

Human Anatomy & Physiology, 10e, (Marieb)
Chapter 2 Chemistry Comes Alive

2.1 Matching Questions

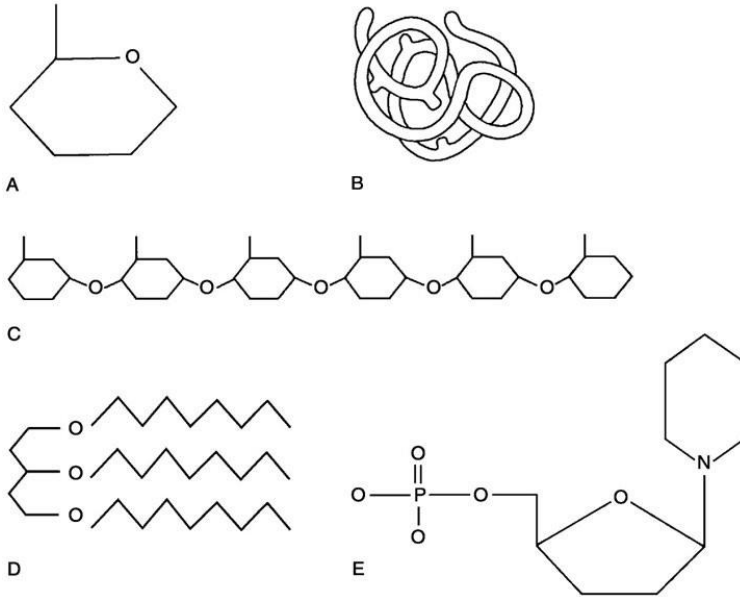


Figure 2.1

Using Figure 2.1, match the following:

- A) C
- B) B
- C) E
- D) D
- E) A

1) Lipid.

Section: 2.9

Learning Outcome: 2.18

Global LO: G2

HAPS LO: HAPS2

Bloom's Level: 1 Knowledge

2) Functional protein.

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS2

Bloom's Level: 1 Knowledge

3) Nucleotide.

Section: 2.11

Learning Outcome: 2.21

Global LO: G2

HAPS LO: HAPS2

Bloom's Level: 1 Knowledge

4) Polysaccharide.

Section: 2.8

Learning Outcome: 2.17

Global LO: G2

HAPS LO: HAPS2

Bloom's Level: 1 Knowledge

5) Monosaccharide.

Section: 2.8

Learning Outcome: 2.17

Global LO: G2

HAPS LO: HAPS2

Bloom's Level: 1 Knowledge

6) Polymer.

Section: 2.7, 2.8

Learning Outcome: 2.16, 2.17

Global LO: G2

HAPS LO: HAPS2

Bloom's Level: 2 Comprehension

7) Tertiary (protein) structure.

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS2

Bloom's Level: 1 Knowledge

Answers: 1) D 2) B 3) C 4) A 5) E 6) A 7) B

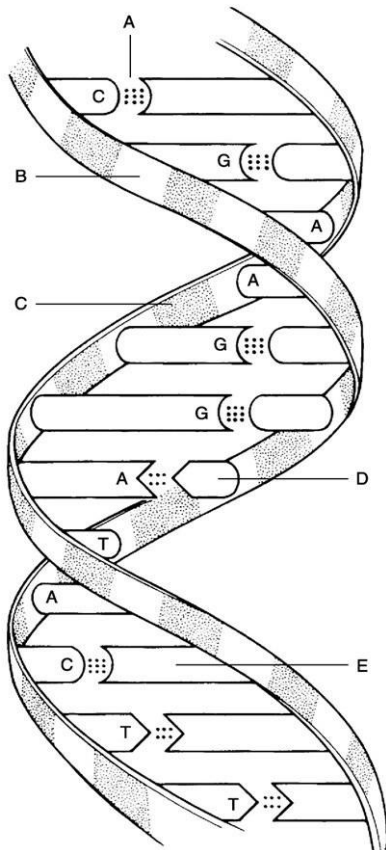


Figure 2.2

Using Figure 2.2, match the following:

- A) A
- B) D
- C) B
- D) E
- E) C

8) Deoxyribose sugar.

Section: 2.11

Learning Outcome: 2.21

Global LO: G2

HAPS LO: HAPS2

Bloom's Level: 1 Knowledge

9) Thymine.

Section: 2.11

Learning Outcome: 2.21

Global LO: G2

HAPS LO: HAPS2

Bloom's Level: 2 Comprehension

10) Guanine.

Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

11) Phosphate.
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS2
Bloom's Level: 1 Knowledge

12) Hydrogen bonds.
Section: 2.11
Learning Outcome: 2.21
Global LO: G2
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

Answers: 8) C 9) B 10) D 11) E 12) A

Match the following chemical bonds to the correct description:

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

13) A bond in which electrons are shared unequally.

Section: 2.4

Learning Outcome: 2.10

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

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 Level: 1 Knowledge

15) A bond in which electrons are shared equally.

Section: 2.4

Learning Outcome: 2.10

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

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 Level: 2 Comprehension

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

Match the following particles to the correct description:

- A) Atom
- B) Neutron
- C) Cation
- D) Molecule

17) Electrically charged particle due to loss of an electron.

Section: 2.4

Learning Outcome: 2.9

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

18) Neutral subatomic particle.

Section: 2.2

Learning Outcome: 2.4

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

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 Level: 1 Knowledge

20) Combination of two or more atoms of the same element held together by chemical bonds.

Section: 2.3

Learning Outcome: 2.6

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

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

Match the following:

- A) Compound
- B) Mixture
- C) Element

21) Water.

Section: 2.3

Learning Outcome: 2.6

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

22) Carbon.

Section: 2.2

Learning Outcome: 2.3

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

23) Dry ice (frozen carbon dioxide).

Section: 2.3

Learning Outcome: 2.6

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

24) Blood.

Section: 2.3

Learning Outcome: 2.6

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

Answers: 21) A 22) C 23) A 24) B

Match the following:

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

25) Can be measured only by its effects on matter.

Section: 2.1

Learning Outcome: 2.1

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

26) Anything that occupies space and has mass.

Section: 2.1

Learning Outcome: 2.1

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

27) 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 Level: 2 Comprehension

28) Is a function of, and varies with, gravity.

Section: 2.1

Learning Outcome: 2.1

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

Answers: 25) D 26) C 27) B 28) A

Match the following:

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

29) Legs moving the pedals of a bicycle.

Section: 2.1

Learning Outcome: 2.2

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

30) 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 Level: 2 Comprehension

31) 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 Level: 2 Comprehension

32) 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 Level: 2 Comprehension

Answers: 29) A 30) B 31) D 32) C

Match the following:

- A) Solutions
- B) Suspensions
- C) Colloids

33) Heterogeneous, will not settle.

Section: 2.3

Learning Outcome: 2.7

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

34) Heterogeneous, will settle.

Section: 2.3

Learning Outcome: 2.7

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

35) Homogeneous, will not settle.

Section: 2.3

Learning Outcome: 2.7

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

36) Will not scatter light.

Section: 2.3

Learning Outcome: 2.7

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

Answers: 33) C 34) B 35) A 36) A

Match the following:

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

37) Usually, the first one or two letters of an element's name.

Section: 2.2

Learning Outcome: 2.4

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

38) Number of protons in an atom.

Section: 2.2

Learning Outcome: 2.5

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

39) Combined number of protons and neutrons in an atom.

Section: 2.2

Learning Outcome: 2.5

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

Answers: 37) A 38) C 39) B

2.2 True/False Questions

1) The atomic weight is an average of the relative weights (mass numbers) of all the isotopes of an element.

Answer: TRUE

Section: 2.2

Learning Outcome: 2.5

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

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 Level: 1 Knowledge

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 Level: 1 Knowledge

4) A charged particle is generally called an ion or electrolyte.

Answer: TRUE

Section: 2.6

Learning Outcome: 2.9

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

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 Level: 1 Knowledge

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 Level: 1 Knowledge

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 Level: 1 Knowledge

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 Level: 1 Knowledge

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 Level: 1 Knowledge

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 Level: 1 Knowledge

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 Level: 2 Comprehension

12) Covalent bonds are generally less stable than ionic bonds.

Answer: FALSE

Section: 2.4

Learning Outcome: 2.9

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

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 Level: 1 Knowledge

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 Level: 2 Comprehension

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 Level: 2 Comprehension

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 Level: 2 Comprehension

17) All organic compounds contain carbon.

Answer: TRUE

Section: 2.7

Learning Outcome: 2.16

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

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 Level: 1 Knowledge

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 Level: 1 Knowledge

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 Level: 2 Comprehension

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 Level: 2 Comprehension

1.3 Multiple Choice Questions

1) The basic structural material of the body consists of _____.

- A) proteins
- B) lipids
- C) nucleic acids
- D) carbohydrates

Answer: A

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

2) In general, the lipids that we refer to as oils have _____.

- A) long fatty acid chains
- B) a high water content
- C) unsaturated fatty acids
- D) saturated fatty acids

Answer: C

Section: 2.9

Learning Outcome: 2.18

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

3) The genetic information is coded in DNA by the _____.

- A) sequence of the nucleotides
- B) three-dimensional structure of the double helix
- C) arrangement of the histones
- D) regular alteration of sugar and phosphate molecules

Answer: A

Section: 2.11

Learning Outcome: 2.21

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

4) Which of the following does NOT characterize proteins?

- A) Their function depends on their three-dimensional shape.
- B) They may be denatured or coagulated by heat or acidity.
- C) They appear to be the molecular carriers of coded hereditary information.
- D) They have both functional and structural roles in the body.

Answer: C

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

5) The single most abundant protein in the body is _____.

- A) hemoglobin
- B) collagen
- C) DNA
- D) glucose

Answer: B

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

6) Carbohydrates are stored in the liver and skeletal muscles in the form of _____.

- A) triglycerides
- B) glycogen
- C) glucose
- D) cholesterol

Answer: B

Section: 2.8

Learning Outcome: 2.17

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

7) Which of the following does NOT describe enzymes?

- A) Enzymes work by raising the energy of activation.
- B) Some enzymes are purely protein.
- C) Some enzymes are protein plus a cofactor.
- D) Each enzyme is chemically specific.

Answer: A

Section: 2.10

Learning Outcome: 2.20

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

8) Which of the following is a general function for a fibrous protein?

- A) protein management
- B) transport
- C) structural framework
- D) body defense
- E) catalysis

Answer: C

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

9) Salts are always _____.

A) double covalent compounds

B) single covalent compounds

C) ionic compounds

D) hydrogen bonded

Answer: C

Section: 2.4

Learning Outcome: 2.9

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

10) 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

B) 2, 8

C) 2, 8, 1

D) 2, 8, 8

Answer: C

Section: 2.4

Learning Outcome: 2.8

Global LO: G2, G4

HAPS LO: HAPS1, HAPS4

Bloom's Level: 3 Application

11) Which of the following statements is FALSE?

A) The pH of blood is slightly basic.

B) The more hydrogen ions in a solution, the more acidic the solution.

C) When acids and bases are mixed, they react with each other to form water and a salt.

D) When the hydrogen ion concentration decreases, the hydroxyl ion concentration also decreases.

Answer: D

Section: 2.6

Learning Outcome: 2.15

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

12) Which of the following is the major positive ion outside cells?

A) hydrogen

B) magnesium

C) sodium

D) potassium

Answer: C

Section: 2.2

Learning Outcome: 2.3
Global LO: G2
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

13) Which of the following would be regarded as an organic molecule?

- A) NaCl
- B) H₂O
- C) CH₄
- D) NaOH

Answer: C

Section: 2.7

Learning Outcome: 2.16

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 3 Application

14) What is a chain of more than 50 amino acids called?

- A) protein
- B) triglyceride
- C) nucleic acid
- D) polysaccharide

Answer: A

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

15) What structural level is represented by the coiling of the protein chain backbone into an alpha helix?

- A) tertiary structure
- B) secondary structure
- C) primary structure
- D) quaternary structure

Answer: B

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

16) Carbohydrates and proteins are built up from their basic building blocks by the _____.

- A) addition of a carbon atom between each two units
- B) removal of a water molecule between each two units
- C) addition of a water molecule between each two units
- D) removal of a carbon atom between each two units

Answer: B

Section: 2.7

Learning Outcome: 2.16

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

17) Which statement about enzymes is FALSE?

- A) Most enzymes can catalyze millions of reactions per minute.
- B) Enzymes may be damaged by high temperature.
- C) Enzymes may use coenzymes derived from vitamins or cofactors from metallic elements.
- D) Enzymes require contact with substrate in order to assume their active form.

Answer: D

Section: 2.10

Learning Outcome: 2.20

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

18) Which of the following statements is FALSE?

- A) Chemical reactions progress at a faster rate when the reacting particles are present in higher numbers.
- B) Catalysts increase the rate of chemical reactions, sometimes while undergoing reversible changes in shape.
- C) Larger particles move faster than smaller ones and thus collide more frequently and more forcefully.
- D) Chemical reactions proceed more quickly at higher temperatures.

Answer: C

Section: 2.5

Learning Outcome: 2.13

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

19) Choose the answer that best describes HCO_3^- .

- A) a proton donor
- B) a weak acid
- C) a bicarbonate ion
- D) common in the liver

Answer: C

Section: 2.6

Learning Outcome: 2.15

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

20) What happens in redox reactions?

- A) the electron acceptor is oxidized
- B) the organic substance that loses hydrogen is usually reduced

- C) both decomposition and electron exchange occur
- D) the reaction is uniformly reversible

Answer: C

Section: 2.5

Learning Outcome: 2.11

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

21) Choose the answer that best describes fibrous proteins.

- A) rarely exhibit secondary structure
- B) are usually called enzymes
- C) are cellular catalysts
- D) are very stable and insoluble in water

Answer: D

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

22) Which of the following does NOT describe uses for the ATP molecule?

- A) pigment structure
- B) mechanical work
- C) transport across membranes
- D) chemical work

Answer: A

Section: 2.12

Learning Outcome: 2.22

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

23) Which of the following is an example of a suspension?

- A) salt water
- B) rubbing alcohol
- C) blood
- D) cytosol

Answer: C

Section: 2.3

Learning Outcome: 2.7

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

24) Select the correct statement about isotopes.

- A) All the isotopes of an element have the same number of neutrons but differing numbers of electrons.

- B) Isotopes of the same element have the same atomic number but differ in their mass number.
- C) All the isotopes of an element are radioactive.
- D) Isotopes occur only in the heavier elements.

Answer: B

Section: 2.2

Learning Outcome: 2.5

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

25) The four elements that make up about 96% of body weight are _____.

- A) carbon, oxygen, hydrogen, nitrogen
- B) carbon, oxygen, phosphorus, calcium
- C) nitrogen, hydrogen, calcium, sodium
- D) sodium, potassium, hydrogen, oxygen

Answer: A

Section: 2.2

Learning Outcome: 2.3

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

26) _____ is fat soluble, produced in the skin on exposure to UV radiation, and necessary for normal bone growth and function.

- A) Cortisol
- B) Vitamin K
- C) Vitamin A
- D) Vitamin D

Answer: D

Section: 2.9

Learning Outcome: 2.18

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

27) Atom X has 17 protons. How many electrons are in its valence shell (outermost energy level)?

- A) 7
- B) 3
- C) 5
- D) 10

Answer: A

Section: 2.4

Learning Outcome: 2.8

Global LO: G2, G4

HAPS LO: HAPS1

Bloom's Level: 3 Application

28) A high fever causes an enzyme to lose its three dimensional structure and function. Which bonds are broken when a protein denatures?

- A) non-polar covalent bonds
- B) polar covalent bonds
- C) ionic bonds
- D) hydrogen bonds

Answer: D

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 3 Application

29) If atom X has an atomic number of 74 it would have which of the following?

- A) 37 protons and 37 neutrons
- B) 37 protons and 37 electrons
- C) 37 electrons
- D) 74 protons

Answer: D

Section: 2.2

Learning Outcome: 2.5

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 3 Application

30) What does the formula $C_6H_{12}O_6$ mean?

- A) The substance is a colloid.
- B) There are 6 calcium, 12 hydrogen, and 6 oxygen atoms.
- C) The molecular weight is 24.
- D) There are, 6 carbon, 12 hydrogen, and 6 oxygen atoms.

Answer: D

Section: 2.8

Learning Outcome: 2.17

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

31) An atom with 3 electrons in its outermost (valence) shell may have a total of _____ electrons altogether.

- A) 13
- B) 8
- C) 17
- D) 3

Answer: A

Section: 2.4

Learning Outcome: 2.8

Global LO: G2, G4

HAPS LO: HAPS1

Bloom's Level: 3 Application

32) Which of the following is a neutralization reaction?

- A) $\text{NH}_3 + \text{H}^+ \rightarrow \text{NH}_4^+$
- B) $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- C) $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$
- D) $\text{NaOH} \rightarrow \text{Na}^+ + \text{OH}^-$

Answer: B

Section: 2.6

Learning Outcome: 2.15

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

33) The chemical symbol $\text{O}=\text{O}$ means _____.

- A) the atoms are double bonded
- B) both atoms are bonded and have zero electrons in the outer orbit
- C) zero equals zero
- D) this is an ionic bond with two shared electrons

Answer: A

Section: 2.4

Learning Outcome: 2.9

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

34) What is a dipole?

- A) a polar molecule
- B) an organic molecule
- C) a type of reaction
- D) a type of bond

Answer: A

Section: 2.4

Learning Outcome: 2.10

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

35) What does CH_4 mean?

- A) This is an inorganic molecule.
- B) This was involved in a redox reaction.
- C) There is one carbon and four hydrogen atoms.
- D) There are four carbon and four hydrogen atoms.

Answer: C

Section: 2.3

Learning Outcome: 2.6

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

36) Amino acids joining together to make a peptide is a good example of a(n) _____ reaction.

- A) decomposition
- B) reversible
- C) synthesis
- D) exchange

Answer: C

Section: 2.5

Learning Outcome: 2.11

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

37) Which of the following is NOT considered a factor in influencing a reaction rate?

- A) time
- B) concentration of reactants
- C) temperature
- D) particle size

Answer: A

Section: 2.5

Learning Outcome: 2.13

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

38) Which property of water is demonstrated when we sweat?

- A) high heat of vaporization
- B) polar solvent properties
- C) high heat capacity
- D) reactivity
- E) cushioning

Answer: A

Section: 2.6

Learning Outcome: 2.14

Global LO: G2

HAPS LO: HAPS1, HAPS3

Bloom's Level: 2 Comprehension

39) Sucrose is a _____.

- A) disaccharide
- B) polysaccharide
- C) triglyceride
- D) monosaccharide

Answer: A

Section: 2.8

Learning Outcome: 2.17

Global LO: G2
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

40) What is the ratio of fatty acids to glycerol in triglycerides (neutral fats)?

- A) 4:1
- B) 3:1
- C) 1:1
- D) 2:1

Answer: B

Section: 2.9

Learning Outcome: 2.18

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

41) In a DNA molecule, the phosphate serves _____.

- A) as a code
- B) to hold the molecular backbone together
- C) as nucleotides
- D) to bind the sugars to their bases

Answer: B

Section: 2.11

Learning Outcome: 2.21

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 1 Knowledge

42) When frying an egg, the protein albumin denatures and maintains only its _____ structure.

- A) tertiary
- B) secondary
- C) quaternary
- D) primary

Answer: D

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 4 Analysis

43) Which of the following is chemically inert (unreactive)?

- A) carbon (atomic number 6)
- B) oxygen (atomic number 8)
- C) neon (atomic number 10)
- D) sodium (atomic number 11)

Answer: C

Section: 2.4

Learning Outcome: 2.8
Global LO: G2
HAPS LO: HAPS1
Bloom's Level: 4 Analysis

44) An atom with an atomic number of 10 and a mass number of 24 would have _____.

- A) 14 electrons
- B) 14 neutrons
- C) 24 protons
- D) 10 neutrons

Answer: B

Section: 2.2

Learning Outcome: 2.5

Global LO: G2, G4

HAPS LO: HAPS1

Bloom's Level: 4 Analysis

45) 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) non-polar covalent bonding
- B) hydrogen bonding
- C) ionic bonding
- D) polar covalent bonding

Answer: B

Section: 2.4

Learning Outcome: 2.9

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 3 Application

46) Lithium has an atomic number of 3. How many electrons are there in the outermost (valence) shell?

- A) one
- B) two
- C) zero
- D) three

Answer: A

Section: 2.4

Learning Outcome: 2.8

Global LO: G2, G4

HAPS LO: HAPS1

Bloom's Level: 4 Analysis

47) $\text{ATP} \rightarrow \text{ADP} + \text{Pi}$ is an example of a(n) _____ reaction.

- A) decomposition
- B) exchange
- C) synthesis
- D) reversible

Answer: A
Section: 2.5
Learning Outcome: 2.11
Global LO: G2
HAPS LO: HAPS1
Bloom's Level: 3 Application

48) An acid with a pH of 6 has _____ hydrogen ions than pure water.

- A) 100-fold fewer
- B) 10-fold more
- C) 10-fold fewer
- D) 100-fold more

Answer: B
Section: 2.6
Learning Outcome: 2.15
Global LO: G2, G4
HAPS LO: HAPS1
Bloom's Level: 3 Application

49) 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?



- A) HCO₃⁻ binds with H⁺ to form H₂CO₃ and lower pH
- B) HCO₃⁻ binds with H⁺ to form H₂CO₃ and raise pH
- C) H₂CO₃ dissociates to form more H⁺ and lower pH
- D) H₂CO₃ dissociates to form more H⁺ and raise pH

Answer: C
Section: 2.6
Learning Outcome: 2.15
Global LO: G2, G7
HAPS LO: HAPS1, HAPS6
Bloom's Level: 4 Analysis

50) Forming glycogen as energy storage in the liver is an example of _____.

- A) exergonic
- B) anabolism
- C) catabolism
- D) oxidation

Answer: B
Section: 2.5
Learning Outcome: 2.11
Global LO: G2
HAPS LO: HAPS1
Bloom's Level: 3 Application

51) 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 assume an alternate form and catalyze additional reactions.
- B) The enzyme will denature and become inactive.
- C) The enzyme will continue to function as it remains unchanged in chemical reactions.
- D) The enzyme will denature but retain its function.

Answer: B

Section: 2.10

Learning Outcome: 2.20

Global LO: G2, G7

HAPS LO: HAPS1, HAPS4

Bloom's Level: 3 Application

52) With a family history of cardiovascular disease, which toast spread would be considered the most "heart healthy?"

- A) olive oil
- B) butter containing butterfat
- C) lard (pig fat)
- D) margarine containing trans fats

Answer: A

Section: 2.9

Learning Outcome: 2.18

Global LO: G2, G5

HAPS LO: HAPS1, HAPS6

Bloom's Level: 3 Application

53) Which of the following is incorrectly matched?

- A) monosaccharide; carbohydrate
- B) eicosanoid; triglyceride
- C) amino acid; protein
- D) nucleotide; nucleic acid

Answer: B

Section: 2.9

Learning Outcome: 2.18

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 3 Application

54) Starch is the stored carbohydrate in plants, while _____ is the stored carbohydrate in animals.

- A) glycogen
- B) cellulose
- C) triglyceride
- D) glucose

Answer: A

Section: 2.8

Learning Outcome: 2.17

Global LO: G2
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

55) How many phosphates would AMP have attached to it?

- A) three
- B) two
- C) one
- D) none

Answer: C

Section: 2.12

Learning Outcome: 2.22

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 2 Comprehension

56) Tendons are strong, rope-like structures that connect skeletal muscle to bone. Which of the following proteins would provide strength to a tendon?

- A) albumin
- B) molecular chaperone
- C) actin
- D) collagen

Answer: D

Section: 2.10

Learning Outcome: 2.19

Global LO: G2

HAPS LO: HAPS1, HAPS4

Bloom's Level: 3 Application

57) 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) a single layer of phospholipids with the polar heads facing outside the cell
- B) a single layer of phospholipids with the polar heads facing inside the cell
- C) two back-to-back phospholipid layers with the polar heads facing out on both sides
- D) two back-to-back phospholipid layers with the non-polar tails facing out on both sides

Answer: C

Section: 2.9

Learning Outcome: 2.18

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 4 Analysis

58) What type of chemical bond can form between an atom with 11 protons and an atom with 17 protons?

- A) polar covalent
- B) ionic
- C) non-polar covalent

D) hydrogen

Answer: B

Section: 2.4

Learning Outcome: 2.9

Global LO: G2

HAPS LO: HAPS1

Bloom's Level: 4 Analysis

1.4 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 Level: 2 Comprehension

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 Level: 2 Comprehension

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 Level: 2 Comprehension

4) 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 Level: 2 Comprehension

5) Explain why chemical reactions in the body are often irreversible.

Answer: Chemical reactions that release energy cannot be reversed unless energy is put back into the system. Also, some reactions produce molecules in excessive quantities (like CO₂ and NH₄) that the body then eliminates, but which are needed to reverse a reaction.

Section: 2.5

Learning Outcome: 2.12

Global LO: G2, G8

HAPS LO: HAPS1, HAPS11

Bloom's Level: 2 Comprehension

6) 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 Level: 2 Comprehension

7) 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 Level: 2 Comprehension

8) 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 Level: 2 Comprehension

9) All chemical reactions are theoretically reversible. Comment on this statement.

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 $\text{Na} + \text{Cl} \rightarrow \text{NaCl}$ 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 Level: 2 Comprehension

10) 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 Level: 2 Comprehension

11) 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 Level: 2 Comprehension

12) 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 "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 Level: 2 Comprehension

13) 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 Level: 3 Application

14) 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 Level: 2 Comprehension

1.5 Clinical Questions

1) 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 Level: 3 Application

2) 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 Level: 3 Application

3) 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 Level: 3 Application

4) 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 Level: 3 Application

5) A 23-year-old male was riding his road bike in 100-degree heat, when he suddenly became nauseated and weak. He called 911 from his cell phone. When the ambulance came, the paramedics started intravenous therapy for severe dehydration. Explain the critical role of water to maintain homeostasis.

Answer: Water is the most abundant and important inorganic compound in living material. It makes up 60% to 80% of the volume of most living cells. The properties of water are: high heat capacity, high heat of vaporization, polar solvent properties, reactivity, and cushioning. In this case the bicyclist lost a large amount of water through perspiration in an effort to cool his body. This caused a disruption in homeostasis.

Section: 2.6

Learning Outcome: 2.14

Global LO: G2, G8

HAPS LO: HAPS1, HAPS3, HAPS6, HAPS11

Bloom's Level: 3 Application