BIOL 1110_01
Principles of Biology I

SECTION 1

1. Which of the following is a trace element that is essential to humans?
   a. nitrogen
   b. calcium
   c. iodine
   d. carbon
   e. oxygen

2. The shape of a molecule
   a. determines its biological function
   b. is determined by orbital positions of its atoms
   c. determines how molecules recognize and respond to each other
   d. may aid in the formation of bonds
   e. all of the above

3. Which of the following best describes the relationship between the atoms described below?

$^{31}_{15}P$ $^{32}_{15}P$

   a. They are both radioactive.
   b. They are both phosphorous cations.
   c. They are both phosphorous anions.
   d. They are both isotopes of phosphorous.
   e. They contain 31 and 32 protons respectively.

4. The formation of ice during colder weather helps temper the seasonal transition to winter. This is mainly because:
   a. the formation of hydrogen bonds releases heat.
   b. the formation of hydrogen bonds absorbs heat.
   c. there is less evaporative cooling of lakes.
   d. ice melts each autumn afternoon.
   e. ice is warmer than the winter air

5. What would be the pH of a solution with a hydroxide ion concentration of 10^{-10} *M*?
   a. 2
   b. 4
   c. 8
   d. 10
   e. 14

6. It is correct to say that the action of buffers

a. is of relatively little significance in living systems
b. tends to prevent great fluctuations in pH
c. depends on the formation of a great number of hydrogen ions
d. depends on the presence of many electron donors
e. is to remove hydroxyl ions from organic acids

7. Which of the following does *not* contain functional ribosomes?
a. a prokaryotic cell
b. a plant mitochondrion
c. a chloroplast
d. an animal mitochondrion
e. a nucleolus

8. Which of the following would be found in a plant cell but not in a bacterial cell?
a. DNA
b. cell wall
c. plasma membrane
d. ribosomes
e. endoplasmic reticulum

9. Of the following, what do both mitochondria and chloroplasts have in common?
a. ATP is produced.
b. DNA is present
c. Ribosomes are present.
d. Only (b) and (c) are correct.
c. (a), (b) and (c) are correct.

10. Cells would not be able to form cilia or flagella if they do not have
a. ribosomes
b. chloroplasts
c. centrioles
d. 5 cords of wood
e. actin

SECTION 2

1. The mass number of an element can be easily approximated by adding together the number of

a. protons and neutrons.
b. electron orbitals in each energy level.
c. protons and electrons.
d. neutrons and electrons.

e. isotopes of the atom.

2. From its atomic number of 15, it is possible to predict that the phosphorus atom has

a. 15 neutrons.
b. 15 protons.
c. 15 electrons.
d. Only B and C are correct.
e. A, B, and C are correct.

3. What does the reactivity of an atom depend upon?

a. The number of valence shells in the atom.
b. The number of orbitals found in the atom.
c. The number of electrons in each orbital in the atom.
d. The presence of unpaired electrons in the valence shell of the atom.
e. The presence of hybridized orbitals in the atoms.

4. When two atoms are equally electronegative, they will interact to form

a. equal numbers of isotopes.
b. ions.
c. polar covalent bonds.
d. nonpolar covalent bonds.
e. ionic bonds.

5. Results from an unequal sharing of electron(s) between atoms.

a. nonpolar covalent bond
b. polar covalent bond
c. ionic bond
d. hydrogen bond
e. hydrophobic interaction

6. Nitrogen (N) is much more electronegative than hydrogen (H). Which of the following statements is correct about the atoms in ammonia (NH_3)?

a. Each hydrogen atom has a partial positive charge.
b. The nitrogen atom has a strong positive charge.
c. Each hydrogen atom has a slight negative charge.
d. The nitrogen atom has a partial positive charge.
e. There are covalent bonds between the hydrogen atoms.

7. Which of the following best describes chemical equilibrium?

a. Reactions continue with no effect on the concentrations of reactants and products.
b. Concentrations of products are high.
c. Reactions have stopped.
d. Reactions stop only when all reactants have been converted to products.
e. There are equal concentrations of reactants and products.

8. The ability to sweat or pant is considered an adaptation. Why?

a. It allows a body to release excess water.
b. It allows a body to absorb heat, due to water's high specific heat.
c. It cools a body off, due to water's high heat of vaporization.
d. It is an important signal to others that an individual is too hot.

9. Which of the following represents the carboxyl functional group?

a. $–NH_2$
b. –COOH
c. –COH
d. –SH
e. None of the above.

10. Which of the following is possible due to the surface tension of water?

a. Lakes don't freeze solid in the winter, despite low temperatures.
b. A water strider can walk across a small pond.
c. Organisms resist temperature changes although they give off heat due to chemical reactions.
d. Water can act as a solvent.
e. The pH remains neutral.

11. Molecules with an "-**SH**" functional group are called _____.

a. ketones
b. thiols
c. alcohols
d. aldehydes
e. ethers

12. What would be the pH of a solution with a hydrogen ion concentration [H^+] of 10^{-8}M?

a. pH 2
b. pH 4
c. pH 6
d. pH 8
e. pH 10

13. If the pH of a solution is decreased from 7 to 6, it means that the

a. concentration of H^+ has decreased to 10 times of what it was at pH 7.
b. concentration of H^+ has increased to 10 times what it was at pH 7.
c. concentration of OH^- has increased to 10 times what it was at pH 7.
d. concentration of OH^- has decreased 10 times what it was at pH 7.
e. Both B and D are correct.

14. Which of the following statements is true about buffer solutions? They

a. will always have a pH of 7.
b. tend to maintain a relatively constant pH.
c. maintain a constant pH when bases are added to them but not when acids are added to them.
d. cause a lowering of pH when acids are added to them.
e. are rarely found in living systems.

15. Carbon is an important element for biology because

a. of the variety of carbon skeletons and functional groups that can be built on them.
b. it has very high electronegativity and forms highly stable bonds.
c. carbon is so rare, organisms conserve it highly.
d. it has the ability to form six covalent bonds.

16. What is the site of synthesis of proteins for export (secretion from the cell)?

a. free ribosomes
b. ribosomes that attach to the endoplasmic reticulum
c. ribosomes that attach to the Golgi complex
d. ribosomes that attach to the outer mitochondrial membrane

17. Which of the following represents a major difference between prokaryotic cells and eukaryotic cells?

    a. Prokaryotes, not eukaryotes, have cell walls.
    b. Eukaryotic cells tend to have much more extensive inner membrane systems and larger numbers of intracellular organelles than prokaryotes.
    c. Prokaryotes are unable to carry out aerobic respiration, a process that requires a complex inner-membrane system.
    d. Prokaryotes are a more homogenous group of organisms than eukaryotes, which include protozoa, plants, and animals.

18. Which of the following components would you expect to find in any type of living organism?

    a. nucleus
    b. chromosome
    c. mitochondria
    d. lysosome
    e. microtubule

19. As part of our immune system, neutrophil cells engulf microorganisms or foreign particles. The process by which the neutrophil does this is known as

    a. exocytosis.
    b. pinocytosis.
    c. phagocytosis.
    d. receptor-mediated endocytosis.

20. Flagella are found in both eukaryotic cells and prokaryotic cells. Despite the functional similarities of all flagella, scientists suspect that eukaryotic and prokaryotic flagella have evolved independently. Why don't they think there is a common evolutionary origin for prokaryotic and eukaryotic flagella?

    a. Prokaryotic flagella move by rotating, whereas eukaryotic flagella undergo an undulating motion. Furthermore, eukaryotic flagella are covered by a plasma membrane and prokaryotic flagella are not.
    b. Prokaryotic flagella do not protrude outside the cell wall, whereas eukaryotic flagella are membrane-bound extensions of cytoplasm.
    c. Prokaryotic flagella are an adaptation to scarce nutrient supply, whereas eukaryotic flagella are designed to protect.
    d. Prokaryotic flagella do not require energy in the form of ATP.

SECTION 3

1. Match the type of chemical bond on the left with the statement on the right by placing the appropriate number in the blank. (Some or all of the numbers will be used more than once)

1. Hydrogen bond	_4___ results from transfer of electron(s) between atoms
2. Double covalent bond	___6_ results from unequal sharing of electrons between atoms
3. Nonpolar covalent bond	___6_ bonds within water molecules
4. Ionic bond	__1__ bonds between water molecules
5. Covalent bond	__1__ is easily disrupted in the presence of water
6. Polar covalent bond	__3__ results from equal sharing of electrons
	__4__ bond between sodium and chlorine atoms
	__3__ bond between 2 O atoms
	__1__ bond between H_2O and NH_3
	__5__ when 2 atoms share a pair of valence electrons