

Summer AP Biology Assignment/2009-2010 (In lieu of attendance at the Summer session beginning prior to the start of school.)

The following questions will be submitted to the instructor (biomanekcs@yahoo.com or jbuckley@ekcsk12.org by the start of class on September 3, 2009.

Instructor phone 244-1897

Possibly Useful Notes include Moodle access to the following PowerPoint.

[Properties of Water and Biochemistry PowerPoint](#)

You can go to my school web page, click on Moodle courses, and then click on AP Biology. You may have guest access at this time to download the PowerPoint below. The guest access password is amsykes and it is case sensitive!

URL to the 7th edition Campbell on-line textbook

http://wps.aw.com/wps/media/access/Pearson_Default/1663/1703422/login.html

Access to this textbook will require a Login Name and Password.

The login name is jbuckley@ekcsk12.org and the password is yobjib

When you get into the website click on the left where it says e-book and you will be prompted for a Login Name and Password which are the same as the previous ones. When you get into the e-book, click on unit I: Chemistry of Life. The reading for this assignment is from chapters 2 through 5.

You also can get a limited number of sixth and seventh edition hardcover Campbell textbooks from me, but I do not have enough at this point to go around ... first come ... first served. The difference between the two editions is not great.

The first 6 questions of this assignment will be weighted as 60% of this assignment. Point values are indicated with each question. The multiple choice section will be weighted as 40% of this assignment. Leaving any questions in any section of this assignment incomplete or not done will result in receiving a zero on the entire assignment. This assignment will count as 3 exam grades or 6 quiz grades (this will be approximately 10% of the course grade for the year) I expect your work will be typed and spell checked on your own paper or it will not be accepted.

[Written Portion of the Assignment]

1. The unique properties (characteristics) of water make life possible on Earth. Select six properties of water and:



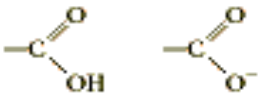
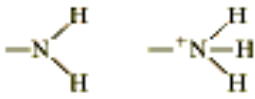
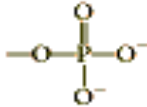
a) for each property, identify and describe/define the property. [12]

b) for each property, describe one specific example of how the property affects the functioning of living organisms. [6]

2. Fill in the table below that summarizes the properties of water that contribute to the fitness of the environment for life. [8]

Property	Explanation of Property	Example of Benefit to Life
a.	Hydrogen bonds hold molecules together and adhere them to hydrophilic surfaces.	b.
High Specific Heat	c.	Temperature changes in environment and organisms are moderated.
d.	Hydrogen bonds must be broken for water to evaporate.	e.
Ice floats	f.	g.
Water is the universal solvent	h.	Most chemical reactions in life involve solutes dissolved in water.

3. Complete the following table in reference to the indicated categories. [14]

Functional Group	Name of Group	Chemical Properties Produced by the group
—OH		
		
		
 (non-ionized) (ionized)		
 (non-ionized) (ionized)		
—SH		
		

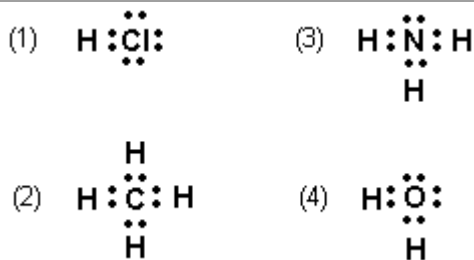
- 4. Carbon is a very important element in living systems. [8]**
- a. Describe four characteristics of the carbon atom that makes possible the building of a variety of biological molecules.**
- b. Explain how reactions involving carbon-containing compounds can contribute to the greenhouse effect and discuss three or more environmental consequences of a possible global warming.**
- 5. Completely explain the difference between the following types of bonding; non-polar covalent, polar covalent, ionic, and hydrogen bonding. In addition, list an example of a molecule exhibiting each type of bonding. You must do all parts of this question to receive any form of credit. [8]**
- 6. Older refrigerants and some plastics contain a class of compounds which are responsible for ozone depletion. [4]**
- a. Identify this compound in these refrigerants and plastics**
- b. Use your knowledge of this compound class chemistry to explain why it so readily can break down O₃ to O₂**
- c. List two harmful effects of stratospheric ozone depletion on humans**
-

Choose the answer which best completes the following statements or answers the following questions. Place the letter or number of the response corresponding to that choice on your own paper.

- 1. Fluorine atoms tend to take electrons from any atoms that come near. As a result, fluorine atoms (A.) tend to become positively charged (B.) are nonpolar (C.) do not react readily with other atoms (D.) tend to form ionic bonds (E.) are not very electronegative**
- 2. Which is NOT a chemical reaction?**
- (A.) Sugar and oxygen gas combine to form carbon dioxide and water.**
- (B.) Sodium metal and chlorine gas unite to form sodium chloride.**
- (C.) Hydrogen gas combines with oxygen gas to form liquid water.**
- (D.) Solid ice melts to form liquid water.**
- (E.) Sulfur dioxide and water vapor join to form sulfuric acid.**
- 3. Molecules are always moving. Some molecules move faster than others. _____ is a measure of the average velocity of molecular motion. (A.) polarity (B.) temperature (C.) heat (D.) electronegativity (E.) density**

4. A radioactive isotope of sulfur has the mass number 35 rather than 32. Its atomic number is 16. How many protons does sulfur 35 have?
A). 16 B). 19 C). 32 D). 35 E). 51
5. A covalent bond is likely to be polar if:
A) one of the atoms sharing electrons is much more electronegative than the other atom
B) the two atoms sharing electrons are equally electronegative
C) the two atoms sharing electrons are of the same element.
D) it is between two atoms that are both very strong electron acceptors
E) it joins a carbon atom and two hydrogen atoms
6. An atom that normally has ____ in its outer shell would not tend to form chemical bonds with other atoms. (A.) 1 electron
(B.) 3 electrons (C.) 4 electrons (D.) 6 electrons (E.) 8 electrons
7. Changing the number of ____ would change an atom into an atom of a different element. (A.) bonds formed by an atom
(B.) electrons circling the nucleus of an atom
(C.) protons in an atom (D.) neutrons in an atom
(E.) particles in the nucleus of an atom
8. Which holds atoms together in a molecule?
(A.) ionic bonds between atoms
(B.) transfer of protons from one atom to another
(C.) sharing of electrons between atoms
(D.) loss of neutrons by atoms
(E.) sharing of protons between atoms
9. ALL of the following statements are true EXCEPT:
A) most of the mass of an atom consists of orbitals
B) isotopes usually contain more neutrons than regular atoms of their type
C) chemical properties are usually determined by the outer orbital of an atom
D) an ion is formed when an atom gains or loses an electron
E) In a stable atom, the electron equal the number of protons
- ** Note that the answers to questions 10 and 11 have a numerical response.
10. The bond between Br atoms in a Br₂ molecule is
(1.) ionic and is formed by the sharing of two valence electrons
(2.) ionic and is formed by the transfer of two valence electrons
(3.) covalent and is formed by the sharing of two valence electrons
(4.) covalent and is formed by the transfer of two valence electrons

11. Which electron-dot structure represents a non-polar molecule?



- 12. The biological function of a molecule is most directly related to**
- A) the number of atoms that form the molecule**
 - B) the shape of the molecule**
 - C) the number of valence electrons present among the atoms**
 - D) whether the molecule's bonds are covalent or ionic**
 - E) whether the valence shell orbitals hybridize during covalent bonding**
- 13. Atoms of different phosphorus isotopes**
- A) have different atomic numbers**
 - B) have different numbers of neutrons**
 - C) react differently with other atoms**
 - D) have different numbers of electrons**
 - E) have different numbers of protons**
- 14. Which is a trace element, required in only small amounts by most living things?** A) oxygen B) magnesium C) nitrogen D) carbon E) hydrogen
- 15. Ions are atoms that have** A) lost an electron B) lost or gained an electron C) different numbers of neutrons D) broken apart due to radioactive decay E) gained an electron
- 16. Nonpolar covalent bonds are different from polar covalent bonds because** A) electrons are lost in nonpolar covalent bonds and gained in polar covalent bonds B) electrons are shared in nonpolar covalent bonds and are lost or gained in polar covalent bonds C) electrons are shared unequally in nonpolar covalent bonds and are shared equally in polar covalent bonds D) electrons are shared equally in nonpolar covalent bonds and shared unequally in polar covalent bonds
- 17. Ionic bonds _____**
- A) result when atoms share one or more electrons**
 - B) result when atoms gain or lose one or more electrons**
 - C) are the forces that hold atoms together in molecules such as water**
 - D) are interactions between the outermost electron shells of atoms**
 - E) all of the above**
 - F) all but one of choices a through d**

- 18. Which of the following statements is true about compounds?**
(A.) Twenty-five compounds are essential to life.
(B.) They are held together by hydrogen bonds.
(C.) They have polarity.
(D.) They contain two or more elements in a fixed ratio to each other.
(E.) All of the previous.
- 19. There are ____ naturally occurring elements. (A.) 92 (B.) 45 (C.) 230 (D.) 25 (E.) 108**
- 20. Why are biologists so interested in chemistry? (A.) Chemicals are the fundamental parts of all living things. (B.) Most chemicals are harmful to living things. (C.) They know little about life except the chemicals it is made from. (D.) If you understand the chemistry of life, you can make a lot of money. (E.) Everything about life can be known by understanding its chemistry.**
- 21. K is the chemical symbol for _____ and P is the symbol for _____. (A.) phosphorus ... sodium (B.) sodium ... potassium (C.) potassium ... phosphorus (D.) magnesium ... phosphorus (E.) iron ... potassium**
- 22. Which one of the following is NOT one of the four most common elements found in living systems? (A.) H (B.) N (C.) C (D.) Ne (E.) all of the above**
- 23. Four elements are the most abundant in life: carbon, oxygen, hydrogen, and nitrogen. What do they have in common? (A.) They are found only in living cells. (B.) They can all form double bonds with carbon. (C.) They are all tetravalent. (D.) They have the same atomic mass. (E.) They are all relatively light atoms (near the top of the periodic table).**
- 24. Which of the following is the smallest in volume? (A.) the nucleus of an oxygen atom (B.) a water molecule (C.) a proton (D.) an ice crystal (E.) the electron cloud of an oxygen atom**
- 25. Which one of the following has negligible mass? (A.) proton (B.) neutron (C.) electron (D.) atom (E.) element**
- 26. Which one of the following subatomic particles has appreciable mass and lacks a charge? (A.) proton (B.) neutron (C.) electron (D.) element (E.) molecule**

27. The number of protons in an uncharged atom _____. (A.) equals the number of electrons (B.) equals the number of neutrons (C.) varies with the different isotopes (D.) equals the number of electrons in the outer orbital of the atom (E.) determines its mass number
28. Consider a hypothetical atom with an atomic number of 4 and a net electronic charge of +1. It has 4 protons. How many neutrons does this atom have? (A.) 2 (B.) 4 (C.) 8 (D.) The answer cannot be determined from the information. (E.) none of the above
29. A particular carbon isotope has an atomic number of 6 and an atomic weight of 14. The respective number of neutrons, protons, and electrons it has is _____. (A.) 6, 8, 6 (B.) 6, 6, 8 (C.) 8, 6, 6 (D.) 8, 6, 8 (E.) 8, 6, 4
30. An element has 8 protons, 9 neutrons, and 8 electrons. Its atomic number and atomic mass, respectively, are _____. (A.) 8 and 16 (B.) 8 and 17 (C.) 9 and 16 (D.) 9 and 17 (E.) 16 and 8
31. Two atoms of the same element must have the same number of _____. (A.) neutrons (B.) protons (C.) electrons (D.) neutrons plus protons (E.) protons plus electrons
32. An uncharged atom of nitrogen (atomic number = 7) has _____. (A.) 7 neutrons (B.) 7 protons and 7 neutrons (C.) 7 neutrons and 7 electrons (D.) 7 protons and 7 electrons (E.) 7 valence electrons
33. Which of the following is NOT a characteristic that makes radioactive tracers useful in medical diagnoses? (A.) They are incorporated into reactions in living material. (B.) They are easily detectable in minute amounts. (C.) They damage or destroy molecules. (D.) Living cells cannot distinguish them from nonradioactive isotopes. (E.) They can be used with PET scanners.
34. Isotopes of an element will always differ in _____. (A.) atomic number (B.) atomic mass (C.) number of electrons (D.) All of the above. (E.) None of the above.

35. Phosphorus-32 (radioactive) has _____ than phosphorus-35 (normal).
(A.) 3 more neutrons (B.) 3 more protons (C.) 3 fewer neutrons
(E.) 3 fewer protons (E.) three more atoms
36. The most common form of calcium has 20 protons, 20 neutrons, and 20 electrons. Which of the following elements would be an isotope of calcium?
(A.) an atom with 21 protons, 20 neutrons, and 21 electrons
(B.) an atom with 20 protons, 20 neutrons, and 18 electrons
(C.) an atom with 20 protons, 21 neutrons, and 20 electrons
(D.) none of the above (E.) all of the above
37. Atomic chlorine has an atomic number of 17. It has _____ electrons in its third shell. (A.) 2 (B.) 7 (C.) 8 (D.) 10 (E.) None of the above.
38. The chemical characteristics of an element depend mostly on the _____.
(A.) number of electrons in its outer shell (B.) number of electron shells present in the atoms (C.) mean energy level of its electrons
(D.) degree to which it has more or fewer electrons than protons
(E.) number of proton plus the number of neutrons
39. Some groups of elements react chemically in similar ways. For example, the chemistry of sodium and the chemistry of lithium are similar, as are the chemistries of chlorine and iodine. These similar chemistries are caused when different elements have similar _____.
(A.) atomic size (B.) numbers of outer shell electrons (C.) numbers of electrons
(D.) energy quanta per electron (E.) atomic number
40. For most atoms, a stable configuration of electrons is attained when the atom _____.
(A.) has as many protons as neutrons
(B.) has moved all its electrons to its outermost shell
(C.) achieves a zero net charge (D.) has 8 electrons in its outermost shell
(E.) none of the above
41. Researchers studying the effects of toxic wastes knew that animals were poisoned by the heavy metal cadmium, but they wanted to know where cadmium accumulated in the body. They could find out by _____.
(A.) tracing the movement of cadmium isotopes in test animals (B.) interviewing David Bowie for knowledge of heavy metal (C.) measuring the size of cadmium atoms
(D.) finding out whether cadmium atoms form ionic or covalent bonds
(E.) finding out whether cadmium is acidic in water
(F.) determining the number of bonds formed by cadmium atoms

42. An atom that normally has ____ in its outer shell would tend not to form chemical bonds with other atoms. (A.) 1 electron (B.) 3 electrons (C.) 4 electrons (D.) 6 electrons (E.) 8 electrons
43. A polar covalent bond is a bond that _____. (A.) is found only in H₂O (B.) is found only in molecules containing oxygen (C.) shares electrons equally between atoms (D.) ionizes (E.) has shared electrons pulled closer to the more electronegative atom
44. A covalent bond is likely to be polar if _____. (A.) the two atoms sharing electrons are equally electronegative (B.) one of the atoms sharing electrons is much more electronegative (C.) it is between two atoms that are both very strong electron acceptors (D.) the two atoms sharing electrons are of the same element (E.) it is between two atoms that are both very strong electron donors
45. When the proton number and electron number are unequal, the atom or molecule _____. (A.) forms a covalent bond with another atom (B.) is an ion (C.) becomes part of a molecule (D.) gains or loses a proton (E.) gains or loses a neutron
46. A sodium atom has a mass number of 23. Its atomic number is 11. How many electrons does it have if it is not an ion? (A.) 11 (B.) 12 (C.) 22 (D.) 23 (E.) 34
47. Chlorine atoms tend to take electrons from many atoms that come near. As a result, chlorine atoms _____. (A.) tend to become positively charged (B.) are nonpolar (C.) do not react readily with other atoms (D.) tend to form ionic bonds (E.) are not very electronegative
48. The compound CaSO₄ ionizes into a calcium ion and a sulfate ion. Calcium has 2 electrons in its outer shell. Upon ionization, what would you expect the charge on the sulfate ion to be? (A.) -4 (B.) 2 (C.) 1 (D.) -1 (E.) -2
49. Ionic bonds form as a result of _____. (A.) attraction between atoms with like charges (B.) attraction between hydrogen and other atoms that share electrons unequally (C.) sharing of electron pairs between atoms (D.) sharing of single electrons between atoms (E.) the attraction between ions formed by electron transfer between atoms

50. A hydrogen bond _____. (A.) is one in which two hydrogens bond to each other (B.) is one in which hydrogen is strongly attracted to a positively charged atom (C.) is a function of hydrophobic interactions (D.) is weak (E.) is one of the strongest bonds known
51. Which is NOT involved in, or is NOT relevant to, hydrogen bonding? (A.) hoarding of electrons by one atom more than another (B.) partial charges (C.) attraction between unlike partial charges (D.) loss of electrons (E.) polar molecules
52. Hydrogen bonds occur when _____. (A.) a molecule with partial charges contacts a molecule without partial charges (B.) a molecule with a low molecular weight is completely enclosed in a molecule with high molecular weight (C.) two atoms achieve stable electron configurations by sharing electrons with each other (D.) partial opposite charges on molecules which come close enough to attract each other (E.) none of the above
53. Which of the following molecules has the shape of a completed tetrahedron? (A.) water (H₂O) (B.) hydrogen gas (H₂) (C.) oxygen gas (O₂) (D.) methane (CH₄) (E.) glucose (C₆H₁₂O₆)
54. Which of the following statements is NOT true about chemical reactions? (A.) They represent the way matter is created and destroyed. (B.) They convert reactants to products. (C.) They always have the same number of a given atom on each side of the equation arrow. (D.) They involve the making and breaking of chemical bonds. (E.) They can involve organic as well as inorganic molecules.
55. Which one of the following does the equation of a chemical reaction NOT tell us? (A.) the number of atoms or molecules involved (B.) the kinds of atoms or molecules involved (C.) the direction in which the reaction occurs (D.) the speed of the reaction (E.) a chemical equation describes ALL the above features

**** Please note that for questions 56 through 60 the choices now use numbers and not letters!**

- 63. Cells are surrounded by water, and cells themselves are 70% to 95% water. As a result (A) the temperature of living things tends to change relatively slowly (B) a variety of nutrient molecules are readily available as dissolved solutes (C) wastes products produced by cell metabolism are easily removed (D) dissolved substances can be easily transported within the cell. or between cells in multicellular organisms (E) all of the above**
- 64. Most of water's unique properties result from the fact that water molecules (A) tend to repel each other (B) are very small. (C) are in constant motion (D) tend to stick together (E) are extremely large**
- 65. If the pH of a solution is decreased from 5 to 4, it means that the : (A) concentration of the hydrogen ions has decreased to 1/10 of what it was at pH 5 (B) concentration of the hydrogen ions has increased 10 times what it was at pH 5 (C) the solution has become more basic (D) concentration of the hydrogen ions has increased 100 times as what it was at pH 5 (E) The concentration of the (OH) ions remains constant**
- 66. Which statement is true about buffer solutions? (A) they will always have a pH of 7 (B) they tend to maintain a relatively constant pH (C) they are rarely found in living systems (D) they cause the lowering of the pH when acids are added to them (E) they cause the raising of the pH bases are added to them.**
- 67. How do strong acids, like hydrochloric acid, differ from weak acids like carbonic acid? (A) weak acids do not release hydrogen ions when they dissociate (B) They differ to the extent to which they dissociate (C) strong acids reversibly release and reaccept hydrogen (D) weak acids contain carbon (E) strong acid dissociation results in the release of two or more hydrogen ions, while weak acids release only a single hydrogen ion**
- 68. You are waiting backstage for your cue to come onstage when you notice that you are breathing very rapidly and beginning to feel light-headed. As you try to control your anxiety and slow your breathing, you think about what you learned in your biology and chemistry classes and realize that your hyperventilation is changing your blood pH. Explain!**

(Reminder: Blood pH is maintained by carbonate buffer, which is related to the amount of carbon dioxide you breathe in or out. One way that your body controls the amount of carbonate in your blood is to change your rate of breathing. When you breathe out, you remove carbon dioxide and lower the amount of carbonic acid in the blood.)

- (A) Rapid breathing decreases my blood's pH, making my blood more acidic.**
- (B) Rapid breathing increases my blood's pH, making my blood more acidic.**
- (C) Rapid breathing decreases my blood's pH, making my blood more basic.**
- (D) Rapid breathing increases my blood's pH, making my blood more basic.**

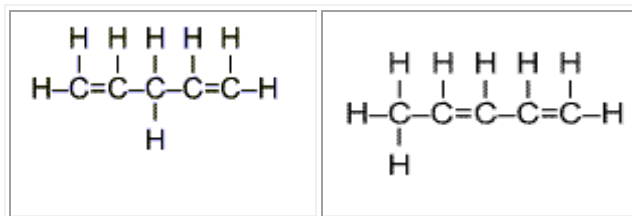
- 69. The tendency of water molecules to stick together ____.**
- (A) provides the surface tension that allows some insects to walk on water**
 - (B) is called cohesion**
 - (C) keeps water moving through the vessels in a tree trunk**
 - (D) acts to moderate temperature**
 - (E) all of the previous are correct**
- 70. In a group of water molecules, hydrogen bonds form between ____.**
- (A) two hydrogen atoms in different water molecules**
 - (B) the oxygen atoms in different water molecules**
 - (C) the oxygen atom in one molecule and a hydrogen atom in another molecule**
 - (D) the hydrogen atoms in a single water molecule**
 - (E) none of the above**
- 71. What do cohesion, surface tension, and adhesion have in common with reference to water?**
- (A) All are results of the structure of the hydrogen atom.**
 - (B) All are produced by covalent bonding.**
 - (C) All are properties related to hydrogen bonding.**
 - (D) All have to do with ionic interactions.**
 - (E) All are aspects of a crystalline structure.**
- 72. All of the following are organic compounds EXCEPT**
- (A) carbon dioxide**
 - (B) proteins**
 - (C) water**
 - (D) fats**
 - (E) methanol**
- 73. Water is considered a universal solvent because**
- (A) it is an excellent circulating medium**
 - (B) relatively stable**
 - (C) it is able to absorb a great deal of heat**
 - (D) contains both positive and negative charged sides**
 - (E) all of the above**
- 74. Each of the following are properties of water EXCEPT**
- (A) it has a low heat of vaporization**
 - (B) it expands when it freezes**
 - (C) it is a useful solvent**
 - (D) it has cohesive properties**
 - (E) it resists changes in temperature**

- 75. All of the following are properties of water EXCEPT**
(A) Water is an excellent solvent (B) Water has a high heat capacity
(C) Water has low surface tension (D) Water adheres to other molecules
(E) As water freezes it becomes less dense than its liquid form
- 76. A liquid that is highly stable and relatively unaffected by large changes in environmental temperature** (A) functions as a universal solvent
(B) has its maximum density at fifteen degrees Celsius
(C) has a high heat capacity (D) is nonpolar (E) is viscous
- 77. Most of water's unique features (such as its great ability to dissolve other substances, its high boiling point, and its great surface tension) result from the fact that ____.**
(A) hydrogen is the only element without any neutrons
(B) oxygen attracts electrons more than hydrogen does
(C) oxygen has only one stable isotope, but hydrogen has three
(D) oxygen has two unfilled electron shells (E) water is a large molecule
- 78. The partial charges on a water molecule occur because of ____.**
(A) the unequal sharing of electrons between hydrogen and oxygen
(B) the achievement of a stable configuration by one atom of a bond but not by the other partner (C) covalent bonding
(D) widespread ionization (E) the high electronegativity of hydrogen
- 79. Water molecules are known for forming hydrogen bonds between themselves and for their ability to dissolve a great variety of substances that have charges or partial charges on their molecules. These two properties are ____.**
(A) both caused by water's ability to form covalent bonds with hydrophobic substances (B) due to water's partial charges and low molecular weight, respectively (C) both caused by water's partial charges (D) both caused by water's two electron shells and the opposite spins of those shells
(E) both due to water's low molecular weight
- 80. The phenomenon responsible for the maintenance of a column of water as it moves upward through a vessel is ____.** (A) cohesion
(B) adhesion (C) surface tension (D) evaporation
(E) heat of vaporization

- 81. Cells are surrounded by water, and cells themselves are about 70% to 95% water. As a result ____.**
(A) the temperature of living things tends to change relatively rapidly
(B) a variety of nutrient molecules are readily available as dissolved solutes
(C) waste products produced by cell metabolism are not easily removed
(D) all of the previous statements are correct
- 82. Water is a polar molecule. This means that ____.**
(A) the opposite ends of the molecule have opposite charges
(B) water molecules are linear, like a pole
(C) water is one of the many hydrophobic molecules
(D) the atoms in water have equal electronegativities
(E) all of the above
- 83. Water plays many roles in cells. Which of the following is NOT a property of water? (A) It possesses a high heat capacity.**
(B) It dissociates completely into H⁺ and OH⁻.
(C) It readily forms hydrogen bonds with polar and charged molecules.
(D) It displays high surface tension.
(E) It serves as an excellent solvent for many substances.
- 84. The attraction of unlike substances is termed ____.** **(A) specific heat**
(B) calorie **(C) heat of vaporization** **(D) adhesion** **(E) cohesion**
- 85. Surface tension involves ____.** **(A) imbibition** **(B) adhesion**
(C) cohesion **(D) wetting action** **(E) none of the above**
- 86. Which action would involve the greatest transfer of heat?**
(A) changing the temperature of 1 gram of water from 10°C to 90°C
(B) cooling 10 grams of water from 80°C to 40°C
(C) evaporating 1 gram of water
(D) condensing 5 grams of steam to liquid water
- 87. Water resists temperature change because ____.**
(A) large bodies of water cannot store heat
(B) heating water absorbs energy by disrupting the hydrogen bonds before evaporation can occur
(C) evaporation of water heats the surface it leaves
(D) hydrogen bonding increases water's ability to vaporize
(E) none of the above

88. The amount of heat required to increase the temperature of 1 g of any substance 1°C is defined as ____.
- (A) the specific heat of that substance (B) 1 calorie
(C) the heat of vaporization of that substance (D) 1 millijoule
(E) molecular cohesion
89. The amount of heat required to convert 1 g of any substance from the liquid to the gaseous state is defined as ____.
- (A) the specific heat of that substance
(B) 1 calorie (C) the heat of vaporization of that substance
(D) the heat of fusion of that substance (E) molecular cohesion
90. That coastal climates are more moderate than inland climates is due primarily to water's high ____.
- (A) heat of fusion
(B) surface tension (C) heat of vaporization (D) specific heat
(E) density
91. Sweating has a cooling effect because of water's high ____.
- (A) heat of fusion (B) surface tension (C) heat of vaporization
(D) specific heat (E) density
92. Because the molecules of water are farther apart in ice than in liquid water, ____.
- (A) ice floats (B) ice is denser than liquid water
(C) ice expands when it melts
(D) ice vaporizes before liquid water does (E) all of the above
93. Nonpolar molecules that cluster away from water are called ____ molecules.
- (A) nonhydrated (B) hydrophilic (C) hydrophobic
(D) saponified (E) none of the above.
94. Hydrophilic substances, but not hydrophobic substances, ____.
- (A) have charges and partial charges to which water molecules can adhere
(B) have a higher bond energy than water
(C) give up electrons to solvents
(D) accept electrons from solvents (E) are repelled by water

95. The two compounds pictured below are related to each other by being _____.



- (A.) hydrocarbons (B.) organic compounds (C.) isomers
(D.) double-bonded compounds (E.) all of the above
96. A molecule that has all nonpolar covalent bonds would be _____.
(A) hydrophobic (B) hydrophilic (C) acidic (D) basic (alkaline) (E) ionic
97. Hydrophobic molecules are _____ water. (A) attracted to (B) absorbed by
(C) repelled by (D) mixed with (E) polarized by
98. Sodium chloride (NaCl) dissolves in water because water molecules _____.
(A) have a high specific heat (B) lose electrons (C) are polar
(D) have a pH near 7 (E) are less dense than NaCl molecules
99. What is an acid? (A) any compound with a pH
(B) any compound that accepts hydrogen ions
(C) a material that resists pH changes
(D) a compound that donates hydrogen ions to a solution
(E) a solution with a pH between 7 and 14
100. Something that resists a change in pH is called a(n) _____. (A) isoproton
(B) buffer (C) proton sink (D) acid (E) base
101. When pH shifts from 7 to 3, how has the hydrogen ion concentration changed? (A) It has increased by 4 times.
(B) It has decreased by 4 times. (C) It has increased by 10,000 times.
(D) It has decreased by 10,000 times.
(E) It has not changed.
102. Which of the following statements is true about acid precipitation?
(A) It can be eliminated if we burn fossil fuels instead of using solar or nuclear power. (B) It affects bodies of water but has little effect on the land. (C) It has the most pronounced effect on lakes and streams in NY in the early spring. (D) Building taller smokestacks can clean it up. (E) None of the above.

- 103. Which is an organic molecule?**
(A) Ne (B) O₂ (C) CH₄ (D) NaCl (E) H₂O
- 104. Which element is most particularly associated with organic chemistry?**
(A) carbon (B) sulfur (C) nitrogen (D) potassium (E) oxygen
- 105. What is the three-dimensional shape created by hybrid orbitals that are formed when a carbon atom is covalently bonded with four other atoms?** (A) a flat sheet with carbon in the center
(B) a triangle with carbon in the center (C) a cube with carbon in the center
(D) a tetrahedron with carbon in the center
(E) all of the above are possible
- 106. A molecule constructed from ___ must contain at least one carbon-carbon double bond.** (A) 6 hydrogens and 2 carbons
(B) 6 hydrogens, 3 carbons (C) 6 hydrogens, 2 carbons, and 1 oxygen
(D) 8 hydrogens, 3 carbons, and 3 oxygens
(E) 14 hydrogens and 12 carbons
- 107. Carbon atoms are the most versatile building blocks of the molecules used by living organisms because**
(A) carbon is the central atom of carbon dioxide, a necessary molecule for photosynthesis (B) carbon is the central atom in urea, a molecule used by many living organisms to transport wastes from the body (C) each carbon atom acts as an intersection point from which a molecule can branch off in up to four directions (D) carbon can combine with hydrogen to form hydrocarbons (E) all of the above
- 108. The carbon atom is tetravalent; this means that** (A) carbon readily forms ionic bonds (B) carbon's first electron shell holds 4 electrons
(C) a carbon atom can complete its valence shell by forming four covalent bonds (D) the bond angle between each bond is 90°, forming an arrangement like the points on a compass (E) carbon has a total of 4 electrons
- 109. Which of these is found in amino acids?** (A) R-COOH (B) R-COH
(C) R-OH (D) R-OH₂ (E) R-PO₄
- 110. Which of these is found in amino acids?** (A) R-POOH (B) R-COH
(C) R-OH (D) R-NH₂ (E) R-PO₄

111. Glucose and hexanoic acid each contain six carbon atoms, but they have completely different properties. Glucose is necessary in food; hexanoic acid is poisonous. Their differences must be due to different (A) monomers (B) macromolecules (C) hydrolysis (D) quaternary structures (E) functional groups
112. Ethanol, propanol, and methanol are three simple alcohols. They can be grouped together because they (A) all share the same functional group: a hydroxyl (B) are soluble in water (C) are soluble in nonpolar solvents (D) all contain a carbonyl group (E) increase the acidity of solutions
113. Which one of the following has a carboxyl group? (A) R-NH₂ (B) R-SH (C) R-OH (D) R-COOH
114. Which one of the following is a weak acid? (A) R-PO₄ (B) R-SH (C) R-OH (D) R-COOH
115. Which one of the following has an amino group? (A) R-NH₂ (B) R-SH (C) R-COOH (D) R-OH
116. Which one of the following has a sulfhydryl group? (A) R-NH₂ (B) R-SH (C) R-COOH (D) R-OH
117. Sodium chloride (NaCl) dissolves in water because water molecules (A) have a high specific heat (B) lose electrons (C) contain atoms with very different electronegativities (D) have a pH near 7 (E) are less dense than NaCl molecules
118. Some substances, such as oil and gasoline, will not dissolve in water because (A) their molecules are so large (B) their molecules have no charges or partial charges to which water molecules can adhere (C) they do not ionize (D) their electrons are so stable that they do not exchange with water molecules (E) oil and gasoline are inorganic compounds
119. From your knowledge of organic chemistry, you would predict that an abscisic acid (ABA) molecule has a(n) _____ group. (A) carboxyl (B) hydroxyl (C) carbonyl (D) amino (E) sulfhydryl
120. The ionized or dissociated carboxyl group may be written as (A) -S - (B) -O - (C) -COO - (D) -NH₄ - (E) -C=O -

Link to [correct answers to the summer assignment](#)