SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

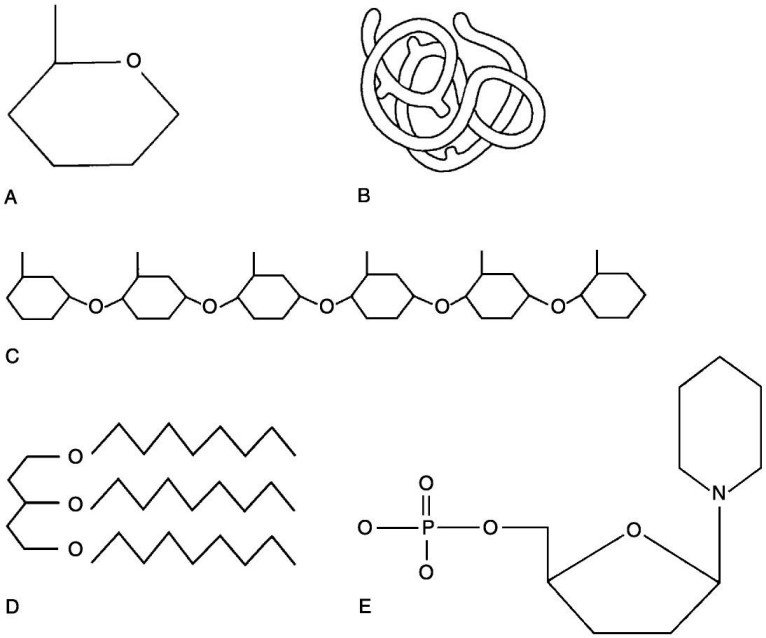

Figure 2.1

Using Figure 2.1, match the following:

1) Lipid 1) _____

2) Functional protein 2) _____

3) Nucleotide 3) _____

4) Polysaccharide. 4) _____

5) Monosaccharide 5) _____

6) Polymer 6) _____

7) Tertiary (protein) structure 7) _____

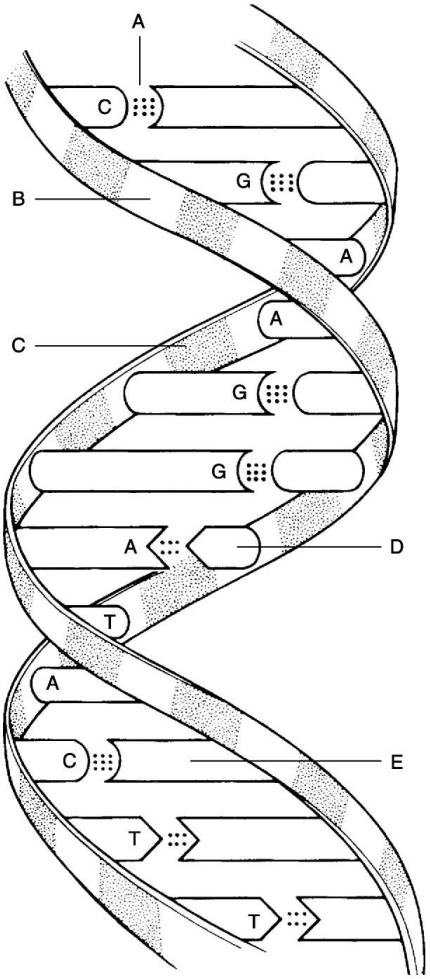

Figure 2.2

Using Figure 2.2, match the following:

8) Deoxyribose sugar. 8) _____

9) Thymine 9) _____

10) Guanine 10) _____

11) Phosphate 11) _____

12) Hydrogen bonds 12) _____

MATCHING. Choose the item in column 2 that best matches each item in column 1.
Match the following chemical bonds to the correct description:

13) A bond in which electrons are shared unequally.

A) Ionic bond

B) Polar covalent bond

13) _____

14) A bond in which electrons are completely lost or gained by the atoms involved.

14) _____

C) Nonpolar covalent bond

D) Hydrogen bond

15) A bond in which electrons are shared equally. 15) _____

16) A type of bond important in tying different parts of the same molecule together into a three-dimensional structure. 16) _____

Match the following particles to the correct description:

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

A) Cation

B) Atom

18) Neutral subatomic particle. 18) _____

C) Molecule

19) Smallest particle of an element that retains its properties. 19) _____

D) Neutron

20) Smallest particle of a compound that still retains its properties. 20) _____

Match the following:

21) Water. 21) _____

22) Carbon. 22) _____

23) Dry ice (frozen carbon dioxide). 23) _____

24) Blood. 24) _____

A) Mixture

B) Compound

C) Element

Match the following:

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

26) Anything that occupies space and has mass. 26) _____

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. 27) _____

A) Energy

A) Weight

B) Mass

C) Matter

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

Match the following:

29) Legs moving the pedals of a bicycle. 29) _____

30) When the bonds of ATP are broken, energy is released to do cellular work. 30) _____

31) Energy that travels in waves. Part of the electromagnetic spectrum. 31) _____

32) Represented by the flow of charged particles along a conductor, or the flow of ions across a membrane. 32) _____

A) Chemical energy

B) Electrical energy

C) Mechanical energy

D) Radiant energy

Match the following:

33) Heterogeneous, will not settle. 33) _____

34) Heterogeneous, will settle. 34) _____

35) Homogeneous, will not settle. 35) _____

36) Will not scatter light. 36) _____

A) Solutions

B) Suspensions

C) Colloids

Match the following:

37) First one or two letters of an element's name 37) _____

38) Number of protons in an atom 38) _____

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

A) Mass number of an element

B) Atomic symbol

C) Atomic number

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

40) The atomic weight is only an average of relative weights of an atom and its isotopes, and it may vary from the weight of a specific isotope. 40) _____

41) It is the difference in the R group that makes each amino acid chemically unique. 41) _____

42) Chemical properties are determined primarily by neutrons. 42) _____

43) A charged particle is generally called an ion or electrolyte. 43) _____

44) Isotopes differ from each other only in the number of electrons the atom contains. 44) _____

45) About 60% to 80% of the volume of most living cells consists of organic compounds. 45) _____

46) Lipids are a poor source of stored energy. 46) _____

47) Current information suggests that omega-3 fatty acids decrease the risk of heart disease. 47) _____

48) Glucose is an example of a monosaccharide. 48) _____

49) Glycogen, the storage form of glucose, is primarily stored in muscle tissue only. 49) _____

50) The lower the pH, the higher the hydrogen ion concentration. 50) _____

51) Covalent bonds are generally less stable than ionic bonds. 51) _____

52) Hydrogen bonds are too weak to bind atoms together to form molecules but are important intramolecular bonds. 52) _____

53) The fact that no chemical bonding occurs between the components of a mixture is the chief difference between mixtures and compounds. 53) _____

54) The acidity of a solution reflects the free hydrogen ions in the solution 54) _____

55) A chemical bond is an energy relationship between outer electrons and neighboring atoms. 55) _____

56) All organic compounds contain carbon. 56) _____

57) A dipeptide can be broken into two amino acids by dehydration synthesis. 57) _____

58) The pH of body fluids must remain fairly constant for the body to maintain homeostasis. 58) _____

59) Mixtures are combinations of elements or compounds that are physically blended together but are not bound by chemical bonds. 59) _____

60) Buffers resist abrupt and large changes in the pH of the body by releasing or binding ions. 60) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

61) Which of the following elements is necessary for proper conduction of nervous impulses? 61) _____
A) I B) Fe C) P D) Na

62) The basic structural material of the body consists of _____. 62) _____
A) Lipids. B) Proteins. C) Carbohydrates D) Nucleic acids.

63) In general, the lipids that we refer to as oils have _____. 63) _____
A) a high degree of saturated bonds B) a high degree of unsaturated bonds
C) long fatty acid chains D) a high water content

64) The genetic information is coded in DNA by the _____. 64) _____
A) three-dimensional structure of the double helix
B) arrangement of the histones
C) regular alteration of sugar and phosphate molecules

D) sequence of the nucleotides

65) Which of the following is not true of proteins? 65) _____
A) They have both functional and structural roles in the body..
B) They appear to be the molecular carriers of coded hereditary information.
C) Their function depends on their three-dimensional shape.
D) They may be denatured or coagulated by heat or acidity.

66) The single most abundant protein in the body is _____. 66) _____
A) DNA B) glucose C) collagen D) hemoglobin

67) Carbohydrates are stored in the liver and muscles in the form of _____. 67) _____
A) triglycerides B) glycogen C) glucose D) cholesterol

68) Which of the following does NOT describe enzymes? 68) _____
A) Each enzyme is chemically specific.
B) Enzymes work by raising the energy of activation.
C) Some enzymes are protein plus a cofactor.
D) Some enzymes are purely protein.

69) Which of the following is not a role of molecular chaperonins? 69) _____
A) help to translocate proteins and certain metal ions across cell membranes
B) promote the breakdown of damaged or denatured proteins
C) act as a platform for assembling primary protein structure
D) aid the desired folding and association process of polypeptides
E) prevent accidental, premature, or incorrect folding of polypeptide chains

70) A chemical reaction in which bonds are broken is usually associated with _____. 70) _____
A) the release of energy B) forming a larger molecule
C) a synthesis D) the consumption of energy

71) Salts are always _____. 71) _____
A) ionic compounds B) single covalent compounds
C) hydrogen bonded D) double covalent compounds

72) 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? 72) _____
A) 2, 8, 1 B) 2, 8 C) 2 D) 2, 8, 8

73) Which of the following statements is false? 73) _____
A) When the hydrogen ion concentration decreases, the hydroxyl ion concentration also decreases.
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) The pH of blood is slightly basic.

74) Which of the following is the major positive ion outside cells? 74) _____
A) sodium B) potassium C) magnesium D) hydrogen

75) Which of the following would be regarded as an organic molecule? 75) _____
A) NaOH B) H_2O C) CH_4 D) NaCl

76) What is a chain of more than 50 amino acids called? 76) _____
A) polysaccharide B) protein C) polypeptide D) nucleic acid

77) What level of protein synthesis is represented by the coiling of the protein chain backbone into an alpha helix? 77) _____
A) primary structure B) quaternary structure
C) tertiary structure D) secondary structure

78) Carbohydrates and proteins are built up from their basic building blocks by the _____. 78) _____
A) addition of a water molecule between each two units
B) removal of a carbon atom between each two units
C) removal of a water molecule between each two units
D) addition of a carbon atom between each two units

79) Which statement about enzymes is false? 79) _____
A) Enzymes have the ability to accelerate reactions as much as a billion-fold.
B) Enzymes may be damaged by high temperature.
C) Enzymes require contact with substrate in order to assume their active form.
D) Enzymes may use coenzymes derived from vitamins or cofactors from metallic elements.

80) Which of the following statements is false? 80) _____
A) Larger particles move faster than smaller ones and thus collide more frequently and more forcefully.
B) Chemical reactions progress at a faster rate when the reacting particles are present in higher numbers.
C) Catalysts increase the rate of chemical reactions, sometimes while undergoing reversible changes in shape.
D) Chemical reactions proceed more quickly at higher temperatures.

81) Choose the answer that best describes HCO_3^-. 81) _____
A) a weak acid B) common in the liver
C) a bicarbonate ion D) a proton donor

82) Select which reactions will usually be irreversible regarding chemical equilibrium in human bodies. 82) _____
A) glucose molecules joined to make glycogen
B) glucose to CO_2 and H_2O
C) $H_2O + CO_2$ to make H_2CO_3
D) ADP + Pi to make ATP

83) What happens in redox reactions? 83) _____
A) both decomposition and electron exchange occur
B) the electron acceptor is oxidized
C) the reaction is uniformly reversible
D) the organic substance that loses hydrogen is usually reduced

84) Choose the answer that best describes fibrous proteins. 84) _____
A) are usually called enzymes B) are very stable and insoluble in water
C) are cellular catalysts D) rarely exhibit secondary structure

85) Which of the following does not describe uses for the ATP molecule? 85) _____
A) mechanical work B) chemical work

C) transport across membranes D) pigment structure

86) Select the most correct statement regarding nucleic acids. 86) _____
A) DNA is a long, double-stranded molecule made up of A, T, G, and C bases.
B) Three forms exist: DNA, RNA, and tDNA.
C) tDNA is considered a molecular slave of DNA during protein synthesis.
D) RNA is a long, single-stranded molecule made up of the bases A, T, G, and C.

87) Which of the following is an example of a suspension? 87) _____
A) blood B) rubbing alcohol C) cytoplasm D) salt water

88) Select the correct statement about isotopes. 88) _____
A) All the isotopes of an element have the same number of neutrons but differing numbers of electrons.
B) Isotopes occur only in the heavier elements.
C) Isotopes of the same element have the same atomic number but differ in their atomic masses.
D) All the isotopes of an element are radioactive.

89) The four elements that make up about 96% of body matter are _____. 89) _____
A) carbon, oxygen, phosphorus, calcium B) carbon, oxygen, hydrogen, nitrogen
C) nitrogen, hydrogen, calcium, sodium D) sodium, potassium, hydrogen, oxygen

90) _____ is fat soluble, produced in the skin on exposure to UV radiation, and necessary for normal bone growth and function. 90) _____
A) Vitamin D B) Cortisol C) Vitamin K D) Vitamin A

91) 31) You notice that you cannot read your book through a test tube of patient fluid held against the print, making it so blurred as to be unreadable. There is no precipitant in the bottom of the beaker, though it has been sitting for several days in a rack. What type of liquid is this? 91) _____
A) suspension B) mixture C) colloid D) solution

92) Atom X has 17 protons. How many electrons are in its valence shell? 92) _____
A) 3 B) 10 C) 7 D) 5

93) Which protein types are vitally important to cell function in all types of stressful circumstances? 93) _____
A) regulatory proteins B) structural proteins
C) molecular chaperones D) catalytic proteins

94) If atom X has an atomic number of 74 it would have which of the following? 94) _____
A) 37 protons and 37 neutrons B) 37 protons and 37 electrons
C) 37 electrons D) 74 protons

95) What does the formula $C_6H_{12}O_6$ mean? 95) _____
A) The molecular weight is 24.
B) The substance is a colloid.
C) There are, 6 carbon, 12 hydrogen, and 6 oxygen atoms.
D) There are 6 calcium, 12 hydrogen, and 6 oxygen atoms.

96) An atom with a valence of 3 may have a total of _____ electrons. 96) _____
A) 17 B) 3 C) 13 D) 8

97) Which of the following is a neutralization reaction? 97) _____

A) $HCl \rightarrow H^+ + Cl^-$

B) $NH_3 + H^+ \rightarrow NH_4^{+2}$

C) $NaOH \rightarrow Na^+ + OH^-$

D) $HCl + NaOH \rightarrow NaCl + H_2O$

98) The chemical symbol O□O means _____. 98) _____

A) both atoms are bonded and have zero electrons in the outer orbit

B) this is an ionic bond with two shared electrons

C) the atoms are double bonded

D) zero equals zero

99) What is a dipole? 99) _____

A) a type of reaction

B) an organic molecule

C) a type of bond

D) a polar molecule

100) What does CH_4 mean? 100) _____

A) There are four carbon and four hydrogen atoms.

B) There is one carbon and four hydrogen atoms.

C) This was involved in a redox reaction.

D) This is an inorganic molecule.

101) Amino acids joining together to make a peptide is a good example of a(n) _____ reaction. 101) _____

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

102) Which of the following is not considered a factor in influencing a reaction rate? 102) _____

A) time B) temperature C) particle size D) concentration

103) Which property of water is demonstrated when we sweat? 103) _____

A) reactivity

B) high heat of vaporization

C) cushioning

D) polar solvent properties

E) high heat capacity

104) Sucrose is a _____. 104) _____

A) polysaccharide

B) triglyceride

C) disaccharide

D) monosaccharide

105) What is the ratio of fatty acids to glycerol in neutral fats? 105) _____

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

106) In a DNA molecule, the phosphate serves _____. 106) _____

A) as nucleotides

B) to bind the sugars to their bases

C) as a code

D) to hold the molecular backbone together

107) Stress proteins are a type of protein called _____. 107) _____

A) coenzymes B) eicosanoids C) cofactors D) chaperones

108) Which bonds often bind different parts of a molecule into a specific three-dimensional shape? 108) _____

A) Amino acid B) Carbon C) Oxygen D) Hydrogen

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

109) The atomic number is equal to the number of _____. 109) _____

110) Molecules such as methane that are made of atoms that share electrons have _____ bonds. 110) _____

111) An atom with three electrons would have a valence of _____. 111) _____

112) AB → A + B is an example of a(n) _____ reaction. 112) _____

113) _____ have a bitter taste, feel slippery, and are proton acceptors. 113) _____

114) A holoenzyme is composed of an apoenzyme and a(n) _____. 114) _____

115) In a DNA molecule, guanine would connect to _____. 115) _____

116) The _____ molecule directly provides energy for cellular work. 116) _____

117) Hydrogen bonds are more like a type of weak _____ than true bonds. 117) _____

118) Weak acids and bases make good _____. 118) _____

119) Starch is the stored carbohydrate in plants, while _____ is the stored carbohydrate in animals. 119) _____

120) How many phosphates would AMP have attached to it? 120) _____

121) Which metals have a toxic effect on the body? 121) _____

122) What does the polar end of a phospholipid contain? 122) _____

123) What type of chemical bond can form between an element with 11 protons and an element with 17 protons? 123) _____

124) What happens when globular proteins are denatured? 124) _____

125) Explain the difference between potential and kinetic energy. 125) _____

126) How can phospholipids form a film when mixed in water? 126) _____

127) What properties does water have that make it a very versatile fluid? 127) _____

128) What advantages does ATP have in being the energy currency molecule? 128) _____

129) Explain why chemical reactions in the body are often irreversible. 129) _____

130) When a set of electrodes connected to a light bulb is placed in a solution of dextrose and a current is applied, the light bulb does not light up. When the same unit is placed in HCl, it does. Why? 130) _____

131) Describe the factors that affect chemical reaction rates. 131) _____

132) Protons and electrons exist in every atom nucleus except hydrogen. Is this statement true or false and why? 132) _____

133) A chemical bond never occurs between components of a mixture. Discuss this. 133) _____

134) All chemical reactions are theoretically reversible. Comment on this statement. 134) _____

135) What is the major difference between polar and nonpolar covalent bonds? 135) _____

136) An amino acid may act as a proton acceptor or donor. Explain. 136) _____

137) Name at least four things you know about enzymes. 137) _____

138) In the compound H_2CO_3, what do the numbers 2 and 3 represent? 138) _____

139) Are all chemical reactions reversible? If not, why aren't they all reversible? 139) _____

140) If all protons, electrons, and neutrons are alike, regardless of the atom considered, what determines the unique properties of each element? 140) _____

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

141) Mrs. Mulligan goes to her dentist and, after having a couple of cavities filled, her dentist strongly suggests that she reduce her intake of sodas and increase her intake of calcium phosphates in the foods she eats. Why?

142) 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?

143) How can DNA be used to "fingerprint" a suspect in a crime?

144) 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?

145) 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.

146) 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.

147) Brenda is a 26-year-old female who is being discharged from the hospital after a vaginal delivery of an 8-pound healthy infant. Brenda is instructed by the nurse to eat a diet high in fiber and to drink 8 glasses of water per day to prevent constipation. Explain the role of fiber and water to promote defecation.

1) D
2) B
3) E
4) C
5) A
6) C
7) B
8) B
9) D
10) E
11) C
12) A
13) B
14) A
15) C
16) D
17) A
18) D
19) B
20) C
21) B
22) C
23) B
24) A
25) C
26) D
27) B
28) A
29) C
30) A
31) D
32) B
33) C
34) B
35) A
36) A
37) B
38) C
39) A
40) TRUE
41) TRUE
42) FALSE
43) TRUE
44) FALSE
45) FALSE
46) FALSE
47) TRUE
48) TRUE
49) FALSE
50) TRUE
51) FALSE

52) TRUE
53) TRUE
54) TRUE
55) TRUE
56) TRUE
57) FALSE
58) TRUE
59) TRUE
60) TRUE
61) D
62) B
63) B
64) D
65) B
66) C
67) B
68) B
69) C
70) A
71) A
72) A
73) A
74) A
75) C
76) B
77) D
78) C
79) C
80) A
81) C
82) B
83) A
84) B
85) D
86) A
87) A
88) C
89) B
90) A
91) C
92) C
93) C
94) D
95) C
96) C
97) D
98) C
99) D
100) B
101) B
102) A
103) B

104) C
105) A
106) D
107) D
108) D
109) protons (and electrons)
110) covalent
111) one
112) decomposition
113) Bases
114) cofactor
115) cytosine
116) ATP
117) attraction
118) buffers
119) glycogen
120) one
121) heavy
122) a phosphorus-containing group
123) ionic
124) The active sites are destroyed.
125) Potential energy is inactive stored energy that has potential to do work. Kinetic energy is energy in action.
126) Phospholipids have both polar and nonpolar ends. The polar end interacts with water, leaving the nonpolar end oriented in the opposite direction.
127) High heat capacity, high heat of vaporization, polarity and solvent properties, reactivity, and cushioning.
128) 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.
129) 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 CO_2 and NH_4) that the body then eliminates, but which are needed to reverse a reaction.
130) HCl ionizes to form current-conducting electrolytes. Dextrose does not ionize, and therefore does not conduct current.
131) 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.
132) 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.
133) 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.
134) 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 Na + Cl → NaCl the amount of energy it takes to reverse table salt to chlorine gas and sodium metal is enormous. The reversing of the covalently bonded sugar molecule once it is reduced to ATP molecules is even harder or next to impossible without plant-like systems.
135) 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.
136) 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.

137) 1. They are proteins.
2. They have specific binding sites for specific substrates.
3. They lower the activation barrier for a specific reaction.
4. The names end in "ase."
5. They can be denatured.
6. They can be used again and again.

138) 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.

139) All chemical reactions are theoretically reversible, but only if the products are not consumed.

140) Atoms of different elements are composed of different numbers of protons, electrons, and neutrons.

141) Sodas are strong acids that can reduce bone and tooth salts. Calcium phosphate makes teeth hard and therefore more resistant to tooth decay.

142) Cholesterol is produced by the liver, in addition to being ingested in foods.

143) The DNA of a person is unique to that individual. By obtaining the DNA from nucleated cells from the crime scene (e.g., tissue, sperm), 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.

144) When an acid and base of equal strength are mixed, they undergo a displacement reaction to form a water and a salt.

145) 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.

146) 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.

147) Cellulose is a polysaccharide found in all plant products that adds bulk to the diet to promote feces through the colon. Water acts as a lubricating liquid within the colon, which eases feces through the bowel.