

CHAPTER 2—THE CHEMISTRY OF LIFE

TRUE/FALSE

1. Our liver converts toxic ammonia to a harmless substance called urea through its enzymes.

ANS: T PTS: 1

NOT: Through enzymes, the liver converts toxic ammonia to a harmless substance called urea.

2. ATP is the high-energy fuel molecule that the cell needs in order to function.

ANS: T PTS: 1 NOT: ATP allows the body cells to do work.

3. Water serves as a medium or solvent in which other reactions occur, and water is referred to as the universal solvent.

ANS: T PTS: 1

NOT: Water serves as a medium or solvent in which other reactions occur, and water is referred to as the universal solvent.

4. Chloride (Cl⁻) is necessary for muscle contraction, as well as for building strong bones.

ANS: F PTS: 1 NOT: Chloride is necessary for nervous transmission.

5. Energy storage is the more common function of carbohydrates.

ANS: T PTS: 1

NOT: Carbohydrates have two important functions: energy storage and cell strengthening. Energy storage is the more common function of carbohydrates.

6. Enzymes are protein catalysts that block a chemical reaction.

ANS: F PTS: 1

NOT: Enzymes are protein catalysts, which increase the rate of chemical reactions without being affected by the reaction.

7. The plasma membrane of cells is a selectively permeable membrane.

ANS: T PTS: 1

NOT: The plasma membrane of cells is a selectively permeable membrane.

8. Concerning the effect of temperature on diffusion, the higher the temperature, the faster the movement.

ANS: T PTS: 1

NOT: The higher the temperature, the faster the movement of diffusion.

9. Ammonia (NH₃) is a by-product of the breakdown of amino acids.

ANS: T PTS: 1

NOT: Ammonia comes from the decomposition of proteins via the digestive process and the conversion of amino acids in cellular respiration.

PTS: 1

6. The arrangement of the elements by increasing atomic number in such a way that similar properties repeat at periodic intervals is known as the ____.
- a. orbital
 - b. periodic table
 - c. energy levels
 - d. atomic weight

ANS: B

	Feedback
A	Orbitals indicate where an electron may be located around the nucleus at any one given time.
B	The periodic table is the arrangement of the elements by increasing atomic number in such a way that similar properties repeat at periodic intervals.
C	Energy levels: orbitals are grouped together to form energy levels.
D	Atomic weight is the relative mass of an atom.

PTS: 1

7. A weak bond that helps hold water molecules together is which type of bond?
- a. hydrogen
 - b. ionic
 - c. covalent
 - d. neutral

ANS: A

	Feedback
A	A hydrogen bond is a weak bond that helps hold water molecules together.
B	In an ionic bond, one atom gains electrons while the other atom loses electrons from its outer shell or orbit.
C	In a covalent bond, the atoms share electrons to fill their outermost shells.
D	Neutral is not a correct answer.

PTS: 1

8. The universal solvent is ____.
- a. hydrogen
 - b. chlorine
 - c. water
 - d. acid

ANS: C

	Feedback
A	This is not a correct answer.
B	This is not a correct answer.
C	Water is the universal solvent.
D	This is not a correct answer.

PTS: 1

9. Approximately what percent of the gas in the atmosphere is oxygen?
- a. 4%
 - b. 16%
 - c. 21%
 - d. 50%

ANS: C

13. An enzyme that increases the rate of a chemical reaction without being affected by the reaction is known as a(n) ____.
- a. catalyst
b. antagonist
c. nucleotide
d. pyrimidine

ANS: A

	Feedback
A	A catalyst is an enzyme that increases the rate of a chemical reaction without being affected by the reaction.
B	An antagonist is something opposing or resisting the action of another.
C	A nucleotide is a combination of a sugar, a nitrogen base, and a phosphate.
D	A pyrimidine is a nitrogen base that consists of a single ring of six atoms.

PTS: 1

14. Crenulate means to ____.
- a. expand
b. dissolve
c. shrivel up
d. multiply

ANS: C

	Feedback
A	This is not a correct answer.
B	This is not a correct answer.
C	Crenulate refers to shriveling up.
D	This is not a correct answer.

PTS: 1

15. A substance that combines with H⁺ ions when dissolved in water is called a(n) ____.
- a. acid
b. base
c. catalyst
d. disaccharide

ANS: B

	Feedback
A	An acid is a substance that dissociates and forms an excess of H ⁺ ions when dissolved in water.
B	A base is a substance that combines with H ⁺ ions when dissolved in water.
C	A catalyst is a substance that increases the rate of a chemical reaction without being affected by the reaction.
D	A disaccharide is a carbohydrate.

PTS: 1

16. A substance that acts as a reservoir for hydrogen ions, donating them to a solution when their concentration falls and taking the hydrogen ions from a solution when their concentration rises, is known as a(n) ____.
- a. acid
b. base
c. buffer
d. catalyst

ANS: C

20. A by-product of the breakdown of amino acids is ____.
- a. ammonia
 - b. glucose
 - c. cortisol
 - d. carbon dioxide

ANS: A

	Feedback
A	Ammonia is a by-product of the breakdown of amino acids.
B	Glucose is a carbohydrate.
C	Cortisol is a hormone.
D	Carbon dioxide is a waste product of cellular respiration.

PTS: 1

21. The mineral salt needed for muscle contraction and strong bones is ____.
- a. phosphate
 - b. calcium
 - c. carbon
 - d. oxygen

ANS: B

	Feedback
A	Phosphate is necessary to produce ATP.
B	Calcium is the mineral salt needed for muscle contraction and strong bones.
C	Carbon is an element found in all living matter.
D	Oxygen is required by all organisms that breathe air.

PTS: 1

22. If the fatty acids contain only single covalent bonds, the fat is called a(n) ____.
- a. unsaturated fat
 - b. suspended fat
 - c. glycerol
 - d. saturated fat

ANS: D

	Feedback
A	An unsaturated fat has one or more double bonds.
B	This is not a correct answer.
C	Glycerol is the backbone of a triacylglycerol.
D	A saturated fat contains only single covalent bonds.

PTS: 1

23. If the fatty acids contain one or more double covalent bonds, the fat is called a(n) ____.
- a. unsaturated fat
 - b. suspended fat
 - c. glycerol
 - d. saturated fat

ANS: A

	Feedback
A	An unsaturated fat has one or more double bonds.
B	This is not a correct answer.
C	Glycerol is the backbone of a triacylglycerol.
D	A saturated fat contains only single covalent bonds.

PTS: 1

24. The building blocks of proteins are ____.
- a. carbohydrates
 - b. hydrogen
 - c. amino acids
 - d. fatty acids

ANS: C

	Feedback
A	Carbohydrates are involved with energy storage and cell strengthening.
B	Hydrogen is an element and a component of many compounds, including water.
C	Amino acids are the building blocks of proteins.
D	Fatty acids are in triacylglycerols.

PTS: 1

25. The random collision of diffusing molecules is called ____.
- a. Dalton's theory
 - b. Brownian movement
 - c. Harvey's theory of combustion
 - d. Mendeleev's theory of motion

ANS: B

	Feedback
A	Dalton's theory suggests that all matter consists of atoms.
B	Brownian movement is the random collision of diffusing molecules.
C	This is not a correct answer.
D	This is not a correct answer.

PTS: 1

26. Increased temperature causes the rate of diffusing molecules to ____.
- a. stop
 - b. decelerate
 - c. accelerate
 - d. reverse

ANS: C

	Feedback
A	This is not a correct answer.
B	This is not a correct answer.
C	Increased temperature causes the rate of diffusing molecules to accelerate.
D	This is not a correct answer.

PTS: 1

27. A solution in which the salt concentration inside the cell is higher than outside the cell is known as ____.
- a. hypertonic
 - b. hypotonic
 - c. isotonic
 - d. base

ANS: B

	Feedback
A	A solution with the salt concentration higher outside the cell than inside the cell is

PTS: 1

31. Blood returning to the lungs is high in ____.
- a. oxygen
 - b. nitrogen
 - c. carbon dioxide
 - d. ammonia

ANS: C

	Feedback
A	Blood returning to the lungs is low in oxygen.
B	This is not a correct answer.
C	Blood returning to the lungs is high in carbon dioxide.
D	This is not a correct answer.

PTS: 1

32. A base is also called a(n) ____.
- a. alkali
 - b. acid
 - c. amino acid
 - d. lipid

ANS: A

	Feedback
A	A base is also called an alkali.
B	This is not a correct answer.
C	This is not a correct answer.
D	This is not a correct answer.

PTS: 1

33. ____ transport is the transportation of materials against a concentration gradient.
- a. Diffusive
 - b. Osmotic
 - c. pH
 - d. Active

ANS: D

	Feedback
A	Diffusion is the movement of molecules through a medium from an area of high concentration to an area of low concentration.
B	Osmosis is a special kind of diffusion.
C	pH is defined as the negative logarithm of the hydrogen ion concentration.
D	Active transport is the transportation of materials against a concentration gradient.

PTS: 1

COMPLETION

1. Approximately 60% to 80% of a cell is _____.

ANS: water

PTS: 1

2. _____ is produced as a waste product of cellular respiration.

ANS: Carbon dioxide

PTS: 1

3. _____ is required by all organisms that breathe air.

ANS: Oxygen

PTS: 1

4. Carbohydrates have two important functions: structural strengthening of the cell and _____.

ANS: energy storage

PTS: 1

5. The smallest particle of an element that maintains all of the characteristics of that element is a(n) _____.

ANS: atom

PTS: 1

6. _____ is the movement of water molecules through a semipermeable membrane from an area of high concentration of water molecules to an area of low concentration of water molecules.

ANS: Osmosis

PTS: 1

7. _____ is a small, simple molecule composed of two hydrogen atoms covalently bonded to one oxygen atom.

ANS: Water

PTS: 1

8. The study of elements, their compounds, and the reactions that occur between them is _____.

ANS: chemistry

PTS: 1

9. The area where an electron can be found is referred to as the electron's _____.

ANS: orbital

PTS: 1

10. Atoms combine chemically with one another to form _____.

ANS: bonds

PTS: 1

11. About _____% of the gas in the atmosphere is oxygen.

ANS:

21

twenty-one

PTS: 1

12. A(n) _____ is a substance whose atoms all contain the same number of protons and the same number of electrons.

ANS: element

PTS: 1

13. Since the number of protons equals the number of electrons, an atom is electrically _____.

ANS: neutral

PTS: 1

14. In 1808, John Dalton proposed the theory that all matter consists of atoms. This proposal led to the development of the _____ theory.

ANS: atomic

PTS: 1

15. The _____ is the number of protons or the number of electrons.

ANS: atomic number

PTS: 1

16. The modern _____ table of the elements arranges the elements by increasing atomic number in such a way that similar properties repeat at periodic intervals.

ANS: periodic

PTS: 1

17. _____ is the genetic material of a cell located in the nucleus of the cell.

ANS:

DNA

Deoxyribonucleic acid

PTS: 1

18. If a substance dissociates and forms an excess of H^+ ions when dissolved in water, it is referred to as a(n) _____.

ANS: acid

PTS: 1

19. A compound is a combination of the atoms of two or more _____.

ANS: elements

PTS: 1

20. Triacylglycerols consist of two types of building blocks: glycerol and _____ acids.

ANS: fatty

PTS: 1

21. _____ are composed of carbon, hydrogen, oxygen, and nitrogen covalently bonded.

ANS: Proteins

PTS: 1

22. _____ triphosphate (ATP) is the fuel that runs the cell's machinery.

ANS: Adenosine

PTS: 1

MATCHING

Match each item with the correct statement below.

- | | |
|--------------|-------------|
| a. osmosis | d. atoms |
| b. diffusion | e. compound |
| c. ion | |

1. the combination of the atoms of two or more elements
2. movement of water across a semipermeable membrane from an area of high concentration to an area of low concentration
3. movement of molecules through a medium from an area of high concentration to an area of low concentration
4. charged atoms
5. smallest particles of an element

1. ANS: E PTS: 1

2. ANS: A PTS: 1

3. ANS: B PTS: 1

4. ANS: C PTS: 1

5. ANS: D PTS: 1

Match each item with the correct statement below.

- | | |
|------------------|-----------|
| a. covalent bond | d. carbon |
| b. ionic bond | e. water |
| c. acid | |

6. element found in all living matter
7. the most abundant substance in living cells
8. bond in which one atom gains electrons while another atom loses electrons
9. bond in which atoms share electrons to fill their outermost shells
10. substance that dissociates and forms an excess of H^+ ions

6. ANS: D PTS: 1

7. ANS: E PTS: 1

8. ANS: B PTS: 1

9. ANS: A PTS: 1

10. ANS: C PTS: 1