# Chapter 02
# Chemical Composition of the Body and Its Relation to Physiology

## Multiple Choice Questions

1. Which correctly describes the structure of an atom?
A. There are always the same number of protons and neutrons.
**B.** There are always the same number of protons and electrons.
C. There are always the same number of neutrons and electrons.
D. The number of protons, neutrons, and electrons is always the same
E. There are never the same number of neutrons and protons.

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01a Describe the charge, mass, and relative location of electrons, protons and neutrons with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

2. What directly determines an atom's identity?
A. the number of electrons
B. the number of neutrons
**C.** the number of protons
D. the number of bonds it can form
E. the ratio of protons to electrons

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01a Describe the charge, mass, and relative location of electrons, protons and neutrons with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

3. Carbon-12 and carbon-14 are isotopes. How are they different from each other?
A. different numbers of protons
**B.** different numbers of neutrons
C. different numbers of electrons
D. they can form different numbers of chemical bonds
E. different number of energy shells

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01c Explain how ions and isotopes are produced by changing the relative number of specific subatomic particles with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

4. Which is a covalent bond?
A. two atoms share inner-orbit electrons with each other
B. a bond between water molecules
C. a bond between two oppositely charged ions
D. a bond between two free radicals
**E.** two atoms share outer orbit electrons with each other

*Bloom's: Level 1. Remember*
*HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.02*
*Section: 02.02*
*Topic: Chemical bonding*

5. Ions are
A. electrically neutral.
**B.** electrically charged.
C. formed by the gain or loss of protons from the nucleus.
D. insoluble in water.
E. nonpolar atoms.

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01c Explain how ions and isotopes are produced by changing the relative number of specific subatomic particles with respect to the structure of an atom.*
*HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes and radioisotopes.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

6. When magnesium loses electrons to become an ion, what does it become?
A. a covalent molecule
**B.** a cation
C. an anion
D. a new element
E. a free radical

*Bloom's: Level 2. Understand*
*HAPS Objective: C01.01c Explain how ions and isotopes are produced by changing the relative number of specific subatomic particles with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

7. If a sports beverage advertises that it replaces the body's electrolytes, what does the drink contain?
A. sugars that were broken down for energy
**B.** ionic forms of mineral elements
C. lipids that form the membranes of cells
D. oxygen and gases used by metabolism
E. vitamins

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes and radioisotopes.*
*HAPS Objective: Q03.01 Define electrolyte.*
*HAPS Topic: Module C01 Atoms and molecules.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*
*Topic: Inorganic compounds and solutions*

8. Of these major ions found in the body, which one carries a negative charge?
**A.** Chloride
B. Sodium
C. Potassium
D. Hydrogen
E. Calcium

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01c Explain how ions and isotopes are produced by changing the relative number of specific subatomic particles with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*
*Topic: Inorganic compounds and solutions*

9. Which describes a characteristic of free radicals?
**A.** They rapidly oxidize other atoms by removing an electron.
B. They are inert molecules that don't interact readily with other molecules.
C. They contain two electrons in the outermost orbital.
D. They have extra neutrons in their nuclei.
E. They are found in high quantities in most sports drinks.

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes and radioisotopes.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.02*
*Section: 02.02*
*Topic: Atoms and molecules*

10. Which is true about electrolytes?
A. They are neutral atoms.
**B.** They conduct electricity when dissolved in water.
C. They are found in pure water.
D. They have equal numbers of protons and electrons.
E. They are insoluble in water.

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.02 Compare and contrast the terms ions, electrolytes, free radicals, isotopes and radioisotopes.*
*HAPS Objective: Q03.01 Define electrolyte.*
*HAPS Topic: Module C01 Atoms and molecules.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*
*Topic: Inorganic compounds and solutions*

11. Which of the following is *not* true of a polar chemical bond?
A. It is covalent.
**B.** It is ionized.
C. It has opposite electrical charge at each end.
D. It has no net electrical charge.

*Bloom's: Level 2. Understand*
*HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.02*
*Section: 02.02*
*Topic: Chemical bonding*

12. Which best describes a hydrolysis reaction?
**A.** Molecules are broken down into smaller ones by breaking covalent bonds within water molecules and transferring hydrogen atoms and hydroxyl groups to the smaller ones.
B. Electrically charged molecules separate into ions when they dissolve in water, and then hydrogen ions and hydroxyl groups covalently attach themselves to the oppositely charged ions.
C. Large molecules are assembled from smaller ones by breaking water into hydrogen and hydroxyl ions.
D. Dissolving a large molecule in water reduces it to its individual atoms.
E. The breaking of hydrogen bonds between any two molecules.

*Bloom's: Level 2. Understand*
*HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.*
*HAPS Topic: Module C02 Chemical bonding.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Chemical bonding*

13. Oil spilled into the ocean does not easily disperse, but rather clumps into an oil slick. Which of the following explains why this occurs?
A. Oil is composed mainly of hydrophilic molecules.
**B.** Oil is composed mainly of nonpolar molecules.
C. Oil has no hydrogen in its molecular structure, so it can't form hydrogen bonds with water.
D. Water is hydrophobic.
E. Electrons are shared unequally between carbon and hydrogen atoms.

*Bloom's: Level 2. Understand*
*HAPS Objective: C02.01c Provide biologically significant examples of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Objective: C03.01 Discuss the physiologically important properties of water.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.02*
*Section: 02.02*
*Topic: Chemical bonding*

14. Molecules that have properties of both polar and nonpolar molecules are called
A. hydrophobic.
B. hydrophilic.
**C.** amphipathic.
D. unipolar.
E. bipolar.

*Bloom's: Level 1. Remember*
*HAPS Objective: C02.01c Provide biologically significant examples of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*HAPS Topic: Module C07 Membrane structure and function.*
*Learning Outcome: 02.03*
*Section: 02.03*
*Topic: Chemical bonding*
*Topic: Membrane structure and function*

15. Compounds A, B, and C have molecular weights of 10, 50, and 100, respectively. If 5 grams of each compound were put into 1 liter of water, which compound will have the greatest molar concentration?
**A.** Compound A
B. Compound B
C. Compound C
D. All will have the same molar concentration.

*Bloom's: Level 2. Understand*
*HAPS Objective: C08.01b Describe the mechanism by which movement of material occurs in each membrane transport process – simple diffusion, facilitated diffusion, osmosis, active transport, exocytosis, endocytosis, phagocytosis, pinocytosis, and filtration.*
*HAPS Topic: Module C08 Mechanisms for movement of materials across cell membranes.*
*Learning Outcome: 02.03*
*Section: 02.03*
*Topic: Inorganic compounds and solutions*

16. The pH of a solution
A. is a measure of the concentration of hydrogen atoms in the solution.
B. is a measure of the concentration of hydrogen ions bound to other molecules in the solution.
**C.** is a measure of the concentration of free hydrogen ions in the solution.
D. increases as the acidity of the solution increases.
E. increases as the free hydrogen ion concentration in the solution increases.

*Bloom's: Level 1. Remember*
*HAPS Objective: C03.04 Define the terms pH, acid, base, and buffer and give examples of physiological significance.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.03*
*Section: 02.03*
*Topic: Inorganic compounds and solutions*

17. Most of the body weight of an average young adult male is what substance?
**A.** Water
B. Protein
C. Minerals
D. Lipids
E. Carbohydrates

*Bloom's: Level 1. Remember*
*HAPS Objective: Q02.01 Describe the fluid compartments (including the subdivisions of the extracellular fluid) and state the relative volumes of each.*
*HAPS Topic: Module Q02 Description of the major fluid compartments.*
*Learning Outcome: 02.03*
*Section: 02.03*

18. Which is true about the composition of organic molecules?
A. They always contain oxygen.
**B.** They always contain carbon.
C. They are always macromolecules.
D. They never contain hydrogen.
E. They never contain oxygen.

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.01 Define the term organic molecule.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

19. Carbohydrates:
**A.** have carbon and oxygen atoms in equal proportions.
B. are the major organic molecules of the body by mass.
C. are nonpolar molecules.
D. are defined by the inclusion of nitrogen in their structure.
E. are composed of only carbon and hydrogen atoms.

*Bloom's: Level 2. Understand*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

20. Which chemical group does glucose best fit into?
**A.** monosaccharides
B. disaccharides
C. polysaccharides
D. glycoproteins
E. phospholipids

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*Learning Outcome: 02.04*
*Section: 02.04*

21. Carbohydrates are stored in the liver and muscles in the form of
A. cellulose.
B. starch.
C. triacylglycerol.
**D.** glycogen.
E. protein.

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Objective: C04.04e Discuss physiological and structural roles in the human body of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

22. What are the two main atoms in lipids, and what type of bonds connect them?
A. carbon and oxygen, connected by covalent bonds.
**B.** carbon and hydrogen, connected by covalent bonds
C. carbon and hydrogen, connected by ionic bonds
D. carbon and hydrogen, connected by hydrogen bonds
E. oxygen and hydrogen, connected by hydrogen bonds

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

23. Eicosanoids are an important class of regulatory molecules; what chemical class do they belong to?
A. steroids
B. proteins
C. carbohydrates
**D.** fatty acids
E. amino acids

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04e Discuss physiological and structural roles in the human body of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

24. Which statement is FALSE with regard to proteins?
A. Their roles in the body include acting as enzymes, providing structural support, and signaling between cells.
B. They make up a greater percentage of body mass than carbohydrates do.
**C.** They are composed of nucleic acids.
D. They are macromolecules with subunits linked by polypeptide bonds.
E. They are polymers made up of amino acids.

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

25. What best describes the main determinant of the **secondary structure** of a protein?
A. the sequence of the various amino acids that make up a polypeptide chain
B. the total number of amino acids that make up a polypeptide chain, and its overall resulting length
C. the total number of polypeptide chains that combine to determine the overall size of the protein
D. molecular interactions between widely separated regions of a polypeptide, such as disulfide bonds, that stabilize the folded conformation
**E.** molecular interactions along a polypeptide chain that fold various regions into alpha helices or beta sheets

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

26. Which of the following is NOT a type of molecular interaction that determines the tertiary structure of a protein?
**A.** covalent bonds between purines and pyrimidine bases
B. ionic bonds
C. Van der Waals forces
D. covalent bonds between two cysteine amino acids
E. hydrogen bonds

*Bloom's: Level 2. Understand*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

27. What is the term describing the covalent bond formed between two amino acids?
A. Glycosidic bond
**B.** Peptide bond
C. Phosphodiester bond
D. Ester bond
E. Hydrolytic bond

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

28. Which is a correct description of nucleic acids?
A. They are polymers of subunits containing glucose an an amino acids.
B. They are polymers of subunits containing glucose, a phosphate group, and an amino acid.
**C.** They are polymers of subunits containing a phosphate group, a sugar, and a purine or pyrimidine base.
D. They are polymers of subunits containing a phosphate group, a sugar, and an amino acid.
E. They are long polymers of amino acids, folded into an alpha helix.

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Nucleic acids: DNA and RNA*

29. Which best describes the main role of adenosine triphosphate (ATP)?
A. It is an amino acid that is part of polypeptide chains that serve structural functions within cells.
B. It is a nucleotide that makes up the backbone of DNA and RNA molecules, that harbor the genetic code.
C. It is a carbohydrate molecule that can be stored in large quantities in the liver to energize cellular processes.
**D.** It is a purine derivative created from the breakdown of fuel molecules, that transfers energy for cellular processes.
E. It is a waste product of aerobic metabolism that is excreted from the body by the kidneys.

*Bloom's: Level 1. Remember*
*HAPS Objective: C05.01 Describe the generalized reversible reaction for release of energy from ATP and explain the role of ATP in the cell.*
*HAPS Topic: Module C05 Energy transfer using ATP.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Energy transfer using ATP*

## True / False Questions

30. An atom is electrically neutral.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01a Describe the charge, mass, and relative location of electrons, protons and neutrons with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

31. The mass of an atom is the sum of its protons and electrons.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01a Describe the charge, mass, and relative location of electrons, protons and neutrons with respect to the structure of an atom.*
*HAPS Objective: C01.01d Distinguish among the terms atomic number, mass number and atomic weight with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

32. The atomic number of an element is given by the number of electrons in the atom.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01d Distinguish among the terms atomic number, mass number and atomic weight with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

33. An atomic nucleus is electrically neutral.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01a Describe the charge, mass, and relative location of electrons, protons and neutrons with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

34. Protons and neutrons have roughly the same mass.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01a Describe the charge, mass, and relative location of electrons, protons and neutrons with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

35. The atomic number of an element refers to the number of particles in its atomic nucleus.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01a Describe the charge, mass, and relative location of electrons, protons and neutrons with respect to the structure of an atom.*
*HAPS Objective: C01.01d Distinguish among the terms atomic number, mass number and atomic weight with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

36. Twelve grams of C contain the same number of atoms as one gram of H.
**TRUE**

*Bloom's: Level 2. Understand*
*HAPS Objective: C01.01a Describe the charge, mass, and relative location of electrons, protons and neutrons with respect to the structure of an atom.*
*HAPS Objective: C01.01d Distinguish among the terms atomic number, mass number and atomic weight with respect to the structure of an atom.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

37. The four most common elements in the body are hydrogen, carbon, calcium, and oxygen.

**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

38. Important mineral elements in the body include Na, Ca, and K.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: Q03.02 Compare and contrast the relative concentrations of major electrolytes in intracellular and extracellular fluids.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Inorganic compounds and solutions*

39. Trace elements such as zinc and manganese are found in minute quantities in the body but do not serve any known function.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Inorganic compounds and solutions*

40. The number of covalent bonds that can be formed by a given atom depends upon the number of electrons present in the outermost orbit.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C01.01b Relate the number of electrons in an electron shell to an atoms chemical stability and its ability to form chemical bonds with respect to the structure of an atom.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.01*
*Learning Outcome: 02.02*
*Section: 02.01*
*Section: 02.02*
*Topic: Chemical bonding*

41. Nitrogen atoms can form a maximum of four covalent bonds with other atoms.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.01*
*Learning Outcome: 02.02*
*Section: 02.01*
*Section: 02.02*
*Topic: Chemical bonding*

42. The shape of a molecule may change as atoms rotate about their covalent bonds.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.02*
*Section: 02.02*
*Topic: Chemical bonding*

43. All of the physiologically important atoms of the body readily form ions.
**FALSE**

*Bloom's: Level 2. Understand*
*HAPS Objective: C02.01c Provide biologically significant examples of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C01 Atoms and molecules.*
*Learning Outcome: 02.01*
*Section: 02.01*
*Topic: Atoms and molecules*

44. Water molecules can form covalent bonds with other water molecules.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C02.01c Provide biologically significant examples of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Objective: C03.01 Discuss the physiologically important properties of water.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.02*
*Section: 02.02*
*Topic: Chemical bonding*

45. In a molecule of water, an oxygen atom forms a double bond with each of two hydrogen atoms.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C03.01 Discuss the physiologically important properties of water.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.02*
*Section: 02.02*
*Topic: Chemical bonding*

46. The carboxyl ion is an anion.
**TRUE**

*Bloom's: Level 2. Understand*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.01*
*Learning Outcome: 02.02*
*Section: 02.01*
*Section: 02.02*
*Topic: Organic compounds*

47. NaCl is a molecule formed by the covalent bonding of a sodium atom to a chlorine atom.

**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.02*
*Section: 02.02*
*Topic: Chemical bonding*

48. All covalent bonds are polar.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C02.01b Explain the mechanism of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.02*
*Section: 02.02*
*Topic: Chemical bonding*

49. During hydrolysis, hydrogen ions and hydroxyl groups are formed.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.03 Define and give examples of dehydration synthesis and hydrolysis reactions.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.03*
*Section: 02.03*
*Topic: Organic compounds*

50. In general, polar molecules will dissolve in polar solvents, while nonpolar molecules cannot.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C03.01 Discuss the physiologically important properties of water.*
*HAPS Topic: Module C02 Chemical bonding.*
*Learning Outcome: 02.03*
*Section: 02.03*
*Topic: Chemical bonding*

51. Solutes that do not dissolve in water are called hydrophilic.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C02.01c Provide biologically significant examples of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.03*
*Section: 02.03*
*Topic: Inorganic compounds and solutions*

52. Molecules with both polar and nonpolar regions are called ambidextrous.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C02.01c Provide biologically significant examples of each type of non-polar covalent, polar covalent, ionic, and hydrogen bonds.*
*Learning Outcome: 02.03*
*Section: 02.03*

53. The molarity of a solution is a measure of the concentration of the solute.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C03.02 Distinguish among the terms solution, solute, solvent, colloid suspension, and emulsion.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.03*
*Section: 02.03*
*Topic: Inorganic compounds and solutions*

54. A solution with a pH of 8 is more acidic than one with a pH of 3.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C03.05 State acidic, neutral, and alkaline pH values.*
*HAPS Topic: Module C03 Inorganic compounds and solutions.*
*Learning Outcome: 02.03*
*Section: 02.03*
*Topic: Inorganic compounds and solutions*

55. Organic chemistry is the study of oxygen-containing compounds.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.01 Define the term organic molecule.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

56. When multiple repeating simple sugar molecules combine to form a larger molecule, it is called a polysaccharide.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

57. Sucrose is called "blood sugar" because it is the most abundant carbohydrate in the blood.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04e Discuss physiological and structural roles in the human body of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*HAPS Topic: Module Q03 Chemical composition of the major compartment fluids.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

58. Triacylglycerol is one subclass of lipid molecules.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

59. Saturated fats contain carbon atoms linked by double bonds.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04b Compare and contrast general molecular structure of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

60. Cholesterol is a phospholipid.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

61. Glycoproteins are protein molecules with molecules of glycogen attached to the amino acid side chains.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

62. The sequence of amino acids in a protein is known as the secondary structure.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

63. A protein may consist of more than one polypeptide chain.
**TRUE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

64. Substitution of one amino acid for a different one in a given protein always significantly alters the conformation of that protein.
**FALSE**

*Bloom's: Level 2. Understand*
*HAPS Objective: C04.05 Describe the four levels of protein structure and discuss the importance of protein shape for protein function.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Organic compounds*

65. In DNA, thymine binds with adenine and cytosine binds with uracil.
**FALSE**

*Bloom's: Level 1. Remember*
*HAPS Objective: C04.04a Identify the monomers and polymers of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Objective: C04.04c Provide specific examples of carbohydrates, proteins, lipids and nucleic acids.*
*HAPS Topic: Module C04 Organic compounds.*
*Learning Outcome: 02.04*
*Section: 02.04*
*Topic: Nucleic acids: DNA and RNA*