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CORRECT ANSWERS ARE LOCATED IN THE 2ND HALF OF THIS DOC.

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

1) Electrons that participate in chemical bonding are typically located closest to the nucleus.
   - ◎ true
   - ◎ false

2) Water molecules are nonpolar molecules.
   - ◎ true
   - ◎ false

3) Polar molecules have more reactivity compared to nonpolar molecules.
   - ◎ true
   - ◎ false

4) A covalent bond is formed between an anion and a cation.
   - ◎ true
   - ◎ false

5) The concentration of a solution expresses the amount of solvent present.
   - ◎ true
   - ◎ false

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6) If solution A has a lower pH compared to solution B, then solution A is more acidic than solution B.
   - ◎ true
   - ◎ false

7) The only part of an amino acid that differs from other amino acids is its R group.
   - ◎ true
   - ◎ false

8) All proteins are enzymes.
   - ◎ true
   - ◎ false

9) Nucleic acids have primary, secondary, tertiary, and quaternary levels of organization.
   - ◎ true
   - ◎ false

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10) The most important outcome of polypeptide intrachain bonding and folding is the unique shape of the protein.
- ◎ true
- ◎ false

11) A new organism was identified that contained arsenic in place of phosphate in its DNA double helix structure. Based upon this information alone, it can be determined that this change will greatly alter the information encoded by this genetic material.
- ◎ true
- ◎ false

12) All atoms in an element have the same number of protons.
- ◎ true
- ◎ false

CHECK ALL THE APPLY. Choose all options that best completes the statement or answers the question.

13) Select the statements that accurately reflect characteristics of nucleotides.
- A) Adenine and guanine are pyrimidine nitrogen bases.
- B) Thymine and cytosine are purine nitrogen bases.
- C) Nitrogen bases are covalently bonded to the sugar molecules within a nucleotide.
- D) Adenine bases hydrogen bond with thymine bases.
- E) Phosphate connects the sugar molecules within a chain of nucleotides.

14) Disulfide bonds are involved in maintaining which levels of protein structure?
- A) Primary
- B) Secondary
- C) Tertiary
- D) Quaternary

15) Select the statements that accurately reflect characteristics of water molecules.
- A) It is a nonpolar molecule.
- B) Polar covalent bonds are found between hydrogen and oxygen within a water molecule.
- C) The atoms within a molecule of water exhibit ionic bonding.
- D) Hydrogen bonds are found between different water molecules.
- E) Electrons are shared between the oxygen and hydrogen atoms within a molecule of water.

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16) Select all of the correct statements below, comparing and contrasting inorganic and organic molecules.
- A) If a molecule contains carbon, it is organic.
- B) If a molecule contains carbon and hydrogen, it is inorganic.
- C) Living things are composed of mostly organic molecules.
- D) Carbon is an important molecule in living things because of its ability to covalently bond to up to four different atoms.
- E) All four types of macromolecules are organic compounds.
- F) The human body never contains inorganic compounds because carbon is the fundamental unit of life and inorganic compounds do not contain carbon.

17) Select the main groups of macromolecules found in living things.
- A) Nucleic acids
- B) Oxygen compounds
- C) Lipids
- D) Proteins
- E) Carbohydrates

18) Select the levels of protein structure that would be disrupted by heat or solvent changes that affect hydrogen bonding.
- A) Primary
- B) Secondary
- C) Tertiary
- D) Quaternary

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19) Select the components of DNA to test your understanding of nucleotide composition.
- A) Amino acids
- B) Phosphate
- C) Deoxyribose
- D) Nitrogen bases
- E) Fatty acids

20) Select the components of ATP.
- A) Ribose
- B) Adenine
- C) Phosphate
- D) Deoxyribose

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21) Select characteristics exhibited by all cells.
- A) Cytoplasmic membrane
- B) Nucleus
- C) DNA
- D) Ribosomes
- E) Cell wall
- F) Organelles

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

22) An atom has gained an electron; it has been
- A) oxidized.
- B) reduced.
- C) ionized.
- D) deionized.
- E) neutralized.

23) Anything that occupies space and has mass is called
- A) atomic.
- B) living.
- C) matter.
- D) energy.
- E) space.

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24) The electrons of an atom are
- A) always equal to the number of neutrons in an atom.
- B) found in the nucleus.
- C) used to determine atomic number.
- D) positively charged.
- E) moving in pathways called orbitals.

25) The electrons of an atom are
- A) always equal to the number of protons.
- B) used to determine the atomic weight.
- C) carrying a positive charge.
- D) used to determine the atomic number.
- E) always in full orbitals.

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26) All of the following pertain to the atom Carbon-14 except it
A) has 6 protons.
B) has 6 electrons.
C) has 14 neutrons.
D) is an isotope of carbon.

27) The subatomic particles that surround the nucleus are the
A) electrons.
B) protons.
C) neutrons.
D) protons and neutrons.
E) protons and electrons.

28) What is the maximum number of electrons in the second energy shell of an atom?
A) 2
B) 4
C) 8
D) 18
E) 32

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29) What is the maximum number of electrons in the first energy shell of an atom?
A) 2
B) 4
C) 8
D) 18
E) 32

30) Protons and neutrons make up the atom's central core, which is referred to as its
A) valence number.
B) isotope.
C) nucleus.
D) center of gravity.

31) The valence number is the
A) number of protons.
B) number of neutrons.
C) atomic weight.
D) number of electrons in the innermost orbital.
E) number of electrons in the outermost orbital.

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32) Two or more atoms bonded together are called a/an
A) ion.
B) isotope.
C) element.
D) electrolyte.
E) molecule.

33) What would be the valence number of electrons in the sulfur (S) atom? Its atomic number is 16.
A) 2
B) 6
C) 8
D) 16
E) 32

34) Polar molecules
A) have an equal charge distribution.
B) have an unequal charge distribution.
C) are insoluble in water.
D) always contain carbon.
E) always involve oxygen.

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35) Organic chemicals always have a basic framework of the element_____ bonded to other atoms.
A) carbon
B) nitrogen
C) oxygen
D) hydrogen
E) phosphorous

36) $C_6H_{12}O_6 + C_6H_{12}O_6 \rightarrow C_{12}H_{22}O_{11} + H_2O$ represents
A) the formation of a peptide bond.
B) a decomposition reaction.
C) a denaturation reaction.
D) the formation of a polysaccharide.
E) a dehydration synthesis.

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37) Substances that release ions when dissolved in water and conduct electricity are
A) covalent.
B) nonpolar.
C) electrons.
D) electrolytes.
E) solvents.

38) A capillary tube is used to acquire a small blood sample for CBC (complete blood count) analysis. Suction is not required to transfer the blood from the fingertip prick to the tube in part due to
A) ionic bonding between the water molecules.
B) cohesive forces between the glass particles of the tube and the water molecules.
C) covalent bonding between the water molecules.
D) adhesive forces between the water molecules and the glass particles of the tube.

39) Polar molecules are composed of covalently bonded
A) identical atoms.
B) carbon atoms.
C) ions.
D) atoms of different electronegativity.
E) atoms of identical electronegativity.

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40) Covalent bonds
A) result from losing electrons.
B) are always polar.
C) are always nonpolar.
D) result from sharing electrons.
E) result from gaining electrons.

41) Cations are
A) charged subatomic particles.
B) atoms that have gained electrons.
C) atoms that have gained neutrons.
D) capable of forming ionic bonds with anions.
E) atoms without protons.

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42) A reaction where an electron is lost is called
A) oxidation.
B) reduction.
C) ionization.
D) decomposition.
E) dissolution.

43) Ionic bonds
A) result from sharing electrons.
B) result from transferring electrons.
C) result from like charge attraction.
D) are the weakest chemical bonds.
E) always involve carbon.

44) Hydrogen bonds
A) result from attractive forces between molecules with polar covalent bonds.
B) result from attractive forces between molecules with polar ionic bonds.
C) result from attractive forces between molecules with nonpolar covalent bonds.
D) result from attractive forces between molecules with nonpolar ionic bonds.
E) are the strongest bonds between molecules.

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45) Atoms that gain or lose electrons become charged particles called
A) cations.
B) anions.
C) ions.
D) isotopes.

46) Which of the following represents a synthesis reaction?
A) $AB \rightarrow A + B$
B) $A + B \rightarrow AB$
C) $AB + XY \rightarrow AY + XB$
D) $AB + XY \leftrightarrow AY + XB$

47) Which of the following represents a reversible reaction?
A) $AB \rightarrow A + B$
B) $A + B \rightarrow AB$
C) $AB + XY \rightarrow AY + XB$
D) $AB + XY \leftrightarrow AY + XB$

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48) Ionic compounds
- A) are hydrophobic.
- B) are hydrophilic.
- C) are acidic in solution.
- D) are basic in solution.
- E) always form salts in solution.

49) The important solvent associated with living things is
- A) carbon dioxide.
- B) sodium chloride.
- C) ethyl alcohol.
- D) benzene.
- E) water.

50) In the cell cytoplasm, molecules of ATP are a
- A) solute.
- B) solvent.

51) Burning coal produces sulfur dioxide in the atmosphere. When combined with rain that falls into bodies of water, this leads to
- A) an increase in pH level of the water.
- B) a greater concentration of OH^- ions in the water.
- C) a decrease in the pH level of the water.
- D) no change in the pH level of the water.

52) Compared to a solution of pH 9, a solution of pH 7
- A) is more basic.
- B) has no OH^- ions.
- C) has more H^+ ions.
- D) has a higher pH.

53) Compared to a solution of pH 9, a solution of pH 7 is
- A) 2 times more acidic.
- B) 20 times more acidic.
- C) 20 times more basic.
- D) 100 times more acidic.
- E) 100 times more basic.

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54) One technique for staining bacteria for viewing under the microscope is called the Gram stain. In this technique, alcohol is used as a decolorizer because it degrades the outer membrane found in some bacteria. What chemical component of the cell does alcohol affect?
A) Protein
B) Carbohydrate
C) Lipid
D) Nucleic acids

55) What type of bond is formed by dehydration synthesis between two amino acids?
A) Glycosidic
B) Ester
C) Peptide
D) Disulfide
E) Phosphate

56) The purine _____ always hydrogen bonds with the pyrimidine _____ in double-stranded DNA.
A) guanine; cytosine
B) cytosine; guanine
C) adenine; guanine
D) thymine; guanine

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57) In what way would life be different if the element carbon was absent?
A) There would be no organic compounds.
B) There would be no inorganic compounds.
C) Life would not exist in any shape or form.
D) The concept of pH would not exist.

58) A student forgot to label a beaker containing a DNA solution and a beaker containing a glucose solution. If chemical analysis was performed to identify the contents of each beaker, which of the following would be found in the beaker of DNA but not in the beaker with glucose?
A) Amino acids
B) Hydrogen and oxygen atoms
C) Nitrogen and phosphorus
D) Fatty acids
E) Carbon atoms

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59) Which of the following functional groups is mismatched to the organic compound in which it is typically found?
A) Phosphate - carbohydrates
B) Sulfhydryl - proteins
C) Amino - proteins
D) Hydroxyl - alcohols
E) Carboxyl - fatty acids

60) Most biochemical macromolecules are polymers, which are chains of
A) hydrophobic molecules.
B) electrolytic molecules.
C) repeating monomers.
D) repeating carbohydrates.
E) hydrogen bonds.

61) All of the following are monosaccharides except
A) glucose.
B) glycogen.
C) fructose.
D) deoxyribose.

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62) Which of the following would have glycosidic bonds?
A) Triglycerides
B) Monosaccharides
C) Polypeptides
D) Polysaccharides
E) ATP

63) Starch is the primary storage food for all of the following except
A) green plants.
B) algae.
C) animals.
D) some fungi.

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64) Select the statement that most accurately reflects the process of plant material digestion in humans.
A) It is a very efficient process the produces very little undigested material in feces.
B) It is a process that is dependent upon enzyme (cellulase) production by gut microbiota.
C) It requires the action of enzymes called kinases.
D) It is linked to the digestion of glycogen.

65) All of the following are lipids except
A) cholesterol.
B) starch.
C) phospholipid.
D) wax.
E) triglyceride.

66) What part of a phospholipid comprises the hydrophobic tail?
A) Fatty acids
B) Glycerol
C) Phosphate
D) Alcohol
E) Hydroxyl

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67) A fat is called_____ if all carbons of the fatty acid chain are single-bonded to 2 other carbons and 2 hydrogens.
A) unsaturated
B) polyunsaturated
C) monounsaturated
D) saturated

68) The building blocks of an enzyme are
A) nucleotides.
B) glycerol and fatty acids.
C) monosaccharides.
D) phosphate, glycerol, and fatty acids.
E) amino acids.

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69) An amino acid contains all of the following except a/an
A) amino group.
B) carboxyl group.
C) variable R group.
D) α carbon.
E) phosphate.

70) An example of an amphipathic molecule found in living cells is
A) glucose.
B) phospholipid.
C) protein.
D) nucleic acid.
E) ATP.

71) The lipid group that serves as energy storage molecules is the
A) prostaglandins.
B) waxes.
C) phospholipids.
D) steroids.
E) triglycerides.

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72) All of the following are polysaccharides except
A) dextran in some bacterial slime layers.
B) agar used to make solid culture media.
C) a cell's glycocalyx.
D) cellulose in certain cell walls.
E) sterols in cell membranes.

73) The lipid group that is the major component of cell membranes is the
A) prostaglandins.
B) waxes.
C) phospholipids.
D) steroids.
E) triglycerides.

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74) Which of the following statements is incorrect regarding protein structure?

A) The interaction between various R groups of amino acids determines the primary structure of a protein.
B) Beta-pleated sheets are a type of protein secondary structure.
C) The folding of a protein to form its active site creates its tertiary structure.
D) Proteins, such as antibodies that are comprised of multiple polypeptide chains, have quaternary structure.

75) Which of the following is not true about enzymes?
A) Enzymes are found in all cells.
B) Enzymes are catalysts.
C) Enzymes participate in the cell's chemical reactions.
D) Enzymes can be denaturated by heat and other agents.
E) Enzymes have high-energy bonds between phosphates.

76) The alpha (α) helix is a type of_____ protein structure.
A) primary
B) secondary
C) tertiary
D) quaternary

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77) ATP differs from the nucleotides found in DNA in the
A) sugar portion of the molecule.
B) use of phosphate instead of sulfate in the backbone.
C) use of phosphorus in the nitrogenous base portion of the molecule.
D) use of adenosine instead of adenine.
E) use of uracil in the nitrogenous base portion of the molecule.

78) One nucleotide contains one
A) phosphate.
B) pentose sugar.
C) nitrogen base.
D) All of the choices are correct.

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79) Purines and pyrimidines are components in the building block units of all
A) nucleic acids.
B) carbohydrates.
C) polysaccharides.
D) amino acids.
E) enzymes.

80) Which of the following is not a pyrimidine?
A) Uracil
B) Adenine
C) Thymine
D) Cytosine

81) Which pertains to DNA but not to RNA?
A) Contains ribose
B) Contains adenine
C) Contains thymine
D) Contains uracil
E) Contains nucleotides

82) Which of the following is a correct description of a component of the ATP molecule?
A) Sugar: deoxyribose
B) Nitrogenous base: alanine
C) High energy bond: peptide bond
D) Sugar: ribose
E) High energy bond: glycosidic bond

83) ATP is best described as
A) an enzyme.
B) a double helix.
C) an electron carrier.
D) the energy molecule of cells.

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84) A culture of an organism believed to cause intestinal symptoms is viewed under the microscope, and the microbiologist observes a cell membrane, flagella, mitochondria, and some dark unrecognizable structures within each cell. The microbiologist notes that the cells are eukaryotic because
A) only eukaryotic cells have a cell membrane.
B) only eukaryotic cells have mitochondria.
C) only eukaryotic cells have flagella.
D) the dark structures must be the cell nuclei.

85) NASA has published a list of criteria for identifying fossil bacteria in samples from Mars, as part of a search for evidence of life. Which of the following is good evidence for the presence of bacterial cells?
A) Cell size of 0.5 to 2 microns
B) Three-dimensional organization of cells in a starburst pattern
C) Absence of carbon in the material
D) No evidence of water in the surrounding mineral

86) Characteristics shared by all cells include
A) a membrane serving as a cell boundary.
B) the possession of genetic information.
C) the presence of cellular fluid.TBEXAM.COM
D) All of the choices are correct.

87) All cells contain
A) ribosomes for protein synthesis.
B) cell walls made of cellulose.
C) uracil in their DNA.
D) organelles for compartmentalization.
E) mitochondria to generate ATP.

88) Alpha helices and beta pleated sheets are examples of the _____ level of protein structure.
A) primary
B) secondary
C) tertiary
D) quaternary

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89) Select the number of phosphates present in a molecule of ATP.
A) 1
B) 2
C) 3
D) 4

90) You are preparing a solution by mixing 10 grams of glucose into distilled water. In this solution, distilled water is the
A) solvent.
B) ion.
C) solute.
D) precipitate.

91) What type of bond is found between carbon and hydrogen in most biological molecules?
A) Van der Waals force
B) Covalent bond
C) Ionic bond
D) Hydrogen bond

92) Choose the phrase that describes what will happen to pH as hydrogen ion concentration increases.
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A) pH will increase
B) pH will decrease
C) pH will not change

93) What type of bond maintains the primary structure of a protein?
A) Glycosidic bond
B) Hydrogen bond
C) Ionic bond
D) Peptide bond
E) Phosphodiester bond

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Answer Key

Test name: Chapter 02

1) FALSE
2) FALSE
3) TRUE
4) FALSE
5) FALSE
6) TRUE
7) TRUE
8) FALSE
9) FALSE
10) TRUE
11) FALSE
12) TRUE

All atoms of an element have the same number of protons and will exhibit the same chemical properties. The number of neutrons may vary if there are different isotopes of the element. The number of electrons can vary as well, creating ions of that same element.

13) [C, D, E]

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Within a nucleotide, adenine and guanine are purine bases while thymine and cytosine are pyrimidine bases. Adenine pairs with thymine and cytosine pairs with guanine through hydrogen bonding. To remember this, think of Adenine and Thymine as Always Together, and Guanine and Cytosine as a Good Couple. Both the phosphate group and the nitrogenous bases are covalently bound to the deoxyribose sugar.

14) [C, D]

Tertiary and quaternary structures of proteins are maintained by different bond types including hydrogen bonds, ionic bonds, and disulfide bonds.

15) [B, D, E]

The oxygen atom in water is bonded to each of two hydrogen atoms by polar covalent bonds, in which electrons are unequally shared. Because of this unequal sharing of electrons, the hydrogen atoms of one water molecule have a partial positive charge and are attracted to the partial negative charge of an oxygen atom in a different water molecule. This attraction *between different* water molecules is called hydrogen bonding.

16) [C, D, E]

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Compounds with**both** carbon and hydrogen are called organic. All others are inorganic. For examples, carbon dioxide (CO_2) is inorganic, whereas glucose ($C_6H_{12}O_6$) is organic. Carbon has four electrons in its valence shell and therefore, it can easily bond to other atoms by sharing those electrons in a covalent bond. This makes it an important part of the building blocks of life, such as the four types of macromolecules (lipids, carbohydrates, nucleic acids, and proteins). Living things are mostly made up of these organic building blocks, but do contain inorganic compounds as well. Simple examples include respiratory gases such asCO_2andO_2.

17) [A, C, D, E]
The four main groups of macromolecules in living things are carbohydrates, lipids, proteins, and nucleic acids. While oxygen and carbon dioxide are important molecules in living things, they are not considered macromolecules.

18) [B, C, D]
Heat and solvent changes can disrupt hydrogen bonds. Hydrogen bonds are involved in maintaining secondary, tertiary and quaternary structure of proteins. Primary structure is maintained by peptide (covalent) bonds that would not be disrupted by heat or solvent changes.

19) [B, C, D]
Nucleic acids are polymers of nucleotides. Nucleotides are composed of phosphate, a pentose sugar (deoxyribose in DNA and ribose in RNA), and nitrogenous bases. There are no amino acids and no fatty acids in nucleic acids.

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20) [A, B, C]
ATP is a ribonucleotide, containing ribose, adenine, and three phosphates. There is no deoxyribose in ATP.

21) [A, C, D]
All cells (bacteria, archaea, and eukaryotic cells) have a cytoplasmic membrane, DNA (chromosome), ribosomes, and cytoplasm. Bacterial and archaeal cells lack a nucleus and organelles. Animal cells and some protists lack a cell wall.

22) B
23) C
24) E
25) A
26) C
27) A
28) C
29) A

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30) C
31) E
32) E
33) B
34) B
35) A
36) E
37) D
38) D
39) D
40) D
41) D
42) A
43) B
44) A
45) C
46) B
47) D
48) B
49) E
50) A
51) C
52) C
53) D
54) C
55) C
56) A
57) A
58) C
59) A
60) C
61) B
62) D
63) C
64) B
65) B
66) A
67) D
68) E
69) E

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70) B
71) E
72) E
73) C
74) A
75) E
76) B
77) A
78) D
79) A
80) B
81) C
82) D
83) D
84) B
85) A
86) D
87) A
88) B
There are four levels of protein structure. Alpha helices and beta pleated sheets are two different forms of secondary structure, which form due to hydrogen bonding between functional groups on the amino acids that make up the primary chain.

89) C
ATP, or adenosine triphosphate, contains adenine, ribose sugar, and three phosphates.

90) A
In this solution, water is the dissolving medium or solvent. Glucose is the solute. Water is the most common solvent in biological systems.

91) B
Carbon and hydrogen form bonds by sharing electrons. Bonds that involve the sharing of electrons are**covalent** bonds.

92) B
As hydrogen ion concentration increases, the pH will decrease. The higher the hydrogen ion concentration is in a solution, the lower the pH and the more acidic a solution will be.

93) D

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The primary structure of a protein consists of the order of amino acids in the polypeptide chain. This order is maintained by peptide bonds. Glycosidic bonds are found in carbohydrates. Phosphodiester bonds are found in nucleic acids. Hydrogen and ionic bonds play roles in maintaining secondary, tertiary, and quaternary structure of proteins.

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