MULTIPLE CHOICE

1. An organic compound differs from an inorganic compound in that an organic compound:
   a. contains carbon.
   b. contains two or more atoms.
   c. lacks valence electrons.
   d. lacks isotopes.
   e. is basic rather than acidic.

   ANS: A PTS: 1 REF: p. 27 OBJ: Bloom's: Comprehension

2. An element is defined as a substance that:
   a. is composed of more than one kind of atom.
   b. is held together by covalent bonds.
   c. cannot be broken into simpler substances by chemical reactions.
   d. cannot burn.
   e. is soluble in both acid and base.

   ANS: C PTS: 1 REF: p. 27 OBJ: Bloom's: Knowledge

3. Which of the following elements is NOT responsible for a significant portion of the mass of living organisms?
   a. O
   b. S
   c. N
   d. H
   e. C

   ANS: B PTS: 1 REF: p. 27 OBJ: Bloom's: Comprehension

4. The particular type of element is determined by the number of:
   a. electrons
   b. protons
   c. neutrons
   d. valence electrons
   e. energy levels

   ANS: B PTS: 1 REF: p. 27 OBJ: Bloom's: Knowledge

5. If atom X contains 14 protons, 13 electrons, and 12 neutrons, and atom Y contains 14 protons, 14 electrons, and 12 neutrons, then you conclude that:
   a. Y is an ion but X is not.
   b. X and Y are both ions.
   c. X and Y both have filled valence shells.
   d. X and Y are isotopes of the same element.
   e. X and Y are atoms of the same element.

   ANS: E PTS: 1 REF: p. 27 OBJ: Bloom's: Application

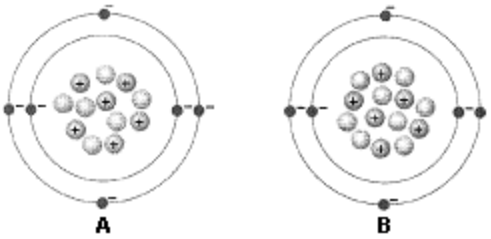
6. An atom has six protons and eight neutrons. Its atomic mass is _____ atomic mass units.
   a. two
   b. four
   c. six
   d. eight
   e. fourteen

   ANS: E PTS: 1 REF: p. 29 OBJ: Bloom's: Comprehension

7. The difference between a stable isotope and a radioisotope is that:
   a. the stable isotope emits radiation.
   b. the radioisotope emits radiation.
   c. the stable isotope emits light.
   d. the stable isotope absorbs radiation.
   e. the radioisotope has an unequal number of protons and electrons.

   ANS: B PTS: 1 REF: p. 29 OBJ: Bloom's: Comprehension

Figure 2-1
Use the figure below to answer the corresponding question(s).



8. The atomic mass of the atom identified as A in Figure 2-1 is:
   a. 2.
   b. 6.
   c. 8.
   d. 12.
   e. 18.

   ANS: D PTS: 1 REF: p. 29 OBJ: Bloom's: Application

9. Figure 2-1 represents:
   a. two isotopes of the same element.
   b. two different elements.
   c. two different ions.
   d. an acid and a base.
   e. a cation and an anion.

   ANS: A PTS: 1 REF: p. 29 OBJ: Bloom's: Application

10. The difference between the two atoms in Figure 2-1 is:
    a. pH.
    b. the number of electrons.
    c. the number of protons.
    d. the number of neutrons.
    e. electrical charge.

    ANS: D PTS: 1 REF: p. 29 OBJ: Bloom's: Application

11. Isotopes differ from each other with respect to the number of:
    a. protons only.
    b. electrons only.
    c. neutrons only.
    d. both protons and electrons.
    e. both neutrons and protons.

    ANS: C PTS: 1 REF: p. 29 OBJ: Bloom's: Knowledge

12. Radioisotopes are used in all of the following scientific applications *except*:
    a. dating fossils.
    b. determining the sequence of genetic information in DNA.
    c. localization of a drug, such as marijuana.
    d. the treatment of cancer.
    e. measuring the pH of the blood.

    ANS: E PTS: 1 REF: p. 29-30 OBJ: Bloom's: Comprehension

13. The chemical behavior of an atom is determined by most directly by the:
    a. atomic number.
    b. atomic weight.
    c. number of energy levels.
    d. number of valence electrons.
    e. number of neutrons.

    ANS: D PTS: 1 REF: p. 31 OBJ: Bloom's: Comprehension

14. Which of the following statements is FALSE?
    a. The 1st principal energy level contains 1 orbital.
    b. The 2nd principal energy level contains 4 orbitals.
    c. The 1st principal energy level contains a maximum of 2 electrons.
    d. The 2nd energy level contains a maximum of 10 electrons.
    e. The 2nd energy level contains 1 spherical orbital and 3 dumbbell-shaped orbitals..

    ANS: D PTS: 1 REF: p. 30 OBJ: Bloom's: Comprehension

15. Chlorine has seven electrons in its valence shell. The number of electrons it must gain to complete its valence shell is:
    a. one.
    b. two.
    c. three.
    d. seven.
    e. eight.

    ANS: A PTS: 1 REF: p. 31 OBJ: Bloom's: Application

16. Any chemical interaction between atoms:
    a. involves neutrons.
    b. may potentially involve any electron.
    c. involves protons.
    d. involves only valence electrons.
    e. involves only the nuclear subatomic particles.

    ANS: D PTS: 1 REF: p. 31 OBJ: Bloom's: Comprehension

17. The representation H–O–H is known as:
    a. a structural formula.
    b. a simplest formula.
    c. a molecular formula.
    d. a Lewis structure.
    e. an orbital diagram.

    ANS: A PTS: 1 REF: p. 31 OBJ: Bloom's: Knowledge

18. The molecular mass of $C_6H_{12}O_6$ is 180 amu. 0.25 moles of this substance contain:
    a. 180 daltons.
    b. 45 g.
    c. 1.8 g.
    d. 45 daltons.
    e. 180 g.

    ANS: B PTS: 1 REF: p. 31-32 OBJ: Bloom's: Application

19. How many molecules are present in one mole of $C_6H_{12}O_6$?
    a. 1.7×10^{-10} molecules
    b. 1.3×10^{10} molecules
    c. 24 molecules
    d. 1.7×10^{22} molecules
    e. 6.02×10^{23} molecules

    ANS: E PTS: 1 REF: p. 32 OBJ: Bloom's: Comprehension

20. Which of the following choices correctly identifies a reactant in the following chemical equation?
    $CO2 + H2O \leftrightarrow H2CO3$
    a. carbonic acid
    b. oxygen
    c. water
    d. sugar
    e. carbon monoxide

    ANS: C PTS: 1 REF: p. 32 OBJ: Bloom's: Comprehension

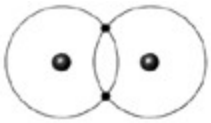
21. In a chemical reaction, the product is:
    a. generally written on the right side of the equation.
    b. always in equilibrium with the reactants.
    c. the substance that is generated by the reaction.
    d. joined by an ionic bond only.
    e. generally written on the right side *and* is the substance generated by the reaction.

    ANS: E PTS: 1 REF: p. 32 OBJ: Bloom's: Comprehension

22. When a chemical reaction is at equilibrium:
    a. the forward reaction is going faster.
    b. the reverse reaction is going faster.
    c. the forward and reverse reactions are proceeding at equal rates.
    d. the forward reaction stops.
    e. the reverse reaction stops.

    ANS: C PTS: 1 REF: p. 32 OBJ: Bloom's: Knowledge

Figure 2-2
Use the figure below to answer the corresponding question(s).



23. Figure 2-2 represents:
    a. elemental helium.
    b. molecular hydrogen.
    c. molecular helium.
    d. a water molecule.
    e. molecular oxygen.

    ANS: B PTS: 1 REF: p. 33 OBJ: Bloom's: Comprehension

24. The type of bond illustrated in Figure 2-2 is:
    a. an ionic bond.
    b. a polar bond.
    c. a single covalent bond.
    d. a hydrogen bond.
    e. a double covalent bond.

    ANS: C PTS: 1 REF: p. 33 OBJ: Bloom's: Comprehension

25. Which covalent bond involves only 2 electrons:
    a. single
    b. double
    c. triple
    d. single and double.
    e. single and triple.

    ANS: A PTS: 1 REF: p. 33 OBJ: Bloom's: Knowledge

26. A covalent bond:
    a. forms only between identical atoms.
    b. involves a sharing of only one pair of electrons.
    c. is always polar.
    d. may be polar or nonpolar depending on the atoms involved.
    e. always forms between identical molecules.

    ANS: D PTS: 1 REF: p. 33-34 OBJ: Bloom's: Comprehension

27. In a water molecule, because oxygen is more electronegative than hydrogen, the shared electrons are more commonly found around the _____ nucleus than the _____ nucleus.
    a. oxygen; hydrogen
    b. hydrogen; oxygen
    c. hydrogen; other hydrogen
    d. oxygen; nitrogen
    e. nitrogen; oxygen

    ANS: A PTS: 1 REF: p. 34 OBJ: Bloom's: Comprehension

28. The covalent bond between a hydrogen atom and the oxygen atom in water is formed when:
    a. hydrogen gains an electron from oxygen.
    b. hydrogen and oxygen share an electron pair.
    c. hydrogen and oxygen both lose electrons from their outer shells.
    d. hydrogen and oxygen both gain electrons in their outer shells.
    e. hydrogen gains an electron from oxygen.

    ANS: B PTS: 1 REF: p. 34 OBJ: Bloom's: Comprehension

29. Covalently bonded atoms with similar electronic negativities are:
    a. ionic.
    b. polar.
    c. nonpolar.
    d. partially positive.
    e. partially negative.

    ANS: C PTS: 1 REF: p. 34 OBJ: Bloom's: Comprehension

30. An atom becomes a cation if:
    a. it gains one or more electron.
    b. it loses one or more electron.
    c. it shares electrons.
    d. one or more of its electrons changes energy levels.
    e. it emits radiation.

    ANS: B PTS: 1 REF: p. 34 OBJ: Bloom's: Application

31. The difference between an electrically neutral atom and an ion is that:
    a. an ion has an unequal number of protons and electrons, while an atom has an equal number.
    b. an ion has an equal number of protons and electrons, while an atom has an unequal number.
    c. an atom has an unequal number of neutrons and protons, while an ion has an equal number.
    d. an atom has its electrons in orbitals, while an ion has its electrons in its nucleus.
    e. an atom must have an equal number of neutrons and electrons, while an ion does not.

    ANS: A PTS: 1 REF: p. 34 OBJ: Bloom's: Comprehension

32. In the formation of common table salt, sodium and chlorine interact because:
    a. sodium and chlorine share a pair of electrons.
    b. sodium and chlorine share two pairs of electrons.
    c. chlorine donates seven electrons to sodium.
    d. there is no electron exchange.
    e. sodium donates one electron to chlorine.

    ANS: E PTS: 1 REF: p. 35 OBJ: Bloom's: Comprehension

33. Table salt dissolves easily in water because:
    a. water can form covalent linkages with salt molecules.
    b. water can remove electrons from the chloride ion, which causes the latter to dissociate from the sodium and dissolve.
    c. water can add electrons to the sodium ion.
    d. water is polar and salt is nonpolar. Nonpolar compounds are more soluble in polar solvents because they are able to form strong covalent bonds that result in a breaking up of the molecule being dissolved.
    e. the partial positive charge of the hydrogens in the water molecule can associate with the negative charge of the chloride ion, and the partial negative charge of the oxygen of the water molecule can associate with the positive charge of the sodium atom.

    ANS: E PTS: 1 REF: p. 36 OBJ: Bloom's: Comprehension

34. Which of the following atoms would most likely be involved in an ionic bond?
    a. hydrogen
    b. oxygen
    c. sodium
    d. hydrogen and oxygen.
    e. hydrogen and sodium.

    ANS: C PTS: 1 REF: p. 35 OBJ: Bloom's: Comprehension

35. The process whereby water molecules surround ions during the process of dissolving is called:
    a. reduction.
    b. hydration.
    c. buffering.
    d. oxidation.
    e. vaporization.

    ANS: B PTS: 1 REF: p. 36 OBJ: Bloom's: Knowledge

36. Which of the following statements concerning van der Waal interactions is FALSE:
    a. They are attractive forces.
    b. They are very strong.
    c. They involve transient regions of positive and negative charges.
    d. They form between nonpolar molecules.
    e. They operate over very short distances.

    ANS: B PTS: 1 REF: p. 36 OBJ: Bloom's: Knowledge

37. Which component becomes oxidized in the following chemical reaction?

    $4\,Fe + 3\,O_2 \rightarrow 2\,Fe_2O_3$

    a. water
    b. iron
    c. oxygen
    d. rust
    e. hydrogen

    ANS: B PTS: 1 REF: p. 37 OBJ: Bloom's: Application

38. Which component is the *oxidizing agent* in the following chemical reaction?

$4\,Fe + 3\,O_2 \rightarrow 2\,Fe_2O_3$

a. water
b. iron
c. oxygen
d. rust
e. hydrogen

ANS: C PTS: 1 REF: p. 37 OBJ: Bloom's: Application

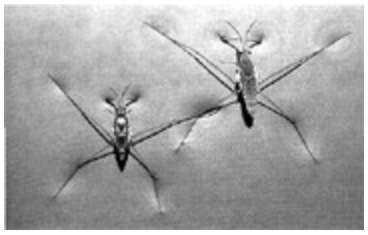
39. The cohesiveness between water molecules is due largely to:
a. hydrogen bonds.
b. polar covalent bonds.
c. nonpolar covalent bonds.
d. ionic bonds.
e. hydrophobic interactions.

ANS: A PTS: 1 REF: p. 38 OBJ: Bloom's: Knowledge

40. A stalk of celery is placed in a solution of blue colored dye. After one hour, the leaves have blue fluid in their veins. Which property of water is being demonstrated?
a. adhesion and cohesion
b. evaporation and cooling
c. lower density as a solid than as a liquid
d. high specific heat
e. surface tension

ANS: A PTS: 1 REF: p. 38 OBJ: Bloom's: Application

41. Which characteristic of water molecules directly contributes to the remarkable "water walking" success of the aquatic insects pictured in the accompanying figure?



a. hydrogen bonds
b. capillary action
c. nonpolar covalent bonds
d. ionic bonds
e. adhesive forces

ANS: A PTS: 1 REF: p. 38 OBJ: Bloom's: Comprehension

42. Which of the following statements is *not* correct?
a. Water heats up and cools down very quickly.
b. The amount of heat required to raise the temperature of 1 g of water 1 °C is one calorie.
c. Due to hydrogen bonds, water has a high surface tension.
d. Large bodies of water have relatively constant temperatures.
e. When one gram of water evaporates, it removes heat.

ANS: A PTS: 1 REF: p. 38-40 OBJ: Bloom's: Comprehension

43. It takes 1 calorie of heat to raise the temperature of 1 gram of water 1 degree Celsius at sea level. This is referred to as the _____ of water.
    a. heat of fusion
    b. heat of vaporization
    c. specific heat
    d. heat of transformation
    e. heat of homeostasis

    ANS: C PTS: 1 REF: p. 40 OBJ: Bloom's: Knowledge

44. Which property of water enables living things to survive in ponds covered with ice?
    a. high heat of vaporization
    b. high specific heat
    c. degree of surface tension
    d. cohesion
    e. greatest density at 4ºC

    ANS: E PTS: 1 REF: p. 40 OBJ: Bloom's: Comprehension

45. Evaporative cooling is a process whereby _____ moving _____ molecules vaporize, thus _____ large amounts of heat.
    a. slow; water; adding
    b. fast; water; removing
    c. slow; oxygen; adding
    d. fast; oxygen; removing
    e. fast; carbon dioxide; removing

    ANS: B PTS: 1 REF: p. 40 OBJ: Bloom's: Comprehension

46. At what temperature is water most dense?
    a. 0 degrees Celsius
    b. 1 degree Celsius
    c. 4 degrees Celsius
    d. 10 degrees Celsius
    e. 100 degrees Celsius

    ANS: C PTS: 1 REF: p. 40 OBJ: Bloom's: Knowledge

47. In a mixture, which would be present in the least amount?
    a. solvent
    b. solute
    c. water
    d. both solvent and solute
    e. both solvent and water

    ANS: B PTS: 1 REF: p. 36 OBJ: Bloom's: Knowledge

48. This characteristic of a molecule determines the ability of hydrogen bonds to form between it and hydrogen:
    a. A nonpolar atom.
    b. An atom with a partial positive charge.
    c. An atom with a partial negative charge.
    d. A hydrophobic molecule.
    e. An atom with a filled valence shell.

    ANS: C PTS: 1 REF: p. 36 OBJ: Bloom's: Comprehension

49. Which characteristic of water makes the existence of pH possible?
    a. ionization
    b. polarity
    c. adhesion
    d. cohesion
    e. hydrophobicity

    ANS: A PTS: 1 REF: p. 40 OBJ: Bloom's: Comprehension

50. A pH of 4 is _____ times more _____ than a pH of 7.
    a. 3; basic
    b. 3; acidic
    c. 1000; neutral
    d. 1000; basic
    e. 1000; acidic

    ANS: E PTS: 1 REF: p. 41 OBJ: Bloom's: Application

51. What is the OH^- concentration of a solution having a pH of 2?
    a. 1×10^{-12}
    b. 1×10^{-10}
    c. 1×10^{-7}
    d. 1×10^{-2}
    e. 1×10^{-1}

    ANS: A PTS: 1 REF: p. 41 OBJ: Bloom's: Application

52. When a small amount of hydrochloric acid (HCl) is added to a solution of Na_2HPO_4, the pH of the solution does not change markedly. The pH also does not change drastically when a small amount of sodium hydroxide (NaOH) is added to this same solution. Based on these observations, the compound Na_2HPO_4 is:
    a. able to donate hydrogen atoms to HCl.
    b. able to remove hydrogen ions from the OH^- of NaOH.
    c. acting as a buffer.
    d. an enzyme facilitating the reaction between HCl and NaOH.
    e. acting as a solvent.

    ANS: C PTS: 1 REF: p. 42 OBJ: Bloom's: Application

53. A salt is a compound in which the hydrogen ion of _____ is replaced by some other cation.
    a. a base
    b. an acid
    c. an anion
    d. a hydroxide ion
    e. water

    ANS: B PTS: 1 REF: p. 42 OBJ: Bloom's: Knowledge

54. A solution having a pH of 6 would:
    a. have equal concentrations of hydrogen ions and hydroxide ions.
    b. have a higher concentrations of hydroxide ions than hydrogen ions.
    c. be slightly acidic.
    d. be slightly basic.
    e. be neutral.

    ANS: C PTS: 1 REF: p. 41 OBJ: Bloom's: Knowledge

55. Identify the chemical(s) that act(s) as a buffer in human blood:
    a. bicarbonate
    b. hydrogen ions
    c. carbon dioxide
    d. water
    e. hydroxide ions

    ANS: A PTS: 1 REF: p. 42 OBJ: Bloom's: Knowledge

56. Identify the hydrogen ion concentration that represents the lowest pH from the following list:
    a. 1×10^{-3}
    b. 1×10^{-4}
    c. 1×10^{-7}
    d. 1×10^{-11}
    e. 1×10^{-14}

    ANS: A PTS: 1 REF: p. 41 OBJ: Bloom's: Knowledge

57. Which of the following has a pH closest to that of human blood?
    a. beer
    b. coffee
    c. rain water
    d. sea water
    e. oven cleaner

    ANS: D PTS: 1 REF: p. 41 OBJ: Bloom's: Knowledge

58. Which of the following would most likely form electrolytes in water?
    a. glucose
    b. ethanol
    c. an organic compound
    d. an inorganic compound
    e. a nonionic compound

    ANS: D PTS: 1 REF: p. 42 OBJ: Bloom's: Knowledge

SHORT ANSWER

1. List the four elements that account for over 90% of the mass of living organisms and identify an important biological function of each element.

   ANS:
   Some examples from Table 2-1: Oxygen is required for cellular respiration, carbon forms the backbone of organic molecules, hydrogen is involved in some energy transfers, and nitrogen is a component of proteins and nucleic acids.

   PTS: 1 REF: p. 27 OBJ: Bloom's: Knowledge

2. Explain how the number of valence electrons is related to the chemical properties of an atom. Use two specific examples in your explanation.

   ANS:
   Atoms having filled valence shells (e.g., helium and neon) are stable and unreactive; atoms having unfilled valence shells (e.g., chlorine and sodium) are unstable and reactive.

   PTS: 1 REF: p. 31 OBJ: Bloom's: Comprehension

3. Compare and contrast the formation, properties, and characteristics of covalent and ionic bonds.

   ANS:
   Both covalent and ionic bonds result in each atom having a filled valence shell. Covalent bonds are formed via the sharing of electrons between neutral atoms; the resulting molecule is electrically neutral but can be polar or nonpolar. Ionic bonds are formed via the transfer of electrons; in the process ions are formed, and the resulting molecule is held together via the electrical attraction between those positive and negative ions. Unlike atoms joined by a covalent bond, atoms joined by an ionic bond tend to dissociate into their respective ions when placed in water.

   PTS: 1 REF: p. 34-35 OBJ: Bloom's: Analysis

4. Diagram and carefully label two water molecules using a ball-and-stick model. Then use this diagram to demonstrate how hydrogen bonds form between them.

   ANS:
   The diagram should resemble Fig. 2-13 except only two water molecules are shown. Hydrogen bonds form as a result of the attraction between the partial positive charge of a hydrogen atom with the partial negative charge of the oxygen atom

   PTS: 1 REF: p. 38 OBJ: Bloom's: Analysis

MODIFIED TRUE/FALSE

1. An *inorganic* compound is one that contains carbon.
   _____

   ANS: F, organic

   PTS: 1 REF: p. 27 OBJ: Bloom's: Knowledge

2. The atomic *mass* determines the type of element.

   _____

   ANS: F, number

   PTS: 1 REF: p. 28 OBJ: Bloom's: Knowledge

3. An atom having a filled valence shell is *stable and unreactive*.

   _____

   ANS: T PTS: 1 REF: p. 31
   OBJ: Bloom's: Knowledge

4. When atoms react to form an ionic bond, electrons are *shared* between those atoms.

   _____

   ANS: F, transferred

   PTS: 1 REF: p. 35 OBJ: Bloom's: Knowledge

5. The tetrahedron shape of a methane molecule is the result of *orbital hybridization*.

   _____

   ANS: T PTS: 1 REF: p. 34
   OBJ: Bloom's: Knowledge

6. An example of *an anion* is K^+.

   _____

   ANS: F, a cation

   PTS: 1 REF: p. 34 OBJ: Bloom's: Knowledge

7. Oxidation occurs when an atom *gains* one or more electrons.

   _____

   ANS: F, loses

   PTS: 1 REF: p. 37 OBJ: Bloom's: Knowledge

8. *Specific heat* refers to the amount of energy required to change 1 gram of a substance from the liquid phase to the vapor phase.

   _____

   ANS: F, Heat of vaporization

   PTS: 1 REF: p. 39 OBJ: Bloom's: Knowledge

9. Water is most dense at *4 C*.

   _____

   ANS: T PTS: 1 REF: p. 40
   OBJ: Bloom's: Knowledge

10. A solution having a pH of 8 is slightly *acidic*.

    _____

    ANS: F, basic

    PTS: 1 REF: p. 41 OBJ: Bloom's: Knowledge

11. A substance that is resistant to changes in pH is called a *buffer*.

    _____

    ANS: T PTS: 1 REF: p. 42
    NOT: Bloom's: Knowledge

MATCHING

Match the type of bond or interaction with its description.

a. hydrogen bond
b. van de Waals interaction
c. ionic bond
d. covalent bond

1. Strong attractive force resulting from the transfer of electrons between atoms
2. Strong attractive force resulting from the sharing of electrons between atoms
3. Weak attractive force joining a hydrogen atom with an electronegative atom such as oxygen
4. In a structural formula this is represented by a straight line
5. Very weak attractive force joining nonpolar molecules
6. Holds adjacent water molecules together

1. ANS: C PTS: 1 REF: p. 35 OBJ: Bloom's: Knowledge
2. ANS: D PTS: 1 REF: p. 32 OBJ: Bloom's: Knowledge
3. ANS: A PTS: 1 REF: p. 36 OBJ: Bloom's: Knowledge
4. ANS: D PTS: 1 REF: p. 33 OBJ: Bloom's: Knowledge
5. ANS: B PTS: 1 REF: p. 36 OBJ: Bloom's: Knowledge
6. ANS: A PTS: 1 REF: p. 37 OBJ: Bloom's: Comprehension

Match the term with its description.

a. adhesion
b. cohesion
c. surface tension
d. capillary action

7. Sticking together of like molecules
8. Directly responsible for the ability of certain insects to walk on water
9. Responsible for the ability of water molecules to move in the microscopic spaces between soil particles
10. Sticking together of unlike molecules
11. Tendency of water to move in narrow tubes

7. ANS: B PTS: 1 REF: p. 38 OBJ: Bloom's: Knowledge
8. ANS: C PTS: 1 REF: p. 38 OBJ: Bloom's: Knowledge
9. ANS: D PTS: 1 REF: p. 38 OBJ: Bloom's: Knowledge
10. ANS: A PTS: 1 REF: p. 38 OBJ: Bloom's: Knowledge
11. ANS: D PTS: 1 REF: p. 38 OBJ: Bloom's: Knowledge

ESSAY

1. As a researcher, you are charged with determining the side effects of a new drug. From previous observations, you suspect that this drug reduces the rate of DNA production (replication) within skin cells of patients using the drug. With the following materials, design an experiment that would answer your questions about the effect of the drug on DNA production. You know that: DNA contains phosphate groups. You have: radioactive isotopes of phosphate (32P), skin cell cultures from various patients, the drug in question, and a device that measures radioactivity.

   ANS:
   Concepts to Consider: Construction of an appropriate experiment with appropriate controls; use of the radioisotope to label DNA; isolation of the DNA using an unspecified technique; measuring radioactivity of the isolated DNA; comparing the treatment and control groups; making a conclusion.

   PTS: 1 REF: p. 29 OBJ: Bloom's: Synthesis
   TOP: Discussion or Thought Questions

2. The hydrogen bonds of water play an important role in the ability of animals to regulate their body temperature. Explain how this occurs.

   ANS:
   Concepts to Consider: Transfer of energy to the hydrogen bonds; excess body heat is transferred to hydrogen bonds of water; heat is removed when water vaporizes at the body surface of the animal.

   PTS: 1 REF: p. 40 OBJ: Bloom's: Comprehension
   TOP: Discussion or Thought Questions

3. Explain the role of carbon dioxide in maintaining blood pH levels.

   ANS:
   Concepts to Consider: Buffering capacity; reversible reactions; maintenance of equilibrium.

   PTS: 1 REF: p. 42 OBJ: Bloom's: Comprehension
   TOP: Discussion or Thought Questions