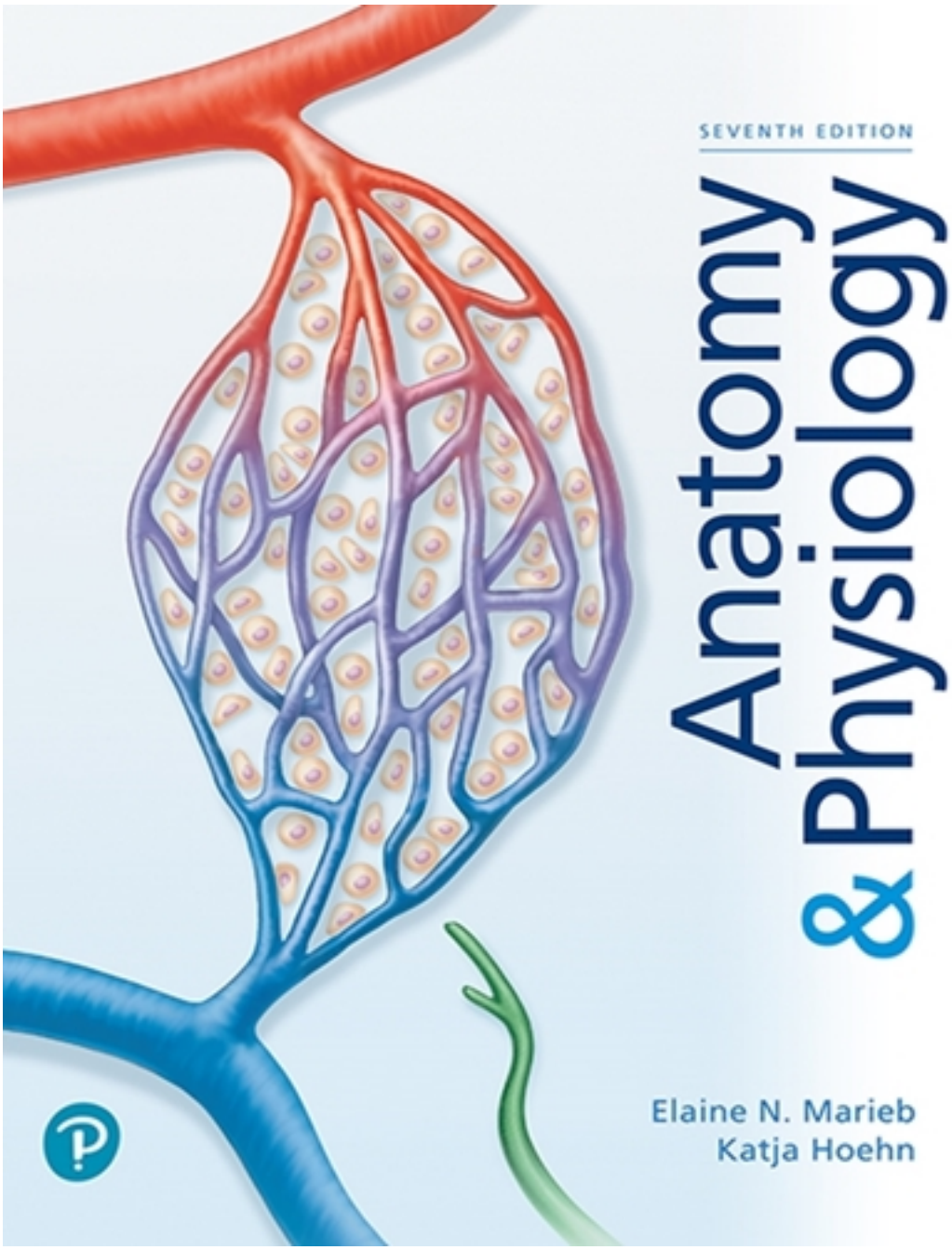
Test Bank for Anatomy & Physiology 7th Edition by Marieb

CLICK HERE TO ACCESS COMPLETE Test Bank



Test Bank

***Anatomy and Physiology, 7e* (Marieb/Hoehn)**
Chapter 2 Chemistry Comes Alive

2.1 Matching Questions

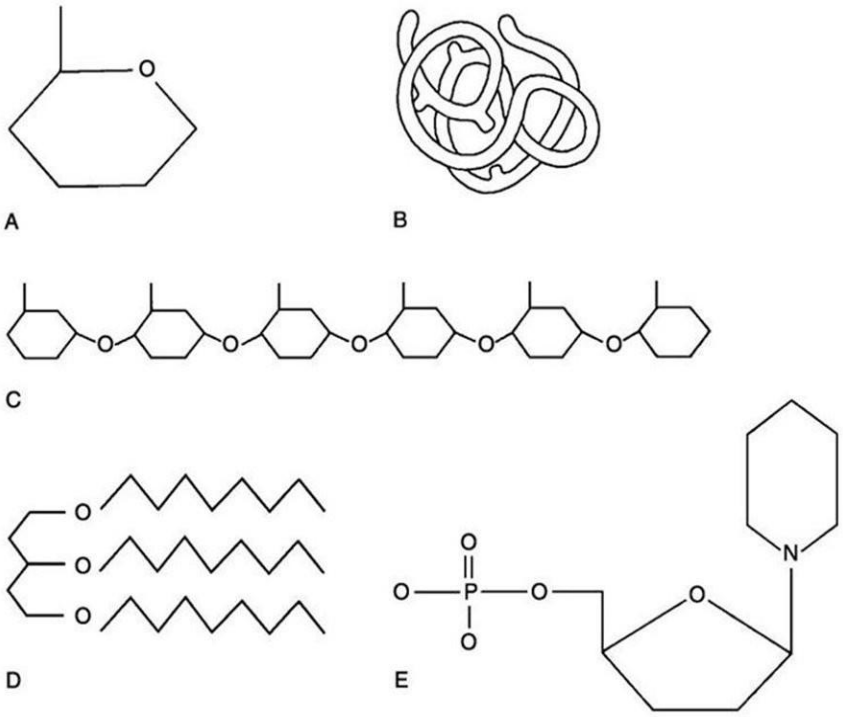


Figure 2.1

Using Figure 2.1, match the following:

1) Lipid.
Answer: D
Section: 2.9
Learning Outcome: 2.18
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

2) Functional protein.
Answer: B
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

3) Nucleotide.
Answer: E
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

4) Polysaccharide.
Answer: C
Section: 2.8
Learning Outcome: 2.17
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

5) Monosaccharide.
Answer: A
Section: 2.8
Learning Outcome: 2.17
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

6) Polymer.
Answer: C
Section: 2.7
Learning Outcome: 2.16
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

7) Tertiary (protein) structure.
Answer: B
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

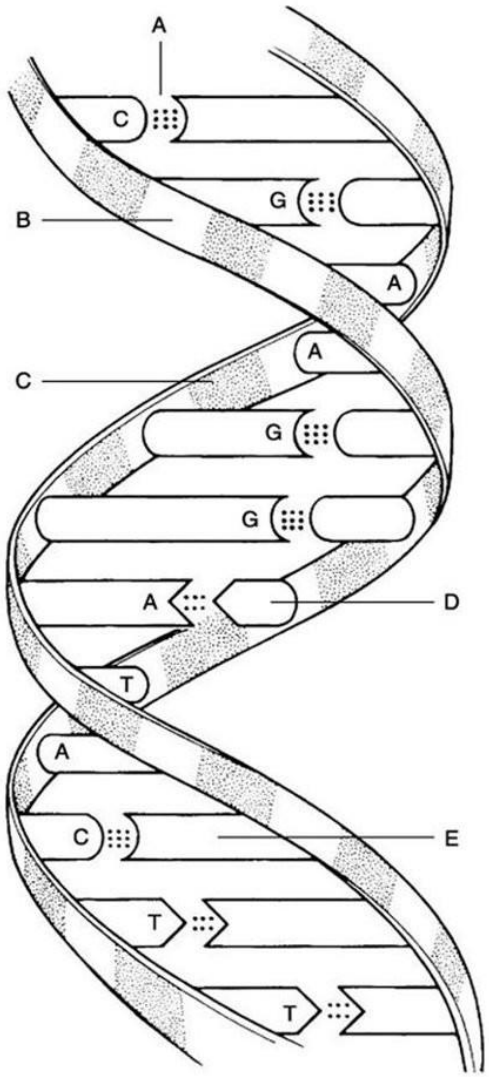


Figure 2.2

Using Figure 2.2, match the following:

8) Deoxyribose sugar.
Answer: B
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

9) Thymine.
Answer: D
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

10) Guanine.
Answer: E
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

11) Phosphate.
Answer: C
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

12) Hydrogen bonds.
Answer: A
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS2
Bloom's: 1-2: Remembering/Understanding

Match the following chemical bonds to the correct description:

A) Ionic bond
B) Hydrogen bond
C) Polar covalent bond
D) Nonpolar covalent bond

13) A bond in which electrons are shared unequally.
Section: 2.4
Learning Outcome: 2.9
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

14) A bond in which electrons are completely lost or gained by the atoms involved.
Section: 2.4
Learning Outcome: 2.9
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

15) A bond in which electrons are shared equally.
Section: 2.4
Learning Outcome: 2.9, 2.10

Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

16) A type of bond important in tying different parts of the same molecule together into a three-dimensional structure.
Section: 2.4
Learning Outcome: 2.9
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

Answers: 13) C 14) A 15) D 16) B

Match the following particles to the correct description:

A) Electron
B) Neutron
C) Atom
D) Proton

17) Negatively charged subatomic particle.
Section: 2.2
Learning Outcome: 2.4
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

18) Neutral subatomic particle.
Section: 2.2
Learning Outcome: 2.4
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

19) Smallest particle of an element that retains its properties.
Section: 2.2
Learning Outcome: 2.4

Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

20) Positively charged subatomic particle.
Section: 2.2
Learning Outcome: 2.4
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

21) Subatomic particle having an AMU (Atomic Mass Unit) of zero.
Section: 2.2
Learning Outcome: 2.4
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

Answers: 17) A 18) B 19) C 20) D 21) A

Match the following:

A) Compound
B) Suspension
C) Solution

22) Water.
Section: 2.3
Learning Outcome: 2.7
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

23) Saline.
Section: 2.3
Learning Outcome: 2.7
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

24) Dry ice (frozen carbon dioxide).
Section: 2.3
Learning Outcome: 2.6, 2.7
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

25) Blood.
Section: 2.3
Learning Outcome: 2.7
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

Answers: 22) A 23) C 24) A 25) B

Match the following:

A) Mass
B) Energy
C) Weight
D) Matter

26) Can be measured only by its effects on matter.
Section: 2.1
Learning Outcome: 2.1
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

27) Anything that occupies space and has mass.
Section: 2.1
Learning Outcome: 2.1
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

28) Although a man who weighs 175 pounds on Earth would be lighter on the moon and heavier on Jupiter, his _____ would not be different.
Section: 2.1

Learning Outcome: 2.1
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

29) Is a function of, and varies with, gravity.
Section: 2.1
Learning Outcome: 2.1
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

Answers: 26) B 27) D 28) A 29) C

Match the following:

A) Electrical energy
B) Chemical energy
C) Radiant energy
D) Mechanical energy

30) Legs moving the pedals of a bicycle.
Section: 2.1
Learning Outcome: 2.2
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

31) When the bonds of ATP are broken, energy is released to do cellular work.
Section: 2.1
Learning Outcome: 2.2
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

32) Energy that travels in waves. Part of the electromagnetic spectrum.
Section: 2.1
Learning Outcome: 2.2

Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

33) Represented by the flow of charged particles along a conductor, or the flow of ions across a membrane.
Section: 2.1
Learning Outcome: 2.2
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

Answers: 30) D 31) B 32) C 33) A

Match the following:

A) Quaternary
B) Tertiary
C) Secondary
D) Primary

34) Protein structure achieved when alpha-helical or beta-pleated regions of the polypeptide chain fold upon one another to produce a compact ball-like, or *globular*, molecule.
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

35) The sequence of amino acids that form the polypeptide chain.
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

36) Protein structure represented by alpha-helices and beta-sheets.
Section: 2.10

Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

37) Two or more polypeptide chains, each with its own tertiary structure.
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

Answers: 34) B 35) D 36) C 37) A

Match the following:

A) Mass number of an element
B) Atomic number
C) Atomic symbol

38) Usually, the first one or two letters of an element's name.
Section: 2.2
Learning Outcome: 2.5
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

39) Number of protons in an atom.
Section: 2.2
Learning Outcome: 2.5
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

40) Combined number of protons and neutrons in an atom.
Section: 2.2
Learning Outcome: 2.5
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

Answers: 38) C 39) B 40) A

2.2 True/False Questions

1) The atomic number of any atom is equal to the number of electrons in its nucleus and is written as a subscript to the left of its atomic symbol.
Answer: FALSE
Section: 2.2
Learning Outcome: 2.5
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

2) It is the difference in the R group that makes each amino acid chemically unique.
Answer: TRUE
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

3) Chemical properties are determined primarily by neutrons.
Answer: FALSE
Section: 2.4
Learning Outcome: 2.8
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

4) A charged particle is generally called an ion or electrolyte.
Answer: TRUE
Section: 2.1, 2.6
Learning Outcome: 2.2, 2.8
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

5) Isotopes differ from each other only in the number of electrons the atom contains.
Answer: FALSE
Section: 2.2
Learning Outcome: 2.5
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

6) About 60% to 80% of the volume of most living cells consists of organic compounds.
Answer: FALSE
Section: 2.6
Learning Outcome: 2.14
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

7) Triglycerides are a poor source of stored energy.
Answer: FALSE
Section: 2.9
Learning Outcome: 2.18
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

8) Omega-3 fatty acids appear to decrease the risk of heart disease.
Answer: TRUE
Section: 2.9
Learning Outcome: 2.18
Global LO: G2, G5
HAPS LO: HAPS1, HAPS6
Bloom's: 1-2: Remembering/Understanding

9) Glucose is an example of a monosaccharide.
Answer: TRUE
Section: 2.8
Learning Outcome: 2.17
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

10) Glycogen, the storage form of glucose, is primarily stored in skeletal muscle and liver cells.
Answer: TRUE
Section: 2.8
Learning Outcome: 2.17
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

11) The lower the pH, the higher the hydrogen ion concentration.
Answer: TRUE
Section: 2.6
Learning Outcome: 2.15
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

12) The sharing of electrons in covalent bonds makes them stronger than ionic and hydrogen bonds.
Answer: TRUE
Section: 2.4
Learning Outcome: 2.9
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

13) Hydrogen bonds are too weak to bind atoms together to form molecules, but they do hold different parts of a single large molecule in a specific three-dimensional shape.
Answer: TRUE
Section: 2.4
Learning Outcome: 2.9
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

14) The fact that no chemical bonding occurs between the components of a mixture is the chief difference between mixtures and compounds.
Answer: TRUE
Section: 2.3
Learning Outcome: 2.6
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

15) The acidity of a solution reflects the concentration of free hydrogen ions in the solution.
Answer: TRUE
Section: 2.6
Learning Outcome: 2.15
Global LO: G2
HAPS LO: HAPS1

Bloom's: 1-2: Remembering/Understanding

16) A chemical bond is an energy relationship between outer electrons and neighboring atoms.
Answer: TRUE
Section: 2.4
Learning Outcome: 2.8
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

17) All organic compounds contain carbon except CO_2 and CO.
Answer: TRUE
Section: 2.7
Learning Outcome: 2.16
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

18) A dipeptide can be broken into two amino acids by dehydration synthesis.
Answer: FALSE
Section: 2.7
Learning Outcome: 2.16
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

19) The pH of body fluids must remain fairly constant for the body to maintain homeostasis.
Answer: TRUE
Section: 2.6
Learning Outcome: 2.15
Global LO: G2
HAPS LO: HAPS1, HAPS3
Bloom's: 1-2: Remembering/Understanding

20) Mixtures are combinations of elements or compounds that are physically blended together but are not bound by chemical bonds.
Answer: TRUE
Section: 2.3
Learning Outcome: 2.6
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

21) Buffers resist abrupt and large changes in the pH of body fluids by releasing or binding ions.
Answer: TRUE
Section: 2.6
Learning Outcome: 2.15
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

2.3 Multiple Choice Questions

1) Which of the following elements is necessary for proper conduction of nerve impulses?
A) Fe
B) I
C) P
D) Na
Answer: D
Section: 2.2
Learning Outcome: 2.3
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

2) The basic structural material of the body consists of _____.
A) carbohydrates
B) lipids
C) proteins
D) nucleic acids
Answer: C
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

3) In general, the lipids that we refer to as oils at room temperature have _____.
A) a high water content
B) long fatty acid chains
C) saturated fatty acids
D) unsaturated fatty acids
Answer: D
Section: 2.9
Learning Outcome: 2.18
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

4) The genetic information is coded in DNA by the _____.
A) regular alteration of sugar and phosphate molecules
B) sequence of the nucleotides
C) three-dimensional structure of the double helix
D) arrangement of the histones
Answer: B
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

5) Which of the following does NOT characterize proteins?
A) They may be denatured or coagulated by heat or acidity.
B) They have both functional and structural roles in the body.
C) They appear to be the molecular carriers of coded hereditary information.
D) Their function depends on their three-dimensional shape.
Answer: C
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

6) The single most abundant protein in the body is _____.
A) DNA
B) hemoglobin
C) collagen
D) glucose
Answer: C
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

7) Carbohydrates are stored in the liver and skeletal muscles in the form of _____.
A) glucose
B) triglycerides
C) glycogen
D) cholesterol
Answer: C
Section: 2.8
Learning Outcome: 2.17
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

8) Which of the following does NOT describe enzymes?
A) Some enzymes are purely protein.
B) Some enzymes are protein plus a cofactor.
C) Each enzyme is chemically specific.
D) Enzymes work by raising the energy of activation.
Answer: D
Section: 2.10
Learning Outcome: 2.20
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

9) Which of the following is a general function for a fibrous protein?
A) transport
B) protein management
C) body defense
D) catalysis
E) structural framework
Answer: E
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

10) A chemical reaction in which bonds are created is usually associated with _____.
A) the release of energy
B) the consumption of energy
C) degradation
D) forming a smaller molecule
Answer: B
Section: 2.5
Learning Outcome: 2.11
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

11) Salts are always _____.
A) ionic compounds
B) single covalent compounds
C) double covalent compounds
D) hydrogen bonded
Answer: A
Section: 2.4
Learning Outcome: 2.9
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

12) The numbers listed represent the number of electrons in the first, second, and third energy levels, respectively. On this basis, which of the following is an unstable or reactive atom?
A) 2, 8, 8
B) 2, 8
C) 2
D) 2, 8, 1
Answer: D
Section: 2.4
Learning Outcome: 2.8
Global LO: G2, G4
HAPS LO: HAPS1, HAPS4
Bloom's: 3-4: Applying/Analyzing

13) Which of the following statements is FALSE?
A) When acids and bases are mixed, they react with each other to form water and a salt.
B) The more hydrogen ions in a solution, the more acidic the solution.
C) When the hydrogen ion concentration decreases, the hydroxyl ion concentration also decreases.
D) The pH of blood is slightly basic.
Answer: C
Section: 2.6
Learning Outcome: 2.15
Global LO: G2
HAPS LO: HAPS1

Bloom's: 1-2: Remembering/Understanding

14) Which of the following is the major positive ion outside cells?
A) magnesium
B) hydrogen
C) potassium
D) sodium
Answer: D
Section: 2.2
Learning Outcome: 2.3
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

15) Which of the following would be regarded as an organic molecule?
A) H_2O
B) CO_2
C) NaOH
D) CH_4
Answer: D
Section: 2.7
Learning Outcome: 2.16
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

16) What is a chain of more than 50 amino acids called?
A) triglyceride
B) polysaccharide
C) protein
D) nucleic acid
Answer: C
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

17) What structural level is represented by the sequence of amino acids in a polypeptide chain?
A) primary structure
B) secondary structure
C) tertiary structure
D) quaternary structure
Answer: A
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

18) Carbohydrates and proteins are built up from their basic building blocks by the _____.
A) Enzymes require contact with substrate in order to assume their active form.
B) Most enzymes can catalyze only one reaction per minute.
C) Enzymes may use coenzymes derived from vitamins or cofactors from metallic elements.
D) Enzymes are not damaged by high temperature.
Answer: C
Section: 2.10
Learning Outcome: 2.20
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

19) Which statement about enzymes is TRUE?
A) Enzymes require contact with substrate in order to assume their active form.
B) Most enzymes can catalyze only one reaction per minute.
C) Enzymes may use coenzymes derived from vitamins or cofactors from metallic elements.
D) Enzymes are not damaged by high temperature.
Answer: C
Section: 2.10
Learning Outcome: 2.20
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

20) Which of the following statements is TRUE?
A) Chemical reactions proceed more slowly at higher temperatures.
B) Chemical reactions progress at a faster rate when the reacting particles are present in higher numbers.
C) Larger particles move faster than smaller ones and thus collide more frequently and more forcefully.
D) Catalysts decrease the rate of chemical reactions, sometimes while undergoing reversible changes in shape.
Answer: B
Section: 2.5
Learning Outcome: 2.13

Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

21) Choose the answer that best describes HCO_3^-.
A) a bicarbonate ion
B) common in the liver
C) a weak acid
D) a proton donor
Answer: A
Section: 2.6
Learning Outcome: 2.15
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

22) Select which reactions will usually be irreversible regarding chemical equilibrium in human bodies.
A) glucose to CO_2 and H_2O
B) ADP + Pi to make ATP
C) H_2O + CO_2 to make H_2CO_3
D) glucose molecules joined to make glycogen
Answer: A
Section: 2.5
Learning Outcome: 2.12
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

23) What happens in redox reactions?
A) both decomposition and electron exchange occur
B) the electron acceptor is oxidized
C) the organic substance that loses hydrogen is usually reduced
D) the reaction is uniformly reversible
Answer: A
Section: 2.5
Learning Outcome: 2.11
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

24) Which type of proteins can function as chemical messengers or as receptors in the plasma membrane?
A) defensive
B) transport
C) communication
D) enzyme
Answer: C
Section: 2.10
Learning Outcome: 2.11
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

25) Which of the following does NOT describe uses for the ATP molecule?
A) chemical work
B) mechanical work
C) transport down their concentration gradient
D) pigment structure
Answer: D
Section: 2.12
Learning Outcome: 2.22
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

26) Select the most correct statement regarding nucleic acids.
A) Three forms exist: DNA, RNA, and tDNA.
B) DNA is a long, double-stranded molecule made up of A, T, G, and C bases.
C) RNA is a long, single-stranded molecule made up of the bases A, T, G, and C.
D) tDNA is considered a "molecular slave" of DNA during protein synthesis.
Answer: B
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

27) Which of the following is an example of a suspension?
A) cytosol
B) salt water
C) rubbing alcohol
D) blood
Answer: D
Section: 2.3
Learning Outcome: 2.7
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

28) If the atomic mass of an element is 14 and the atomic number is 6, which of the following would describe this element?
A) atom
B) neutral
C) ion
D) isotope
Answer: D
Section: 2.2
Learning Outcome: 2.5
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

29) The four elements that make up about 96% of body weight are _____.
A) carbon, oxygen, phosphorus, calcium
B) nitrogen, hydrogen, calcium, sodium
C) carbon, oxygen, hydrogen, nitrogen
D) sodium, potassium, hydrogen, oxygen
Answer: C
Section: 2.2
Learning Outcome: 2.3
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

30) _____ is fat soluble, produced in the skin on exposure to UV radiation, and necessary for normal bone growth and function.
A) Vitamin K
B) Cortisol
C) Vitamin A
D) Vitamin D
Answer: D
Section: 2.9
Learning Outcome: 2.18
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

31) You notice that you cannot read your book through a test tube of patient fluid held against the print, making it so blurred as to be unreadable. There is no precipitant in the bottom of the beaker, though it has been sitting for several days in a rack. What type of liquid is this?
A) solution
B) suspension
C) colloid
D) mixture
Answer: C
Section: 2.3
Learning Outcome: 2.7
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

32) Atom X has 17 protons. How many electrons are in its valence shell (outermost energy level)?
A) 3
B) 5
C) 7
D) 10
Answer: C
Section: 2.2
Learning Outcome: 2.4
Global LO: G2, G4
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

33) A high fever causes an enzyme to lose its three-dimensional structure and function. Which bonds are broken when a protein denatures?
A) ionic bonds
B) hydrogen bonds
C) polar covalent bonds
D) non-polar covalent bonds
Answer: B
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

34) If atom X has an atomic number of 74 it would have which of the following?
A) 37 protons and 37 neutrons
B) 37 electrons
C) 74 protons
D) 37 protons and 37 electrons
Answer: C
Section: 2.2
Learning Outcome: 2.5
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

35) What does the formula $C_6H_{12}O_6$ mean?
A) There are 6 calcium, 12 hydrogen, and 6 oxygen atoms.
B) There are 6 carbon, 12 hydrogen, and 6 oxygen atoms.
C) The molecular weight is 24.
D) The substance is a colloid.
Answer: B
Section: 2.5, 2.8
Learning Outcome: 2.17
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

36) An atom with 3 electrons in its outermost (valence) shell may have a total of _____ electrons altogether.
A) 3
B) 8
C) 13
D) 17
Answer: C
Section: 2.2
Learning Outcome: 2.4
Global LO: G2, G4
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

37) Which of the following is a neutralization reaction?
A) $HCl \rightarrow H^+ + Cl^-$
B) $NaOH \rightarrow Na^+ + OH^-$
C) $NH_3 + H^+ \rightarrow NH_4^{+2}$
D) $HCl + NaOH \rightarrow NaCl + H_2O$
Answer: D
Section: 2.6
Learning Outcome: 2.15
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

38) The chemical symbol O=O means _____.
A) zero equals zero
B) both atoms are bonded and have zero electrons in the outer orbit
C) the atoms are double bonded
D) this is an ionic bond with two shared electrons
Answer: C
Section: 2.4
Learning Outcome: 2.9
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

39) What is a cation?
A) an atom that shares its valence electrons
B) an atom that gains one or more electrons and acquires a net negative charge
C) an atom that loses one or more electrons and acquires a net positive charge
D) a molecule that has both positive and negative charges
Answer: C
Section: 2.4
Learning Outcome: 2.8
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

40) What does CH_4 mean?
A) There is one carbon and four hydrogen atoms.
B) There are four carbon and four hydrogen atoms.
C) This is an inorganic molecule.
D) This was involved in a redox reaction.
Answer: A
Section: 2.3
Learning Outcome: 2.6
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

41) Amino acids joining together to make a peptide is a good example of a(n) _____ reaction.
A) synthesis
B) decomposition
C) exchange
D) reversible
Answer: A
Section: 2.5
Learning Outcome: 2.11
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

42) Which of the following is NOT considered a factor in influencing a reaction rate?
A) temperature
B) concentration of reactants
C) particle size
D) time
Answer: D
Section: 2.5
Learning Outcome: 2.13
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

43) Which property of water is demonstrated when we sweat?
A) high heat capacity
B) high heat of vaporization
C) polar solvent properties
D) reactivity
E) cushioning
Answer: B
Section: 2.6
Learning Outcome: 2.14
Global LO: G2
HAPS LO: HAPS1, HAPS3
Bloom's: 1-2: Remembering/Understanding

44) Starch is a _____.
A) monosaccharide
B) disaccharide
C) polysaccharide
D) triglyceride
Answer: C
Section: 2.8
Learning Outcome: 2.17
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

45) What is the ratio of fatty acids to glycerol in triglycerides (neutral fats)?
A) 1:1
B) 2:1
C) 3:1
D) 4:1
Answer: C
Section: 2.9
Learning Outcome: 2.18
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

46) In a DNA molecule, the phosphate serves _____.
A) as a code
B) to hold the molecular backbone together
C) to bind the sugars to their bases
D) as nucleotides
Answer: B
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

47) When frying an egg, the protein albumin denatures and maintains only its _____ structure.
A) quaternary
B) tertiary
C) secondary
D) primary
Answer: D
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

48) Which of the following is chemically inert (unreactive)?
A) carbon (atomic number 6)
B) neon (atomic number 10)
C) oxygen (atomic number 8)
D) sodium (atomic number 11)
Answer: B
Section: 2.2
Learning Outcome: 2.4
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

49) An atom with an atomic number of 10 and a mass number of 24 would have _____.
A) 14 electrons
B) 14 neutrons
C) 10 neutrons
D) 24 protons
Answer: B
Section: 2.2
Learning Outcome: 2.5
Global LO: G2, G4
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

50) When DNA is replicated, it is necessary for the two strands to "unzip" temporarily. Choose which bonding type is most appropriate for holding the strands together in this way.
A) ionic bonding
B) polar covalent bonding
C) hydrogen bonding
D) non-polar covalent bonding
Answer: C
Section: 2.4
Learning Outcome: 2.9
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

51) Lithium has an atomic number of 3. How many electrons are there in the outermost (valence) shell?
A) one
B) two
C) three
D) zero
Answer: A
Section: 2.4
Learning Outcome: 2.8
Global LO: G2, G4
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

52) ATP → ADP + Pi is an example of a(n) _____ reaction.
A) reversible
B) synthesis
C) exchange
D) decomposition
Answer: D
Section: 2.5, 2.12
Learning Outcome: 2.11, 2.22
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

53) An acid with a pH of 6 has _____ hydrogen ions than pure water.
A) 10-fold more
B) 100-fold more
C) 10-fold fewer
D) 100-fold fewer
Answer: A
Section: 2.6
Learning Outcome: 2.15
Global LO: G2, G4
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

54) A patient is hyperventilating. The "blowing off" of excessive carbon dioxide causes a decrease in blood H^+ concentration. How can the carbonic acid-bicarbonate buffer system function to correct this imbalance?
$CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow H^+ + HCO_3^-$
A) H_2CO_3 dissociates to form more H^+ and raise pH.
B) HCO_3^- binds with H^+ to form H_2CO_3 and raise pH.
C) H_2CO_3 dissociates to form more H^+ and lower pH.
D) HCO_3^- binds with H^+ to form H_2CO_3 and lower pH.
Answer: C
Section: 2.6
Learning Outcome: 2.15
Global LO: G2, G7
HAPS LO: HAPS1, HAPS6
Bloom's: 3-4: Applying/Analyzing

55) Forming glycogen as energy storage in the liver is an example of _____.
A) oxidation
B) anabolism
C) exergonic
D) catabolism
Answer: B
Section: 2.5
Learning Outcome: 2.11
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

56) Salivary amylase is an enzyme produced by the salivary glands that breaks down carbohydrates. What will happen to this enzyme as it follows the food into the stomach where the pH drops to 2.5?
A) The enzyme will continue to function as it remains unchanged in chemical reactions.
B) The enzyme will assume an alternate form and catalyze additional reactions.
C) The enzyme will denature but retain its function.
D) The enzyme will denature and become inactive.
Answer: D
Section: 2.10
Learning Outcome: 2.20
Global LO: G2, G7
HAPS LO: HAPS1, HAPS4

Bloom's: 3-4: Applying/Analyzing

57) With a family history of cardiovascular disease, which toast spread would be considered the most "heart healthy"?
A) margarine containing trans fats
B) olive oil
C) butter containing butterfat
D) lard (pig fat)
Answer: B
Section: 2.9
Learning Outcome: 2.18
Global LO: G2, G5
HAPS LO: HAPS1, HAPS6
Bloom's: 3-4: Applying/Analyzing

58) Which of the following is *incorrectly* matched?
A) amino acid; protein
B) monosaccharide; carbohydrate
C) nucleotide; nucleic acid
D) eicosanoid; triglyceride
Answer: D
Section: 2.9
Learning Outcome: 2.18
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

59) Starch is the stored carbohydrate in plants, while _____ is the stored carbohydrate in animals.
A) glycogen
B) cellulose
C) glucose
D) triglyceride
Answer: A
Section: 2.8
Learning Outcome: 2.17
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

60) How many phosphates would ADP have attached to it?
A) two
B) three
C) one
D) none
Answer: A
Section: 2.12
Learning Outcome: 2.22
Global LO: G2
HAPS LO: HAPS1
Bloom's: 1-2: Remembering/Understanding

61) Tendons are strong, rope-like structures that connect skeletal muscle to bone. Which of the following proteins would provide strength to a tendon?
A) actin
B) collagen
C) molecular chaperone
D) albumin
Answer: B
Section: 2.10
Learning Outcome: 2.19
Global LO: G2
HAPS LO: HAPS1, HAPS4
Bloom's: 3-4: Applying/Analyzing

62) Phospholipids make up most of the lipid part of the cell membrane. Since water exists on both the outside and inside of a cell, which of the following phospholipid arrangements makes the most sense?
A) two back-to-back phospholipid layers with the non-polar tails facing out on both sides
B) a single layer of phospholipids with the polar heads facing outside the cell
C) two back-to-back phospholipid layers with the polar heads facing out on both sides
D) a single layer of phospholipids with the polar heads facing inside the cell
Answer: C
Section: 2.9
Learning Outcome: 2.18
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

63) What type of chemical bond can form between an atom with 11 protons and an atom with 17 protons?
A) non-polar covalent
B) polar covalent
C) hydrogen
D) ionic
Answer: D
Section: 2.4
Learning Outcome: 2.9
Global LO: G2
HAPS LO: HAPS1
Bloom's: 3-4: Applying/Analyzing

2.4 Short Answer Questions

1) What happens when globular proteins are denatured?
Answer: The active sites are destroyed.
Section: 2.10
Learning Outcome: 2.19
Global LO: G2, G8
HAPS LO: HAPS1, HAPS4, HAPS11
Bloom's: 1-2: Remembering/Understanding

2) Explain the difference between potential and kinetic energy.
Answer: Potential energy is inactive stored energy that has potential to do work. Kinetic energy is energy in action.
Section: 2.1
Learning Outcome: 2.1
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

3) How can phospholipids form a film when mixed in water?
Answer: Phospholipids have both polar and nonpolar ends. The polar end interacts with water, leaving the nonpolar end oriented in the opposite direction.
Section: 2.9
Learning Outcome: 2.18

Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

4) What properties does water have that make it a very versatile fluid?
Answer: High heat capacity, high heat of vaporization, polar solvent properties, reactivity, and cushioning.
Section: 2.6
Learning Outcome: 2.14
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

5) What advantages does ATP have in being the energy currency molecule?
Answer: Its energy is easy to capture and store; it releases just the right amount of energy for the cell's needs so it is protected from excessive energy release. A universal energy currency is efficient because a single system can be used by all the cells in the body.
Section: 2.12
Learning Outcome: 2.22
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

6) Explain why water is considered to have partial charges even though it is sharing electrons in a polar covalent bond.
Answer: Due to the electronegativity of oxygen, it pulls the shared electron more strongly than the hydrogen. As a result, the oxygen acquires a partial negative charge, and the hydrogens acquire a partial positive charge.
Section: 2.4
Learning Outcome: 2.10
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

7) When a set of electrodes connected to a light bulb is placed in a solution of dextrose and a current is applied, the light bulb does not light up. When the same unit is placed in HCl, it does. Why?
Answer: HCl ionizes to form current-conducting electrolytes. Dextrose does not ionize, and therefore does not conduct current.
Section: 2.6
Learning Outcome: 2.15
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 3-4: Applying/Analyzing

8) Describe the factors that affect chemical reaction rates.
Answer: Temperature increases kinetic energy and therefore the force of molecular collisions. Particle size: smaller particles move faster at the same temperature and therefore collide more frequently; also, smaller particles have more surface area given the same concentration of reactants. Concentration: the higher the concentration, the greater the chance of particles colliding. Catalysts increase the rate of the reaction at a given temperature. Enzymes are biological catalysts.
Section: 2.5
Learning Outcome: 2.13
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

9) Protons and electrons exist in every atom nucleus except hydrogen. Is this statement true or false and why?
Answer: False. Hydrogen has one proton and one electron. It is the neutron, not the electron that can coexist in the nucleus and that hydrogen does not have.
Section: 2.2
Learning Outcome: 2.4
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

10) A chemical bond never occurs between components of a mixture. Discuss this.
Answer: Mixtures come in three forms—solutions, colloids, and suspensions. Components of these mixtures always retain their original makeup and can be separated into their individual components; therefore, no chemical bonding has taken place.
Section: 2.3
Learning Outcome: 2.6
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

11) All chemical reactions are theoretically reversible, but reactions in the body tend to be irreversible. Discuss why this is the case.
Answer: It is possible to reverse any reaction if the products are still present. Those that are only slightly exergonic are easily reversible. Some would require an enormous amount of energy to reverse. In the simple reaction Na + Cl → NaCl the amount of energy it takes to reverse table salt to chlorine gas and sodium metal is enormous. When glucose is oxidized the energy goes into bonds of ATP molecules which are then spent and thus the energy is not available to reform glucose.
Section: 2.5
Learning Outcome: 2.12
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

12) What is the major difference between polar and nonpolar covalent bonds?
Answer: Polar bonds have an unequal sharing of electrons resulting in a slight negative charge at one end of the molecule and a slight positive charge at the other end. Nonpolar bonds have an equal sharing of electrons, resulting in a balanced charge among the atoms.
Section: 2.4
Learning Outcome: 2.10
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

13) An amino acid may act as a proton acceptor or donor. Explain.
Answer: Amino acids have two components—a base group (proton acceptor) and an organic acid part (a proton donor). Some have additional base or acid groups on the ends of their R groups as well.
Section: 2.10
Learning Outcome: 2.19
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

14) Name at least four things you know about enzymes.
Answer:
1. Most are proteins.
2. They have specific binding sites for specific substrates.
3. They lower the activation barrier for a specific reaction.
4. The names often end in "Suffix: -ase."
5. They can be denatured.
6. They can be used again and again.
Section: 2.10
Learning Outcome: 2.20
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

15) In the compound H_2CO_3, what do the numbers 2 and 3 represent?
Answer: The 2 indicates that there are two hydrogen atoms in the compound and the 3 indicates that there are three oxygen atoms in the compound.
Section: 2.5
Learning Outcome: 2.11
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 3-4: Applying/Analyzing

16) Are all chemical reactions reversible? If not, why aren't they all reversible?
Answer: All chemical reactions are theoretically reversible, but only if the products are not consumed and enough energy is available for the reaction.
Section: 2.5
Learning Outcome: 2.12
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

17) If all protons, electrons, and neutrons are alike, regardless of the atom considered, what determines the unique properties of each element?
Answer: Atoms of different elements are composed of different numbers of protons, electrons, and neutrons.
Section: 2.2
Learning Outcome: 2.4
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 1-2: Remembering/Understanding

2.5 Clinical Questions

1) Mrs. Mulligan goes to her dentist and, after having a couple of cavities filled, her dentist strongly suggests that she reduce her intake of sodas and increase her intake of calcium phosphates in the foods she eats. Why?
Answer: Sodas are strong acids that can reduce bone and tooth salts. Calcium phosphate makes teeth hard and therefore more resistant to tooth decay.
Section: 2.2, 2.6
Learning Outcome: 2.3, 2.15
Global LO: G2, G5, G8
HAPS LO: HAPS1, HAPS6, HAPS11
Bloom's: 3-4: Applying/Analyzing

2) Although his cholesterol levels were not high, Mr. Martinez read that cholesterol was bad for his health, so he eliminated all foods and food products containing this molecule. He later found that his cholesterol level dropped only 20%. Why did it not drop more?
Answer: Cholesterol is produced by the liver, in addition to being ingested in foods.
Section: 2.9
Learning Outcome: 2.18
Global LO: G2, G5, G8
HAPS LO: HAPS1, HAPS6, HAPS11
Bloom's: 3-4: Applying/Analyzing

3) How can DNA be used to "fingerprint" a suspect in a crime?
Answer: The DNA of a person is unique to that individual. By obtaining the DNA from nucleated cells from the crime scene (e.g., blood, semen, other body tissues), enzymes may be used to break up the DNA into fragments. Because nearly everyone's DNA is different, it also breaks up into fragments differently. When the fragments are separated, they form patterns even more unique than fingerprint patterns. A match of suspect and crime scene DNA is strong evidence.
Section: 2.11
Learning Outcome: 2.21
Global LO: G2, G5, G8
HAPS LO: HAPS1, HAPS6, HAPS11
Bloom's: 3-4: Applying/Analyzing

4) Why is it possible for us to drink a solution that contains a mixture of equal concentration of a strong acid and a strong base, either of which, separately, would be very caustic?
Answer: When an acid and base of equal strength are mixed, they undergo a displacement (neutralization) reaction to form water and a salt.
Section: 2.6
Learning Outcome: 2.15
Global LO: G2, G8
HAPS LO: HAPS1, HAPS11
Bloom's: 3-4: Applying/Analyzing

5) A 65-year-old patient came to the emergency room with complaints of severe heartburn unrelieved by taking a "large handful" of antacids. Would you expect the pH to be high or low? Explain why.
Answer: You would expect a high pH. Taking antacids will neutralize the acidic stomach. Taking a "handful" of antacids can cause an alkaloid state. Certain drugs, such as corticosteroids and antacids that contain baking soda, will lead to metabolic alkalosis.
Section: 2.6
Learning Outcome: 2.15
Global LO: G2, G5, G8
HAPS LO: HAPS1, HAPS6, HAPS11
Bloom's: 3-4: Applying/Analyzing

6) A 22-year-old female college student is stressed out due to final exams and begins to hyperventilate. This means she is exhaling too much carbon dioxide. As a result, the pH of the blood will become too basic creating a homeostatic imbalance. Her friend hands her a paper bag and instructs her to inhale and exhale into the bag. Breathing in the bag helps to replace the lost carbon dioxide lowering the pH back to normal levels. Which buffer system in the body will be involved in this reaction?
Answer: The bicarbonate buffer system is going to be involved in this situation. In this buffer system, the weak acid is carbonic acid, which is formed from the reaction between carbon dioxide and water. The body responds to an increase in blood pH by shifting the equation to the left, causing carbonic acid to dissociate into bicarbonate and protons. These protons will bring the rising pH back to a normal level.

Section: 2.6
Learning Outcome: 2.15
Global LO: G2, G8
HAPS LO: HAPS1, HAPS3, HAPS6, HAPS11
Bloom's: 3-4: Applying/Analyzing

7) Brenda is a 26-year-old female who is being discharged from the hospital after a vaginal delivery of an 8-pound healthy infant. Brenda is instructed by the nurse to eat a diet high in fiber and to drink 8 glasses of water per day to prevent constipation. Explain the role of fiber and water to promote defecation.
Answer: Cellulose is a polysaccharide found in all plant products that adds bulk to the diet to promote feces through the colon. Water acts as a lubricating liquid within the colon, which eases feces through the bowel.
Section: 2.8
Learning Outcome: 2.17
Global LO: G2, G8
HAPS LO: HAPS1, HAPS6, HAPS11
Bloom's: 3-4: Applying/Analyzing