Chapter 2
The Chemistry of Life

1. Which of the following is a *mismatched* pair?
   a. electrons: negative charge
   b. neutrons: no charge
   c. protons: positive charge
   d. atomic mass number: protons plus electrons
   e. uncharged atom: the number of electrons = the number of protons

2. If an atom X has an atomic number of 18, then:
   a. there are 18 protons.
   b. there are 9 protons and 9 electrons.
   c. there are 18 neutrons.
   d. there are 9 protons and 9 neutrons.
   e. it also has a mass number of 18.

3. When one atom donates electrons and another atom accepts those electrons, a(n) _____ bond forms.
   a. polar covalent
   b. hydrogen bond
   c. nonpolar covalent
   d. ionic

4. An atom has 1 electron in an outer shell that holds a maximum of eight electrons. This atom:
   a. is most likely an inert gas.
   b. will most likely form polar covalent bonds.
   c. will most likely gain electrons to achieve stability.
   d. will most likely become a negatively charged ion to achieve stability.
   e. will most likely lose its outer electron to achieve stability.

5. Which of the following compounds will not dissolve in water?
   a. one consisting largely of non-polar covalent bonds
   b. one consisting largely of polar covalent bonds
   c. one consisting largely of ionic bonds
   d. one that readily forms hydrogen bonds
   e. one in which many of the atoms have partial charges

6. Which of the following statements is correct?
   a. A base is a H^+ ion donor.
   b. Pure water is completely neutral and has a pH of 0.
   c. As the concentration of H^+ goes up, the pH also goes up.
   d. If the hydroxyl ions outnumber the H^+ ions, the pH will be less than 7.0.
   e. Bases reduce the concentration of H^+ in water.

7. When two monosaccharides are joined together, _____ is formed through _____ synthesis.
   a. a disaccharide; hydrolysis
   b. a polysaccharide; hydrolysis
   c. glucose; condensation
   d. a disaccharide; condensation
   e. starch; condensation

8. The building blocks of _____ are _____ .
   a. polysaccharides; fatty acids
   b. DNA; nucleotides
   c. nucleic acids; amino acids
   d. polysaccharides; glycerol
   e. fats; monosaccharides

9. Enzymes function by _____, which speeds up the rate of a chemical reaction.
   a. increasing the stability of the reactants
   b. multiplying the number of active sites on the reactants
   c. lowering the energy of activation
   d. increasing the energy of activation
   e. keeping the pH constant

10. The purines of nucleic acids are _____ and _____.
   a. thymine; guanine
   b. adenine; guanine
   c. adenine; cytosine
   d. thymine; cytosine
   e. cytosine; guanine

11. Describe the relationship between an atom's stability and its energy. How does this impact an atom's reactivity?

12. What factors determine if a substance will or will not dissolve in water?

13. Why do proteins become less active as they lose their three-dimensional shape?

Chapter 2 Answers

1. d
2. a
3. d
4. e
5. a
6. e
7. d
8. b
9. c
10. b
11. There is an inverse relationship between an atom's stability and its energy level. They are more likely to interact with other atoms (they are more reactive) when their energy is greater and their stability is lower.
12. Water is a highly polar molecule, because of the polar covalent bonds between oxygen and hydrogen atoms. These polar covalent bonds result in partial charges on each atom in a water molecule; partial negative on the oxygen and partial positive on the hydrogen atoms. These partial charges can attract charges, either partial or full, on other molecules, allowing the water to hydrogen bond with these charged molecules. Consequently, any molecule with charges (ionic compounds or compounds consisting of largely polar covalent bonds) will hydrogen bond with water, and the collective force of many hydrogen bonds causes the molecule to dissolve. Molecules that are composed of mainly nonpolar covalent bonds lack charges, and therefore cannot hydrogen bond with water. They therefore do not dissolve in water.
13. The ability of a protein to carry out its specific functions is dependent on its precise three-dimensional folding, which allows the protein to interact with other molecules in a highly specific manner. Anything that interferes with the protein's complex three-dimensional shape reduces the ability of the protein to properly interact with other molecules and therefore reduces its activity. As proteins lose their three-dimensional shape, they are said to be denatured. High temperature and pH extremes are common causes of protein denaturing.