and polar groups associated with surfaces. A water column in a plant is a result of cohesion – water molecules being held together – and maintained by water adhering to the walls of the water conducting tissue (xylem).
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Subjective Short Answer
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.1 - Discuss the role of the hydrogen bond lattice in determining the properties of water.

100. The pH of your stomach is between 1 and 3. Use your knowledge of polar and nonpolar substances to explain why the acids in your stomach do not alter the pH of your blood.
ANSWER: Cells are comprised of a lipid bilayer that excludes hydrophillic substances, including acids. The cells lining the inside of the stomach prevent the acid from moving across the cell membrane into the blood stream.
REFERENCES: 2.4 Hydrogen Bonds and the Properties of Water
QUESTION TYPE: Subjective Short Answer
LEARNING OBJECTIVES: DYNS.RUSS.17.02.4.2 - Discuss how molecular polarity contributes to the properties of water.
KEYWORDS: Bloom's: Apply